State of New York
Public Service Commission

----------X **Proceeding on Motion of the Commission |** **Regarding a Retail Renewable Portfolio |** **Standard. |** **----------X**	**Case No. 03-E-0188**

Comments of Assembled CHP Interests,
including for this purpose
The E Cubed Company, LLC, Hess Microgen, RealEnergy,
Equity Office Property Trust, Capstone Turbines, Coast Intelligen, Encorp,
Ingersoll Rand Energy Systems, Invensys, Turbostream,
and the Northeast Combined Heat & Power Initiative.[1]

The Commission's Order Instituting Proceeding seeks comments on the feasibility of implementing a renewable portfolio standard ("RPS") in New York State. That order keys in part to Executive Order 111. These comments principally address that Order, the 2002 State Energy Plan, and the rationale advanced for including environmentally beneficial combined heat and power (CHP) technology in the emerging standard.

Each of the electricity generation technologies under consideration for inclusion in this standard, including CHP, has its unique costs and benefits that make them best suited for some applications, but not others. Solar, wind, geothermal, CHP, fossil fueled fuel cells and others

---

[1] These firms and associations are all active in the realization and mobilization of markets for combined heat and power and other forms of clean efficient energy production and operation. Five are manufacturers and/or packagers of systems including Hess Microgen, Coast Intelligen, Capstone Turbines, Ingersoll-Rand Energy Services, and Turbostream. RealEnergy and Invensys are developer/installers of CHP systems. Encorp provides communications and controls for operating individual and aggregated CHP facilities. The Northeast Combined Heat and Power Initiative is a voluntary Association. The E Cubed Company, LLC is a provider of strategic energy services to the CHP and other industries. Some of these companies have participated together in other policy and regulatory processes in New York State in a voluntary association called the Joint Supporters.

ALL, in combination, have an important role to play in providing a secure energy future for New York in the 21st century.

Since CHP is energy efficient, reduces air pollution and can lower energy costs, it represents precisely the type of technology that EO 111 is intended to encourage. We urge the PSC, therefore, to include CHP and fossil fuel cells within the scope of the 25% generation portfolio standard. Likewise, we urge the PSC to make the application of any portfolio standard requirement results depend on technologically neutral environmental performance, optimum energy efficiency and lowest cost energy reduction criteria, rather than mandating purchase of power from specific technologies based on their perceived benefits.

SUMMARY OF POSITIONS ON REQUESTED COMMENTS

These comments address generally the following threshold issues identified the in the Order: 1, 5, 8, 10, 11, 12, 13, and 14, especially issues 1 and 5.

Issue 1 addresses the types of resources to be considered for the purposes of the new environmental beneficial portfolio standard. It is our position that efficient and environmentally beneficial Combined Heat and Power (CHP) should be included in the environmental beneficial portfolio standard that emanates from the instant proceeding.

Issue 5 addresses the best methods for retail customers to obtain environmentally beneficial resources (e.g. construction and ownership versus purchases). By this we interpret that local or remote are issues. CHP is local generation and efficiency yet it can be aggregated and distributed from remote sources. As such it is very compatible with retail competition.

Issue 8 addresses the impact on reliability and system operations. These are enhanced by CHP at needed locations.

Issue 10 addresses the appropriateness of a “attributes trading system”. This is highly appropriate for environmentally beneficial technologies, such as CHP.

Issue 11 addresses the Commission’s Environmental Disclosure Label Program. CHP is already an Energy Star Technology of US EPA. We welcome the opportunity to help reform the Commission’s Environmental Disclosure Label Program to recognize the efficiency and environmental benefits of CHP.

Issue 12 addresses installing facilities in the high load areas of the State. We believe that clean efficient CHP facilities can be built in such situations and bring environmental and efficiency benefits to those regions, perhaps faster than any other environmental beneficial dispersed technology.

Issue 13 addresses the impact on existing green marketing programs in the State. Clean, efficient CHP could widen the resources available in-state to marketers in several ways, including the tradable attributes method.

