Selected Low Carbon CHP & Micro-CHP comments on the Draft State Energy Plan (Draft SEP)
From Remarks Presented by Ruben S. Brown
President, The E Cubed Company, LLC
On behalf of the Joint Supporters
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The Joint Supporters are a 20-year old ad hoc voluntary association with a floating constituency[1] that frequently includes other associations and companies that produce, distribute, engineer, install and operate clean heat and power systems (CHP, sometimes described as combined heat and power systems). These particular comments address CHP and the need to move it to centrality in the Final State Energy Plan. CHP should permeate all five strategies outlined in the Plan.

> Five strategies are outlined in the Plan, which simultaneously achieve *[these]* multiple policy objectives. The strategies are: (1) produce, deliver, and use energy more efficiently; (2) support development of in-state energy supplies; (3) invest in energy and transportation infrastructure; (4) stimulate innovation in a Clean Energy Economy; and (5) engage others in achieving the State's policy objectives. Executive Summary p. xi

In-state low carbon CHP systems are essentially efficient. They reduce two fuel streams to one. One stream is remote (it goes to a generating station); the other goes to the end-use site. By producing two or more outputs (electricity, heat/chilling, mechanical) at the site from one fuel stream, significant societal inefficiencies can be eliminated and societal emissions can be reduced dramatically. The existing energy transportation structure can be more effectively utilized, e.g. existing natural gas distribution systems. Innovation in the clean energy economy is prompted by sales of CHP systems, especially residential micro-CHP systems that were not available a few years ago. CHP investment, whether by performance contracting or otherwise, mobilizes and leverages substantial investment beyond subsidized measures. Giving away light bulbs does not create similar leverage.

These achievements come from both large-scale CHP and micro-CHP systems. In the latter instance, the home's heating fuel is utilized to generate much of the home's electricity. Each will be discussed in turn.

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[1] The Joint Supporters include for this purpose: NAESCO, ECR International, Climate Energy, Capstone Turbine Corporation, Energy Concepts Engineering, P.C., Energy Spectrum, Inc., Marathon Energy (Ecogen), WhisperGen, IRR Supply, Red Hook Green Power, LLC, and Fairway Operating Company and others.

We urge the Governor to sign A.2442-C (Destito) / S. 4283-8 (Valesky)[2] which would allow low carbon highly efficient (80% overall) micro-CHP systems to 10 kilowatts to net meter within New York State. Net excess, if any, at the end of the accounting period would be paid at wholesale rates. In effect, a micro-CHP installation could permit a household in New York State to displace 2/3rds of the CO2 caused its car's operation each year. This should be considered "Win/Win".

We also urge the Governor to sign xxx, which would amend the Town Law to allow xxxx. This may become a resource for some towns to utilize to stimulate micro-CHP activity and other efficiency improvements.

The US EPA's CHP Emissions Calculator for an illustrative micro-CHP system shows emissions reductions in NYS of CO2 (40-50%), NOx (70-80%), SO2 (100%) compared to central generation and the prior thermal facilities on-site. For every 1,000 units installed in NY residences the carbon removal is the equivalent of taking 623 passenger automobiles per year off New York's streets and road or the amount of carbon sequestered in 777 acres of pine and fir forest. An output sheet in PDF format is attached.

One of the companies is New York State's largest boiler manufacturer, which is expanding factory facilities upstate to make micro-CHP systems for 1-4 family residential homes, and small commercial uses. Fifty jobs are being created. There are over three million 1-4 family residential buildings in NYS. The State Energy Plan and public agency activity should stimulate this growth market.

It is the overall position of the Joint Supporters that, by largely ignoring CHP, the draft State Energy Plan neglects significant off-site and on-site societal energy waste and greatly restricts the stability, reliability and emissions reduction benefits provided by a diversity of clean energy heat and power (CHP) resources, regardless of fuel source or technology.

The final State Energy Plan should emphasize eliminating energy waste and/or reducing waste energy. CHP does both. Reducing energy waste in generation, production and transmission/distribution should be the first in-state energy supply. CHP on-site could reduce the need for and the use of external generation, production and transmission or

[2] A.2442-C (Destito) / S. 4283-8 (Valesky) AN ACT to amend the public service law and the public authorities law, in relation to the net energy metering for micro-combined heat and power generating systems

distribution. This includes lightly used remote renewable generation.

