

Consumer Power Advocates

Continuum Health Partners
Fordham University
Luthin Associates, Inc.
Memorial Sloan Kettering Cancer Center

Mount Sinai Medical Center
New York University
NYU Langone Medical Center
Montefiore Medical Center

December 17, 2009

Hon. Jaclyn Brillling
Secretary
State of New York Public Service Commission
Three Empire State Plaza, 14th Floor
Albany, New York 12223-1350

Re: Case 09-S-0029 – Proceeding on Motion of the Commission to Consider Steam Resource Plan and East River Re-Powering Project Cost Allocation Study, and Steam Energy Efficiency Programs for Consolidated Edison Company of New York, Inc.

Dear Secretary Brillling:

Please find Consumer Power Advocates report on the market potential for Customer Sited Supply within New York City for filing in the above-captioned proceeding. Copies of the aforementioned report are being served via e-mail on all active parties.

Thank you for the opportunity to provide this for consideration.

Very truly yours,
Catherine Luthin

Catherine M. Luthin
Executive Director

Encl.

cc: ALJ Rudy Stegemoeller by E-mail
Active Parties by E-mail.

**State of New York
Public Service Commission**

Proceeding on Motion of the Commission to Consider Steam
Resource Plan and East River Re-powering Project Cost
Allocation Study, and Steam Energy Efficiency Programs for
Consolidated Edison Company of New York, Inc.

Case 09-S-0029

**Report on the Market Potential of Customer Sited Supply
by
Consumer Power Advocates**

Dated: December 17, 2009

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REPORT ON THE POTENTIAL FOR CUSTOMER SITED STEAM IN NEW YORK CITY

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REPORT ON THE POTENTIAL FOR CUSTOMER SITED STEAM IN NEW YORK CITY

I. Introduction

Previously, Consumer Power Advocates (CPA) submitted a Customer Sited Steam Supply Proposal to the New York State Public Service Commission. The Proposal brought to light the fact that Combined Heat and Power (CHP) will improve air quality and reduce the economic risk of high capital costs of cogeneration within New York City. Further, it stated that development of customer-sited combined heat and power (CHP) plants in New York City's largest buildings is essential to meet the New York State Energy Plan and PlaNYC CHP goals. This is of particular significance with the Commission permitting Con Edison to install replacement boilers rather than a new CHP plant at Hudson Avenue. The Commission recognized opportunities to manage steam supply costs in its Order Regarding the Hudson Avenue Generating Facility (Issued and Effective December 17, 2009). The Order states:

We expect this proceeding to examine – and the Company to undertake where warranted – cost-effective measures to reduce the need for generation at Hudson Avenue, thereby deferring or eliminating the need to install all of the planned package boilers at the site. Such measures could include, for example: a standard offer for customers to propose efficiency measures or **customer-sited generation that would reduce steam demand**; a comprehensive energy efficiency program available to all customers; or a program to assist low-margin customers in switching to alternative heating sources. **This list is neither prescriptive nor exhaustive**; it is intended only to provide guidance for the parties.

Combined heat and power plant economics are largely determined by the price of energy used to fuel the plants and wholesale energy prices determined hourly in NYISO markets. In almost all hours, the wholesale price is set by a natural gas fired generator. Because both price-setting wholesale generators and CHP plants burn natural gas, no additional price risk need be assumed by the CHP operator, and the economic savings and environmental improvements are proportional to the improvement in thermal efficiency. Therefore, CHP plants maximize the benefits of fuel efficiency when they are operated on peak, when the difference in efficiency between the CHP plant and the marginal wholesale generator is the greatest.

Recognizing the economic and efficiency benefits outlined in the original Customer Sited Steam Supply Proposal, Judge Rudy Stegemoeller requested that Consumer Power Advocates delve deeper in their evaluation of Customer Sited Steam Supply market potential. What follows is a more specific report based on previous information obtained from the Gas Technology Institute (GTI) reports, Endurant Energy's analysis, and Luthin Associates' studies. The report makes use of information from Constellation Energy's analysis of the CHP potential of Hudson Yards, projects identified by the New York City Economic Development Corporation (NYCEDC), and cogeneration projects funded by The New York State Energy Research and Development Authority (NYSERDA).