Issue 14 addresses changes in the SBC-funded programs to coordinate with the new target. Clean, efficient CHP has been advanced by the SBC funded programs. We welcome the greater emphases on environmentally beneficial technology, especially in demonstrating and advancing hybrid applications of other renewable technologies in conjunction with clean, efficient CHP.

POLICY BASIS IN EXECUTIVE ORDER 111 IS BROADER THAN VIEWED IN THE ISSUING DOCUMENTS IN THIS PROCEEDING

On June 10, 2001, Governor Pataki issued Executive Order 111 “Directing State Agencies To Be More Energy Efficient And Environmentally Aware "Green And Clean State Buildings And Vehicles." EO 111 represents one of the most significant energy policy initiatives in New York State history and places New York squarely at the critical intersection where energy, economic growth and environmental protection meet. It must also be viewed in the larger context of state leadership on climate change initiatives, brought about by a lack of consensus at the federal level on climate change treaties or legislation.

The New York Public Service Commission (PSC) has set an ambitious goal in this proceeding of 25% energy from "renewable" sources and has asked for comment on the issue of what electricity sources should be included in the 25% goal. We believe that the PSC should supplement the concept of "renewability" with a "Clean, energy efficient" electricity standard, which covers Combined Heat and Power (CHP) systems and other energy efficient generating technologies. This approach fits with the goals set forth in EO 111 and is closely aligned with the goals of the Governor's State Energy Plan. Moreover, for reasons that will be discussed below, it allows the PSC greater flexibility in encouraging continued economic growth. Particularly in a time of budget deficits, rising unemployment, national security concerns and economic uncertainty, energy cost reductions and their effect on economic growth is a goal equally worthy of consideration. CHP has the unique ability be clean and energy efficient, as well as *lowering* energy costs.

Background

Because EO 111 is one of the main foundations on which this proceeding rests, it is important to review the policy goals, which EO 111 sought to achieve:

> WHEREAS, New York has adopted measures designed to allow energy markets to operate more competitively and has significantly reduced taxes in order to *reduce energy costs and encourage continued economic growth;*
>
> WHEREAS, the *generation and use of energy has a significant impact on the environment, contributing to emissions of sulfur dioxide, nitrogen oxides, greenhouse gases, and other pollutants*;
>
> WHEREAS, State government is a major consumer of energy, spending approximately $300 million per year and purchasing approximately 1500 new vehicles annually with a concomitant impact on the environment; and
>
> WHEREAS, it *is appropriate that State government assume a leadership role in promoting the efficient use of energy and natural resources i*n the interest of the long-term protection and enhancement of our environment, our economy, and the health of our children and future generations of New Yorkers.
> (Emphasis added)

In June 2002, the Governor's issued his New York State Energy Plan" (June 2002) in which he referred to EO 111 as part of the process of fulfilling Goal 3, that of:

> "Increasing energy diversity in all sectors of the State's economy through greater use of energy efficiency and technologies and alternative energy resources, including renewable based energy" (State Energy Plan page 1-39)

In fulfilling this goal, the State Energy Plan also

> "…supports the development and use of distributed generation and combined heat and power (CHP) technologies at customer sites, with the goal of becoming a national leader in the deployment of clean distributed generation technology" (State Energy Plan page 1-40)

Because EO 111 predates the Governor's Energy Plan, we believe that it would be appropriate for the PSC to update the list of identified technologies contained in EO 111 to include CHP systems and thereby more closely align the outcome of this proceeding with the Governor's more recent State Energy Plan.