As indicated by multiple other witnesses who testified ahead of me, CHP needs to be re-stressed in the Final SEP and alternative funding avenues should be identified and mobilized during the Plan implementation whether by NYSERDA and/or other sources.

Larger Clean Heat and Power Systems

Performance contractors who represented in the Joint Supporters by the National Association of Energy Services Companies (NAESCO) often deploy and employ larger CHP systems in their long-term contracts with hospitals, governmental facilities, industry, commercial operations, educational institutions and even sporting complexes. Examples include projects funded by the State Education Department, NYSERDA, local authorities (e.g. Monroe County), School Districts (e.g. , North Tonawanda), Community Colleges (e.g. Hudson Valley CC) and Universities (e.g. Cornell, Hofstra) and many other institutions.

These systems generally, but not totally, fall within the category of small generating systems identified by the Federal Energy Regulatory Commission (FERC) as 20,000 kilowatts and smaller. This is relevant to the interconnection guidelines administered by wholesale market institutions under FERC regulatory oversight, such as the New York Independent System Operator (NYISO), when and if such sites interface with the wholesale market. Otherwise interconnection, especially for sites under 2,000 kilowatts is supervised under distribution system entities, under the jurisdiction of the Public Service Commission or the Long Island Power Authority. Federal business tax credits of ten percent are available for such projects where the ownership can be maintained by an otherwise tax paying business entity. A minimum sixty percent overall efficiency standard is required for eligibility.

NAESCO's more than sixty member companies (ck) perform across the Nation (and New York State) substantial amounts of energy efficiency that is on a par with all the EE performed by the all the utilities in the United States.

Other Companies active in the Joint Supporters including Capstone Turbine Corporation, Energy Concepts Engineering, Energy Spectrum, Red Hook Green Power, have deployed more than thirty systems (ck?) in the 100-2,000 kilowatt size range in New York State utilizing micro-turbines (which have only one moving part, the turbine in the size of 65 to 250 kW), reciprocating engines, and fuel cells with various feedstocks. In addition to institutions identified above, these technologies have applications everywhere from nursing homes to waste water treatment facilities and landfill methane recovery situations

During the period from 1998-2009 the Joint Supporters have actively negotiated the evolution of New York's distributed generation interconnection standards now set to the 2,000 kW level except at Con Edison where in an electric rate case it was negotiated to 5,000 kW. The Joint Supporters also negotiated the design of the current standby structure in a series of generic and utility specific PSC proceedings.

The CHP potential of New York State both upstate and downstate has been well documented in studies by the Pace University Climate and Energy Center.

Several recommendations for Final SEP with respect to Larger CHP

- Establish a locational signal for CHP investment, for example additional funds to support CHP investment and/or production in NYC such as encouraged by PlaNYC with its 800 MW goal for combined heat and power and distributed generation by 2030.
- Expand local energy planning resources
- Create a State CHP target and strategy for the Planning period
- Recognize efficient CHP in environmental policies: RGGI-supported deployment, climate change levies
- Continue support for renewable and fossil CHP/DHC, particularly in planning urban development
- Expand export opportunities for CHP

Micro Clean Heat and Power Systems (Micro-CHP)

The application of combined clean power and heat technology to 1-4 residential and small commercial situations is the result of technological innovations during the past decade with respect to reciprocating engines, Stirling engines, and fuel cells. Approximately 50,000 kilowatts of micro-CHP systems are installed in Japan and another 50,000 kilowatts are installed in Europe.

In February 2004, the European Union's CHP Directive to its member countries defined micro-combined heat and power technology to be 50 kWe (kilowatt electric) or less, providing that an 80% overall efficiency standard was set. Various nations provided incentives similar, but not identical, to those provided renewables.