II. Data Collection

Following the filing of the Proposal, efforts were begun to identify all potential projects. This included discussions with NYSERDA and the New York City Economic Development Corporation (NYCEDC). NYSERDA provided information on nine (9) projects, four (4) of which were judged to be possible steam supply sites. NYCEDC identified a, heavily subsidized, new biomedical center located on the East Side of Manhattan (the East Side project), and Bellevue Hospital as properties among numerous City buildings as viable cogeneration sites that could connect to the Con Edison system.

The total potential for steam exports from combined heat and power plants to the Con Edison steam system were estimated by examining several sources. The first category of projects is those included in the Proposal for Customer Sited Supply by Consumer Power Advocates filed in this case. That proposal included economic analysis for five Endurant projects. The forecasted operating data supplied by Endurant was used as the basis for all required estimates of peak and annual steam supply. The proposal also referred to the Gas Technology Institute's estimate of the potential for DG/CHP in New York City, and those judged to be suitable for steam supply are included in this analysis. The CPA Proposal included two other projects identified by Luthin Associates. In addition, NYSERDA supplied a list of projects, five of which were possible steam supply sites. NYCEDC identified Hudson Yards and a large project on the East Side. Finally, the redacted steam elasticity data was examined, and those customers identified as high risk for leaving the system by installing boilers were included. To the extent possible, all duplicate projects were identified and removed. The results show that there is potential for forty eight (48) projects.

III. Market Potential Summary

Table 1 summarizes the estimated potential peak and annual volume of customer sited steam exports, and the peak and annual total steam production (export plus building load) by all the identified CHP opportunities. The total production is important because that is the volume of steam displaced from the Con Edison production, regardless of whether it is exported to Con Edison. It represents one measure for the lost steam sales due to these CHP projects.

TABLE 1: Summary of Customer Sited Steam Opportunities

	CHP Capacity (MW)	ANNUAL EXPORT (Mlbs)	PEAK EXPORT (Mlbs/hr)	TOTAL ANNUAL STEAM
INCLUDED IN THE CPA PROPOSAL	67.0	449,334	170	850,506
NEWLY IDENTIFIED	29.8	312,434	194	644,361
AT RISK STEAM CUSTOMERS	52.2	346,353	69.48	675,548
	<u>148.9</u>	<u>1108120.5</u>	<u>433.6</u>	<u>2,170,415</u>
PlaNYC goal Steam Sales	800.0			24,000,000
Fraction of goal	<u>18.6%</u>			<u>9.0%</u>

Table 2 contains the projects originally included in the proposal. The first five (5) projects in Table 1 are the Endurant projects. Endurant has created a detailed description of the annual operation of these projects on an hourly basis. This analysis includes total hourly steam output, hourly export, and hours of operation, among other things. These five (5) projects were totaled, and the annual peak and total steam export was divided by the electric capacity. These factors were applied to the electric capacity of the remaining projects to develop peak and annual export capacity for those projects.

Table 2: ESTIMATED STEAM EXPORT CAPABILITY OF PREVIOUSLY IDENTIFIED CHP PLANTS

	CHP Capacity (MW)	NUMBER OF EXPORT HOURS	OPERATING HOURS	TOTAL EXPORT (Mlbs)	PEAK EXPORT (Mlbs/hr)	TOTAL ANNUAL PRODUCTION
<i>Endurant projects:</i>						
Eastside	2.0	4,301	4,301	14,885	8.08	21,873
Westside	2.0	2,120	3,500	11,680	10.02	30,637
Eastside	1.6	2,619	3,500	10,991	7.78	27,462
Midtown	4.0	2,163	3,500	25,403	21.31	84,915
Westside	6.0	4,047	4,047	41,661	23.86	95,097
Subtotal	15.6	15,250	18,848	104,621	71.05	259,984
<i>Projects identified by Luthin:</i>						
Eastside	1.9		3,500	12,742	8.65	24,605
Subtotal	1.9		3,500	12,742	8.65	24,605
<i>Projects identified in the GTI study:</i>						
1221 6th	7.0			46,945	9.42	90,650
1251 6th	5.0			33,532	6.73	64,750
1271 6th	5.0			33,532	6.73	64,750
745 7th	4.0			26,826	5.38	51,800
345 Park	5.0			33,532	6.73	64,750
80 Pine	3.5			23,473	4.71	45,325
24 State	2.0			13,413	2.69	25,900
1 New York Plaza	7.0			46,945	9.42	90,650
1411 Broadway	3.5			23,473	4.71	45,325
Subtotal	42.0			281,672	56.5	543,900
TOTAL	59.5			399,035	136.20	828,489