<u>CHP systems are clean, efficient and use waste energy</u>

> "*The average efficiency of the fossil-fueled power plants in the U.S. is 33% and has remained virtually unchanged for 40 years. This means that two-thirds of the energy in the fuel is lost as heat. CHP systems recycle this waste heat and convert it to useful energy…….. This improvement reduces emissions of sulfur dioxide, nitrous oxide, mercury, particulate matter, and carbon dioxide, the leading greenhouse gas associated with climate change. In addition to reducing air pollution, CHP conserves our limited fossil fuel resources, thereby increasing our nation's energy self-sufficiency*." (U.S. EPA Combined Heat and Power Partnership)[2]

A brief review of some of the energy generation technologies listed in EO 111 demonstrates the variability in the nature of those technologies and points to the similarity those technologies have with CHP systems. While some such as solar and wind, are fueled by conventional renewable fuels, others

---

[2] U.S. Environmental Protection Agency, Combined Heat and Power Partnership - http://www.epa.gov/chp/about_chp.htm

such as fuel cells are fueled largely from fossil fuels. What they all have in common is that they are all good examples of clean, energy efficient technologies. These systems in most cases, use energy resources more efficiently do convention energy systems, capturing and reusing energy that would be lost in the form of waste heat in conventional systems that produce power and heat separately. Because they use less fuel to satisfy the same needs, they produce significantly less pollution.

A summary of EO111 Technologies and CHP Systems and their characteristics appears below. In this table, "renewability" is defined in two ways to recognize that the benefits delivered by renewable energy – reduced emissions, reduced fuel combustion and reduced fuel purchase most predominantly – exist on a continuum that covers many technologies and many fuels.

- "Gross renewability" – These technologies produce electricity with no corresponding increase in the combustion of non-renewable fossil fuels, leading to a gross reduction in emissions, fuel combustion and fuel purchase.
- "Net renewability" – These technologies produce electricity with a corresponding increase in the combustion of non-renewable fossil fuels, but with an increase that is less than the energy sources they displace, leading to a net reduction in emissions, fuel combustion and fuel purchase.

Generation Technology	Generator Fuel	"Renewability"	
		Gross	Net
U.S. Power Grid	Mix – predominantly natural gas, coal, nuclear and hydroelectric. In aggregate, industry has an emissions profile of a 33% efficient gas turbine with no heat recovery	No	No
Photovoltaics	Solar energy	Yes	Yes
Wind Turbines	Wind	Yes	Yes
Multiple technologies	Geothermal energy from earth's mantle	Yes	Yes
Hydroelectric turbines	Falling Water	Yes	Yes
Multiple technologies, incl. Reciprocating engines, gas turbines, microturbines, fuel cells	Biological methane (landfill, digester gas, etc.)	Yes in some cases3	Yes in all cases
Steam turbine generators	Solid biomass fuels	Yes	Yes
Steam turbine-generators without waste heat recovery	Fossil fuels	No	No
Steam turbine-generators	Waste heat and/or pressure	Yes	Yes
Fuel cells	Renewably manufactured hydrogen	Yes	Yes
Fuel cells	Natural gas	No	Yes, in some cases4
Combined Heat and Power	Waste Heat sources	Yes	Yes
Combined Heat and Power	Fossil Fuels	No	Yes
Combined Heat and Power	Opportunity Fuels[5]	Yes	Yes

[3] Landfill gases are – to some degree – derived from non-renewable, fossil-derived materials that decay in landfills. However, the failure to recover these gases often leads to more substantial environmental impacts as the organic gases (mostly methane) that are produced present much more substantial environmental hazards than the CO2 produced from combustion of same.

[4] Some fuel cell technologies have efficiencies of less than the U.S. power grid, while others have efficiencies of 45 – 55%. All fuel cells may be used in combined heat and power applications.

[5] This term broadly includes any combustible wastes from industrial processes. It may include gas flares from refineries, mill wastes from sawmills, organic off-gases from papermaking processes or any number of other such materials, which would otherwise be expelled into the atmosphere.

We believe this basic commonality of characteristics across the eligible technologies, supports our position that CHP systems be included in the program.

At least one other state, Maine, has chosen to include energy efficient technologies within an energy target. Under Maine law (35-A §3210), utilities selling power in Maine must provide 30% of their electricity from "eligible resources", which includes both renewable resources and "efficient resources", the latter of which is defined to categorically include combined heat and power. Maine bypasses value-loaded labels to give power providers the freedom to choose the most economical source of low-emissions electricity, rather than simply stipulating a technology. In part as a result, Maine has the highest use of efficient CHP systems in the country.