At the March 2009 European Boiler Manufacturer Show in Frankfort, every maker of boilers had a micro-CHP offering. To illustrate momentum, on July 1, 2009 one of Spain's largest industrial groups started production for its subsidiary EFFICIENT HOME ENERGY SL, at a factory in the Basque region of Spain to meet a sizeable number of commitments for markets in the European Union outside Great Britain.

Micro-CHP as a term has only crossed into the United States and Canada in the past few years. Many states allow the interconnection of smaller DG/CHP systems and policies in this area have evolved into standards that are widely accepted and indeed have been approved by Congress with respect to inverter technology employed on renewable and micro-CHP systems. New York State has been a leader in advancing interconnection standardization for smaller systems.

Smaller cogeneration systems powered by natural gas and/or propane has also been allowed to net meter in some States since the 1980's, perhaps nine or ten. However, the technology was not available to make the opportunity fruitful. In recent years a group of additional states have expanded the opportunity and some have added overall efficiency standards. The current number now stands at fourteen.

All five of New York's neighbors provide various opportunities and incentives for CHP. New Jersey has legislatively supported the addition of 1,500 MW of CHP, which was identified in Governor Corzine's Energy Master Plan. The other four neighbors now provide incentives for micro-CHP including net metering, alternative energy tax credits, and/or a type of environmental/renewable attribute credit. Connecticut and Massachusetts have allowed fossil fuel CHP net metering since the 1980s. None have an overall efficiency standard as high as New York's proposed eighty percent set for micro-CHP in the micro-CHP net metering bill. Only Maine has a comparable standard.

In 2005 and 2006 Pennsylvania allowed residential net metering and alternative energy tax credits for combined heat and power systems of 50 kW or less. There is no minimum efficiency standard. Larger CHP systems to three MW can also net meter.

In February 2008 Connecticut revised its rules to 50 kW at the upper limit with a fifty percent overall efficiency standard. All CHP projects can earn a type of environmental/renewable attribute credit. The State has articulated a goal of four percent reductions due to energy efficiency and CHP.

In March 2008, Vermont altered its renewable net metering law to allow net metering for a qualified "micro□combined heat and power system" of 20 kilowatts or fewer that meets a sixty-five percent overall efficiency standard. It may use any fuel source that meets air quality standards.

In July 2008 Massachusetts legislated its standard administrative practice of 60 kW at the upper limit into statute with a sixty percent minimum efficiency standard trending to eighty percent by 2020.

In April 2009, the States of Maryland and Maine enacted statutes to allow the net metering of micro-CHP and made other changes to net metering for renewables.

Maryland adopted a 30 kW upper limit and made modifications to siting and ownership issues that eliminated some problems for commercial scale net metering for renewables.

Maine adopted an expansive definition of eligible facilities for "net energy billing" to include micro-CHP and efficiency standards.

- It produces heat and electricity from one fuel input, without restriction to specific fuel or generating technology".
- Any fuel or any technology is allowed as long as it meets minimum eighty percent efficiency standard for units 30 kW or below or a minimum of sixty-five percent for units 31-660 kW.
- May work in combination with supplemental or parallel conventional heating systems;
- Is manufactured, installed and operated in accordance with applicable government and industry standards; and
- Is connected to the electric grid and operated in conjunction with the facilities of a transmission and distribution utility; and In addition shared ownership provisions were adopted alike for renewables and micro-CHP. Such provisions allow shared owners to net meter at remote locations from the generating unit anywhere within the connected utility's service territory.

New York has the prospect of stimulating an in-State market and external market for micro-CHP manufacturing in New York State. Adopting net metering and other incentives for micro-CHP would be a very positive step in that direction.

The technology is here now and can produce substantial efficiency and environmental benefits during the heating season and reliability benefits at any time that the utility or the grid may need localized resources. Internet communications put the systems in position to be ready adjuncts to smart grid initiatives and the micro-CHP system can actually serve as a controller and balancer for household loads.

Ruben S. Brown, M.A.L.D.
President, The E Cubed Company, LLC
1700 York Avenue, Suite B1
New York, NY 10128
212.987.1095 (office)
917.974.3146 (cell)
212.937.3960 (fax)
ruben.brown.ecubedllc@gmail.com

Comments On Selected Points From The Bullet Lists In The Executive Summary.