Different methods were required to estimate the steam export and production for each group. For the first five (5) sites, Endurant provided an hour by hour model of the steam export, including total thermal production, total thermal consumption and steam available for export for all hours of the year. This data was aggregated and averaged, and the average per kW of electric capacity was developed, and applied to all other known projects. An average thermal production of three and seven tenths (3.7) MLbs/MW was used for all other projects to develop the total peak steam production. The annual total steam production was estimated by multiplying the total peak steam production by the number of operating hours. For the Endurant projects, operating hours were provided. For all the remaining projects, three thousand and five hundred (3500) hours were used, except for the hospital site. For that project, four thousand and one hundred (4100) hours were used to recognize the around the clock nature of hospital operations.

Finally, average values were used to develop peak steam exports and total steam production for eight hundred (800) MW of installed capacity, an amount equal to the PlaNYC goal. By this analysis, the known customer sited steam supply may meet more than nine percent (9%) of that goal.

The buildings identified by GTI¹ were chosen based on the energy savings available from a CHP system and site-specific construction costs. GTI's analysis assumed that a CHP system would be built to backup

electric power to the building, without consideration of the possibility of using the Con Edison steam system as a thermal sink.

These estimates are driven by Endurant’s operating model and the total electric capacity, and are completely scalable. New known projects or possible projects identified by favorable building characteristics can be easily added. This results in average values that can help estimate the total potential volume or value of customer sited steam, but they are not intended to substitute for a detailed, site-specific analysis for particular projects. At this point in the development of the customer sited steam concept, before tariff and operating requirements are known, such a detailed analysis is unnecessary.

Table 3 lists projects not identified at the time of the CPA proposal. These include one project identified by Luthin Associates, and several identified by NYSERDA.

Table 3: NEWLY IDENTIFIED ESTIMATED STEAM EXPORT CAPABILITY

	CHP Capacity (MW)	NUMBER OF EXPORT HOURS	OPERATING HOURS	TOTAL EXPORT (Mlbs)	PEAK EXPORT (Mlbs/hr)	TOTAL ANNUAL PRODUCTION
<i>New projects identified by Luthin Associates:</i>						
Eastside	1.9		3,500	12,742	8.65	24,605
<i>Projects identified by NYCEDC:</i>						
East Side Project (confidential)	1		3,500	6,706	4.55	15,170
<i>NYSERDA projects:</i>						
526 East 68th Street	7.5		3,500	50,299	34.13	97,125
206 West End Ave	0.3		3,500	2,012	1.37	3,885
621 Eighth Ave	1.5		3,500	10,060	6.83	19,425
86 West Street	0.7		3,500	4,795	3.25	9,259
<i>Other new projects:</i>						
Hudson Yards	8.0		3,500	53,648	36.44	103,600
Eastside Hospital (incl. Bellevue)	8.9		4,100	172,172	98.59	371,292
Total newly identified projects	29.8			312,434	193.80	644,361

Finally, Hudson Yards and a project identified only as “Eastside Hospital” are included. Eastside Hospital is a large medical complex in midtown, and this project includes an export of Steam to Bellevue Hospital. Its potential was estimated from data in the 2008 Feasibility Study prepared by John Winston Engineers. That study includes estimates of the total steam production and export. The hours of operation for this project were assumed to be equal to the average of the hours of operation of the two (2) hospitals in the Endurant data.

Table 4 shows the estimated potential of customer sited steam in buildings identified by Con Edison as at risk for leaving the steam system. All of these buildings were identified as having both a high composite risk and a physical risk of more than three tenths or six tenths (0.3 or 0.6). The size of the possible CHP

plant was set equal to the boiler size from Company data by converting boiler horsepower (BHP) to MW. The estimated total production and export were estimated from Endurant data. Finally, the excess of total steam produced on site over the 2009 steam purchase from Con Edison was computed as another estimate of the possible magnitude of the volume of steam exported to Con Edison.