Including CHP with wind, solar and other efficient technologies is also consistent with third party assessments, such as those presented in the recent paper "Micropower at the Crossroads.[6]" CHP was included in the "cleanest" group of technologies with a specific recommendation that it should be encouraged as a very good improvement over less efficient technologies.

How CHP meets the EO 111 goals

While each of the elements of EO 111 and how CHP meets those elements is discussed in greater detail below, this single table from the October 2002 New York State Energy Research and Development Authority's (NYSERDA) report "*Combined Heat and Power Market Potential*[7]" sums up in a simple and compelling fashion. CHP offers the potential to provide clean, energy efficient, low cost power to New York:

---

[6] *Micropower at the Crossroads: Public Health and the Future of Distributed Generation,* Frontier Group, NRDC, Pace et. al, 2002. Available at http://www.eany.org/reports/micropower.pdf

[7] *Combined Heat and Power Market Potential,* NYSERDA , October 2002, available at http://www.nyserda.org/dgchp.html

BENEFITS OF CHP

CHP contributes economic savings, energy savings, reduction in criteria pollutants, and a reduction in emissions that contribute to global warming. A summary of these benefits for the base and accelerated market penetration cases is shown in **Table ES5**.

Table ES5. CHP Benefits in New York

CHP Benefits	Base Case	Accelerated Case
User Savings		
2012 Annual ($million)	$109	$487
Cumulative Savings ($million)	$536	$1,825
Net Present Value ($million)	$253	$808
Energy Savings		
2012 Annual (trillion Btu)	25	74
2002-2012 Savings (trillion Btu)	118	316
Emissions Savings Annual (2012)		
NOx (tons/year)	3,210	10,282
SO2 (tons/year)	9,778	27,766
CO2 (1000 tons/year)	1,259	3,854

Energy Efficiency

Because a CHP system produces two or more usable outputs from a single fuel source, defining overall system efficiency is more complex than with simple systems. The CHP system can be viewed as two subsystems: the power system, which is usually an engine or turbine, and the heat recovery system, which is usually some type of boiler. The efficiency of the overall system results from an interaction between the individual efficiencies of the power and heat recovery systems. In almost all circumstance the efficiency of the combined system will be higher than that for two separate systems.

Since we assume that the thermal load would exist independent of the CHP facility, the net power heat rate represents the additional fuel input required to generate a unit of power produced by a CHP system, over and above that which is required to generate the thermal energy alone. The net power heat rate is analogous to the electric heat rate for separate power generation. The net power heat rate for CHP systems is typically in the range of 4,000 to 4,600 British thermal units per kilowatt of electricity produced (Btu/kWh), which reflects a net power efficiency of between 70 to 85 percent in some instances.

The low magnitude of these heat rate numbers is appreciated by comparison to stand-alone electric power generation, where heat rates frequently range from 7,000 for the newest systems to well over 10,000 Btu/kWh for older systems. The average efficiency of U.S. electricity utility generation has not improved since about 1960 as the graph below indicates.