- Improve coordination of all end-use energy efficiency programs administered by the State and utilities, and consistently measure and report results. (p. Xii)

You are risking over coordination and standardization and it now impeding innovation, especially at the margins. The fast track initiatives in the EEPS have left a number of beneficial existing activities and performers behind. Improve coordination but stimulate autonomy of action by other participants in the marketplace, including local government.

- Enact efficiency standards for products for which the federal government does not preempt the states. (P. Xii)

Adopt and introduce overall efficiency standard of 80% for micro-CHP already adopted by European Union (Feb 2004), the State of Maine in April 2009, and by NYS Legislature in bill amendments to net metering legislation. This will be the highest standard in set in North America. (See below).

- Implement alternative financing programs to fund energy efficiency retrofits.

Encourage adoption of Energy Waste Bill based on Babylon model - insert bill nos. And keep this out of the jurisdiction of the PSC.

- Create a tracking and trading system for renewable energy credits to foster the voluntary market for renewable energy purchases.

Modify this to foster efficiency attribute credits for the voluntary market. Deploy a variation of the Connecticut model and make allowance for the aggregation of micro-CHP.

- Encourage deployment of distributed generation (DG) through improved net metering laws.

This statement is predicated on the assumption that the net metering laws should be improved by the addition of micro-CHP. However the expansion to shared ownership for net metering in addition to consideration of Massachusetts's models, should also consider the newly approved model adopted by the State of Maine.

- Expand funding and implementation support for environmentally beneficial distributed energy resources such as solar thermal and geothermal heat pumps.

Revise this to recognize and include environmental beneficial CHP as well as encourage hybrid installations.

- Foster collaboration among academia, research and development organizations, national laboratories, and private businesses and industry to accelerate the commercialization of emerging clean energy technologies by New York-based firms.

Micro-CHP commercialization should be fostered among the federally funded Clean Energy Applications Center at Pace University in conjunction with the U of Mass- Amherst.

- Increase local demand for clean energy technologies through the State's clean energy programs.

The State should increase the demand for clean energy technology that is manufactured and deployed in NYS.

- Partner with the Congressional delegation to advance New York's clean energy agenda at the federal level.

The State Government should strongly support the legislative efforts of the Congressional Delegation to obtain a 30 percent personal tax credit for micro-CHP that meets NYS's proposed high efficiency standard of 80 percent overall efficiency.

S933 sponsored by Senators Schumer and Gillibrand HR xxxx sponsored by Representatives Higgins, Tonko, McHugh and others merit serious advocacy by the State Government. It would stimulate micro-CHP manufacturing in upstate New York and further the adoption of micro-CHP technology across New York State.

- Improve energy efficiency in public buildings.

Joint Supporters strongly support DR deployment. Thermally led Micro-CHP integrates readily with DR programs because of Internet capability, etc.

CHP Results

The results generated by the CHP Emissions Calculator are intended for eductional and outreach purposes only;
it is not designed for use in developing emission inventories or preparing air permit applications.

Annual Emissions Analysis

	CHP System	Displaced Electricity Production	Displaced Thermal Production	Emissions/Fuel Reduction	Percent Reduction
NOx (tons/year)	1.53	5.06	3.12	6.65	81%
SO2 (tons/year)	0.02	17.89	0.02	17.89	100%
CO2 (tons/year)	4,510	4,634	3,649	3,773	46%
Carbon (metric tons/year)	1,115	1,146	902	933	46%
Fuel Consumption (MMBtu/year)	77,094	58,591	62,382	43,880	36%
Equivalent Acres of Pine and Fir Forests				777	
Equivalent Passenger Vehicles				623	

This CHP project will reduce emissions of Carbon Dioxide (CO2) by 3,773 tons per year

This is equal to 933 metric tons of carbon equivalent (MTCE) per year

This reduction is equal to the annual carbon stored by 777 acres of pine and fir forests

OR

This reduction is equal to the carbon emissions of 623 passenger vehicles per year