Table 4: CUSTOMERS AT RISK FOR LEAVING THE STEAM SYSTEM

	BUILDING AREA	BOILER BHP	BOILER MW	ANNUAL EXPORT (Mlbs)	PEAK EXPORT (Mlbs/hr)	TOTAL ANNUAL STEAM	2008 Sales (Mlb)	EXCESS OF ANNUAL BLDG USE
<i>Risk greater than 0.6</i>								
Customer 290	154,328	185	1.81	12,172	2.44	23,503	25,886	-
Customer 191	158,816	191	1.87	12,526	2.51	24,186	22,518	1,669
Customer 34	284,695	342	3.35	22,453	4.50	43,357	27,233	16,123
Customer 25	182,554	219	2.15	14,398	2.89	27,802	16,071	11,731
Customer 98	2,124,441	1,567	15.36	102,990	20.66	198,871	247,050	-
Subtotal	2,904,834	2,503	24.53	164,539	33.01	317,719	338,758	29,523
<i>Risk greater than 0.3</i>								
Customer 89	27,165	33	0.32	2,102	0.42	4,137	14,033	-
Customer 387	89,560	107	1.05	6,930	1.39	13,639	32,996	-
Customer 174	128,235	154	1.51	9,923	1.99	19,529	31,715	-
Customer 235	105,000	126	1.23	8,125	1.63	15,991	17,665	-
Customer 271	247,181	297	2.91	19,127	3.84	37,644	29,216	8,428
Customer 61	130,000	156	1.53	10,059	2.02	19,798	15,245	4,553
Customer 24	249,575	299	2.94	19,312	3.87	38,008	30,750	7,259
Customer 412	263,521	316	3.10	20,391	4.09	40,132	29,417	10,715
Customer 106	247,910	297	2.92	19,183	3.85	37,755	19,084	18,670
Customer 172	284,249	341	3.34	21,995	4.41	43,289	22,357	20,932
Customer 393	204,122	245	2.40	15,795	3.17	31,086	15,205	15,881
Customer 366	173,108	208	2.04	13,395	2.69	26,363	13,992	12,371
Customer 136	200,000	240	2.35	15,476	3.10	30,458	14,628	15,830
Subtotal	2,349,626	2,820	27.63	181,814	36.48	357,829	286,302	114,639
Total	5,254,460	5,323	52.17	346,353	69.48	675,548	625,061	144,161

IV. Methodology

The models Endurant developed for its projects were used to estimate the potential for all the other sites, with the exception of the large Eastside Hospital. The Endurant models include an hour-by-hour operating schedule describing hourly steam output, hourly export and hours of operation, among other things. These five (5) projects were totaled, and the annual peak and total steam export was divided by the electric capacity. These factors were applied to the CHP electric capacity of all but one (1) of the remaining projects to develop peak and annual export capacity for those projects. The CHP electric capacity of the customers at risk of leaving the steam system was assumed to be equal to the replacement boiler size (stated in the elasticity data as BHP).

The CHP electric capacity applicable to the at-risk customer sites set equal to the boiler size, which is stated as brake horsepower (BHP) in the elasticity data. The estimated total production and export were estimated from Endurant data, as above. Finally, the excess of total steam produced on site over the 2009 steam purchase from Con Ed was computed as another estimate of the possible magnitude of the volume of steam exported to Con Ed.

The project identified as “Eastside Hospital” is a large medical complex in midtown. Its potential was estimated from data in the 2008 Feasibility Study prepared by John Winston Engineers. That study includes estimates of the total steam production and export. The hours of operation for this project were assumed to be equal to the average of the hours of operation of the two (2) hospitals in the Endurant data.

V. Conclusion

CHP plants could be a significant source of supply for the Con Edison steam system. The market potential identified above, including the potential among customers who are at risk of leaving the steam system, could equal as much as nine percent (9%) of the total annual supply. While technical problems remain, particularly the site specific capability of the steam system to accept customer generated steam, these issues appear manageable for many or most sites. The economics of CHP plants are greatly improved by the extended operating hours possible because the unlimited heat sink of the steam system allows for efficient generation in all hours, regardless of the host buildings’ thermal load.

ⁱ Opportunities for the Development of Distributed Generation / Combined Heat and Power Systems in New York City Commercial Buildings, Gas Technology Institute, prepared by Redwood Power Company