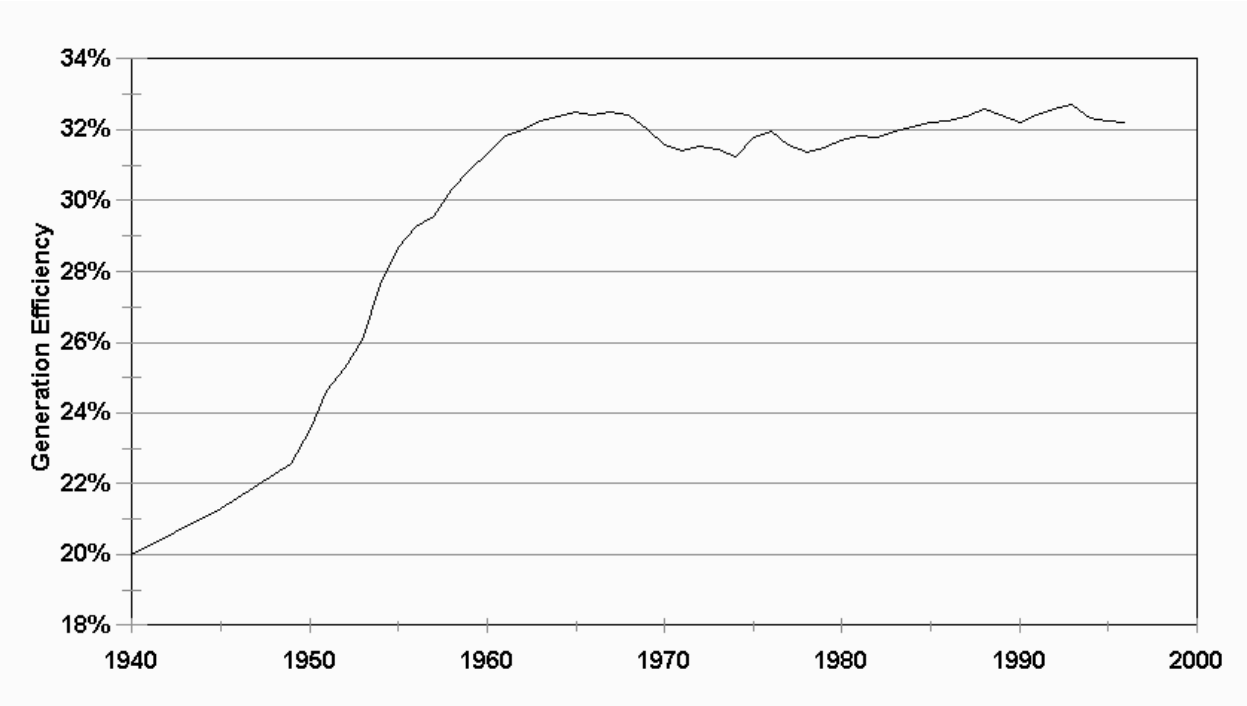

Figure 1. Average U.S. Utility Electric Energy Generation Efficiency (Source: ACEEE based on DOE/EIA data).

The U.S. Combined Heat and Power Association (USCHPA)[8] developed emissions criteria that emerged from the Regulatory Assistance Project's (RAP)[9] model emission rule discussions.

To qualify as an energy efficient technology under these criteria, the CHP system should have –

- *A total system design efficiency, adjusted for seasonal thermal demand factors, of at least 55% for systems with a power output of less than 500kW and 60 % for systems of 500 kW or greater. And, produce at least 15% of the total usable energy output in the form of*

[8] www.uschpa.org
[9] www.raponline.org

electrical or mechanical power and at least 20% of the total usable energy output in the form of useful thermal energy.

OR

- *Technologies that generate electricity or mechanical power using back-pressure steam turbines in place of existing pressure reducing valves or which make use of waste heat from industrial processes such as by using organic rankin, Stirling, or kalina heat engine systems.*[10]

We propose that this be used as the test for determining what types of CHP generated electricity can be used to meet the 25% target.

Reduction in Air Pollution

An environmentally advantaged resource is an energy resource that offers significant fuel efficiency and lowers air emissions compared to conventional technologies. While having zero emissions would be desirable, it is not practical today to meet thermal requirements without combusting some fuel resulting in the production of air emissions.

CHP can represent a clean and efficient means of meeting the power and thermal requirements of an end-user. CHP systems need to be compared to the separate systems that are required as the alternative means of meeting these requirements. In this context, most CHP systems clearly meet this requirement, achieving a very high net power heat rate.

The emissions for CHP systems will be significantly lower than from the separate systems. For a fair comparison, the emissions from the displaced grid-purchased electricity need to be combined with the emissions from the displaced on-site boiler or other thermal device. Measuring the emissions from the on-site boiler is fairly straightforward. However, estimating the displaced utility generation emissions is more complicated because of the time and location nature of the displaced utility generation and accounting for the line losses. CHP system that are base loaded can be viewed as reducing the utility

---

[10] Based on language from the U.S. Senate Energy Bill (H.R.4 as amended by the Senate) from the 107th Congress.

generation at all times, so a plausible estimate is to use the average utility generation and take into account the average line losses. However, many building CHP systems are only operated during the daily peak and mid-peak periods. In these cases, grid power has a much higher component of peaking plants that frequently have a higher average emissions rate. In this case, the environmental benefit of CHP may be greater compared to the grid-average emissions rate.