CHP Results

CHP Technology:	Recip Engine - Rich Burn	
Fuel:	Natural Gas	
Unit Capacity:	1	kW
Number of Units:	1,000	
Total CHP Capacity:	1,200	kW
Operation:	4,160	hours per year
Heat Rate:	15,443	Btu/kWh HHV
CHP Fuel Consumption:	77,094	MMBtu/year
Duct Burner Fuel Consumption:	-	MMBtu/year
Total Fuel Consumption:	**77,094**	**MMBtu/year**
Total CHP Generation:	**4,992**	**MWh/year**
Useful CHP Thermal Output:	49,906	MMBtu/year for thermal applications (non-cooling)
	-	MMBtu/year for electric applications (cooling and electric heating)
	49,906	**MMBtu/year Total**
Displaced On-Site Production for		Existing Gas Boiler
Thermal (non-cooling) Applications:	0.10	lb/MMBtu NOx
	0.00%	sulfur content
Displaced Electric Service (cooling and electric heating):		
	There is no displaced cooling service	
Displaced Electricity Profile:	eGRID Average Fossil 2004	
Egrid State:	NY	
Distribution Losses:	7%	
Displaced Electricity Production:	4,992	MWh/year CHP generation
	-	MWh/year Displaced Electric Demand (cooling)
	-	MWh/year Displaced Electric Demand (electric heating)
	349	MWh/year Transmission Losses
	5,341	**MWh/year Total**

CHP Results

Annual Analysis for CHP				
	CHP System: Recip Engine - Rich Burn			Total Emissions from CHP System
NOx (tons/year)	1.53	-		1.53
SO2 (tons/year)	0.02	-		0.02
CO2 (tons/year)	4,510	-		4,510
Carbon (metric tons/year)	1,115	-		1,115
Fuel Consumption (MMBtu/year)	77,094	-		77,094

Annual Analysis for Displaced Production for Thermal (non-cooling) Applications				
				Total Displaced Emissions from Thermal Production
NOx (tons/year)				3.12
SO2 (tons/year)				0.02
CO2 (tons/year)				3,649
Carbon (metric tons/year)				902
Fuel Consumption (MMBtu/year)				62,382

Annual Analysis for Displaced Electricity Production					
	Displaced CHP Electricity Generation	Displaced Electricity for Cooling	Displaced Electricity for Heating	Transmission Losses	Total Displaced Emissions from Electricity Generation
NOx (tons/year)	4.72	-	-	0.33	5.06
SO2 (tons/year)	16.72	-	-	1.17	17.89
CO2 (tons/year)	4,330	-	-	303.13	4,634
Carbon (metric tons/year)	1,071	-	-	75	1,146
Fuel Consumption (MMBtu/year)	54,758	-	-	3,833	58,591

CHP Results

Total Emissions for Conventional Production
8.17 tons of NOx
17.91 tons of SO2
8,283 tons of CO2

58,591 MMBtu
Fuel consumption

Central Station
Powerplant

4,992 MWh
Electricity to Facility

No Cooling

349 MWh
Transmission Losses

5.06 tons of NOx
17.89 tons of SO2
4,634 tons of CO2

62,382 MMBtu
Fuel consumption

On-Site Thermal
Production

49,906 MMBtu
Thermal to Facility

3.12 tons of NOx
.02 tons of SO2
3,649 tons of CO2

Total Emissions for CHP System
1.53 tons of NOx
.02 tons of SO2
4,510 tons of CO2

77,094 MMBtu
Fuel Consumption

CHP
System

4,992 MWh
Electricity
to Facility

1.53 tons of NOx
.02 tons of SO2
4,510 tons of CO2

Thermal from CHP

49,906 MMBtu
Thermal to
Facility

Absorption
Chiller

No Cooling

CHP Results

Emission Rates			
	CHP System including Duct Burners	Recip Engine - Rich Burn Alone	Displaced Electricity
NOx (lb/MWh)	0.61	0.61	1.89
SO2 (lb/MWh)	0.01	0.01	6.70
CO2 (lb/MWh)	1,807	1,807	1,735

Emission Rates	
	Displaced Thermal Production
NOx (lb/MMBtu)	0.10
SO2 (lb/MMBtu)	0.00059
CO2 (lb/MMBtu)	117