CHP is not a technology, but rather a way to maximize the efficiency of an energy system. CHP systems can be fueled by both fossil and renewable energy sources, with approximately 40% of the electricity generated from CHP in this country coming from renewable energy sources. Irrespective of the fuel, CHP systems contrast with conventional, inefficient centralized power system and distributed technologies, by offering greater efficiency and reduced emissions to satisfy the same end-user demands.

Relationship to Output Based Standards for Emissions

The New York Department of Environmental Conservation (DEC) has initiated a rule making to adopt air emissions standards for distributed generation. The DEC standards are expected to set output based limits that represent either reasonably available control technology or best available control technology for criteria pollutants. We propose that the DEC standards for new units become the benchmark for meeting the EO 111 goal of reductions in criteria pollutants and inclusion of CHP generated electricity to meet the 25% target. Until such a time as an emissions standard has been adopted, we suggest use for the purposes of this proceeding of the DEC's proposed interim standard, or a standard such as that adopted by several states including California, Massachusetts, and Texas[11].

One of the reasons that this standard should apply based on technology neutral criteria rather than to specified energy sources is that electricity generated from some of sources under consideration for coverage under the portfolio standard may not have as positive effect on air pollution as CHP, particularly

---

[11] *Output-Based Emission Standards: Advancing Innovative Energy Technologies*, Susan Freedman and Suzanne Watson, Northeast-Midwest Institute, 2003. Available at http://www.nemw.org/output_emissions.pdf

when viewed from a usable energy output based perspective. For example, air emissions from biomass energy, such as from direct combustion of biomass, vary significantly depending upon the precise fuel, technology used and emissions controls applied. [12] Accordingly, an energy source could qualify as a renewable for purposes of this proceeding, but might not actually be environmentally beneficial in terms of air emissions.

Reducing Energy Costs

The greatest reductions in air emissions and gains in energy efficiency will happen only if CHP, which reduces overall energy costs in the most cost effective fashion among distributed generation resources, is allowed to compete on a level playing field with other technologies. Although other technologies may have very low or zero emissions, the benefit of those technologies is more limited if their cost of energy is high thus reducing deployment to special circumstances, such as where a government subsidy is available. For example, most of the technologies cited in EO 111 have much higher installed cost per kW than do CHP systems, as indicated in this table from the California Energy Commission[13]:

[12] See, e.g., "Emissions from Distributed Generation", NRDC presentation, April 20, 2000.

[13] *California Distributed Energy Resource Guide*, http://www.energy.ca.gov/distgen/economics/capital.html

Capital Costs of Selected DER Equipment	
	Capital Cost ($/kW)
Microturbine	700-1100
Combustion Turbine	300-1000
IC Engine	300-800
Stirling Engine	2,000-50,000
Fuel Cell	3,500-10,000
Photovoltaic	4,500-6,000
Wind Turbine	800-3,500

Importantly, CHP considerably improves the fuel utilization efficiency of the overall system so that when the heat component is properly accounted for, the true energy costs to the facility are much lower.

Absent utility created barriers to deployment such as standby rates or interconnection difficulties, CHP is already competitive in the marketplace and capable of substantially reducing energy costs in many applications, while reducing air pollution at the same time. The October 2002 NYSERDA[14] report also included this table, which illustrates that CHP is already cost competitive.

[14] See footnote 5

Table ES3. Summary of Paybacks for All Cases (Years)

CHP Paybacks (years) Scenario	100 kW Engine	800 kW Engine	5 MW Turbine	10 MW Turbine	50 MW Turbine
Current Technology, Upstate					
Full Standby* and CTC	7.7	4.5	6.9	5.0	2.8
No Standby or CTC	2.9	1.9	3.1	2.5	1.7
Reduced Standby and CTC	4.2	2.7	4.3	3.3	2.1
Current Technology, Downstate					
Full Standby and CTC	10.6	3.4	3.0	2.5	1.3
No Standby or CTC	3.5	1.7	1.6	1.5	0.9
Reduced Standby and CTC	4.5	2.1	1.9	1.7	1.0
Advanced Technology, Upstate					
Full Standby* and CTC	4.6	2.7	4.3	3.4	2.4
No Standby or CTC	1.7	1.2	2.2	1.8	1.4
Reduced Standby and CTC	2.5	1.6	2.9	2.4	1.8
Advanced Technology, Downstate					
Full Standby and CTC	5.7	2.3	2.0	2.1	1.2
No Standby or CTC	2.2	1.2	1.1	1.2	0.8
Reduced Standby and CTC	2.8	1.4	1.3	1.4	0.9

*Full standby for upstate is based on 2/3 of Niagara Mohawk's Rule 12 tariff structure. Reduced standby rates are 1/3 of full standby in downstate and ½ of full standby in upstate to reflect levels consistent with states such as Illinois and Texas

Another example from "Micropower at the Crossroads"[15] is a CHP system at the Rochester Airport that will reduce energy demand by 47%, saving $334,000 per year. Much of the testimony introduced in connection with the currently pending Consolidated Edison standby rate case also confirms the ability of CHP to reduce energy costs, in many cases by hundreds of thousands of dollars.[16] See testimony of Equity Office Property Trust's Frank Frankini & Thomas Smith and Invensys Arthur W. Pearson available at the foot of the webpage at http://ecubedllc.com/coned.html

As a final point, not all electricity is created equal. One of the touchstones of many of the actions taken by the PSC, particularly those in the rate setting and demand response contexts, is that the "value" of electricity varies greatly, with the highest values per kW at peak periods. Spot market rates can vary by more than an order of magnitude between peak and off-peak. Thus, in terms of setting a portfolio standard, the question arises as to whether the 25% standard is peak based, and how the portfolio standard

---

[15] *Micropower at the Crossroads: Public Health and the Future of Distributed Generation,* Frontier Group, NRDC, Pace et. al, 2002. Available at http://www.eany.org/reports/micropower.pdf

[16] See also testimony by Neil Elliott, American Council on Energy Efficient Economy and Bruce Hedman, Energy and Environmental Analysis on environmental and energy benefits of CHP and the market penetration potential in NYS of CHP.

deals with intermittent sources, such as wind and solar power, without creating redundant or inefficient capacity. These sources cannot consistently deliver electricity in peak periods, creating a low capacity factor. From a grid and real world economy perspective, electricity from intermittent sources has less economic value than sources that can deliver a steady, predictable source of electricity. This is another area in which the value of CHP should be recognized in this proceeding, since CHP IS a steady, reliable energy source, producing low cost, clean energy that can be used in a predictable and efficient manner to meet a clean portfolio standard.

CONCLUSION

Each of the electricity generation technologies under consideration for inclusion in this standard, including CHP, has its unique costs and benefits that make them best suited for some applications, but not others. Solar, wind, geothermal, CHP, fossil fueled fuel cells and others ALL, in combination, have an important role to play in providing a secure energy future for New York in the 21st century. Since CHP is energy efficient, reduces air pollution and can lower energy costs, it represents precisely the type of technology that EO 111 is intended to encourage. We urge the PSC, therefore, to include CHP and fossil fuel cells within the scope of the 25% generation portfolio standard. Likewise, we urge the PSC to make the application of any portfolio standard requirement results depend on technologically neutral environmental performance, optimum energy efficiency and lowest cost energy reduction criteria, rather than mandating purchase of power from specific technologies based on their perceived benefits.

Respectfully Submitted

Ruben S. Brown, M.A.L.D.
President, The E Cubed Company, LLC
On Behalf of the Assembled CHP Interests
rsbrown@ecubedllc.com