Combined Heat & Power – Impact Evaluation

Final Report

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Appendix A. Additional Analysis Details and Site-Specific Examples

This appendix includes the site level details of the individual sites and describes some of the year-to-year, seasonal, and site level variations in the CHP included in NYSERDA's program. Table A-1 shows the individual program reported and evaluated savings for all the A&A projects. This shows the range in savings size across the program. The capacity factor is the average generated electricity over the rated generation capacity and corresponds to the electric kWh realization rate. The kW realization rate is more variable, and generally higher, but also tends to be increase as the capacity factor increases. Table A-2 shows the individual results for the three Performance sites.

Table A-1: Site Specific Results for Aggregation and Acceleration sites with DERIDS data

Project ID	Program Reported			Evaluated			
	Electric Generation (MWh)	Utilized Heat (MMBtu)	Peak kW[a]	Electric Generation (MWh)	Utilized Heat (MMBtu)	Peak kW[b]	Capacity Factor
226	610	793	100	236	739	48	27%
227	458	595	75	440	2,715	68	67%
242	458	595	75	460	2,858	68	70%
245	4,880	6,344	800	1,503	4,723	369	21%
252	1,830	2,379	300	1,387	6,439	260	50%
272	1,373	1,784	225	999	8,283	203	57%
274	915	1,190	150	394	3,496	88	32%
275	458	595	75	224	1,494	51	35%
297	458	595	75	350	2,426	69	53%
300	610	793	100	478	676	72	57%
302	1,830	2,379	300	837	4,452	262	32%
309	1,220	1,586	200	349	999	101	20%
310	458	595	75	363	3,053	67	60%
312	610	793	100	483	3,056	75	55%
320	458	595	75	334	2,430	64	51%
323	458	595	75	182	1,416	63	28%
327	458	595	75	321	2,163	88	25%
328	915	1,190	150	527	2,487	109	32%
365	610	793	100	496	1,515	61	57%
371	458	595	75	412	2,799	68	65%
372	1,708	2,220	280	760	5,138	193	43%

Project ID	Program Reported			Evaluated			
	Electric Generation (MWh)	Utilized Heat (MMBtu)	Peak kW[a]	Electric Generation (MWh)	Utilized Heat (MMBtu)	Peak kW[b]	Capacity Factor
391	458	595	75	371	2,150	66	56%
393	458	595	75	228	2,068	87	35%
400	458	595	75	174	1,042	61	25%
411	1,220	1,586	200	595	5,170	122	17%
425	610	793	100	422	2,560	78	53%
445	397	515	65	372	3,031	62	65%
486	610	793	100	255	862	36	19%
490	458	595	75	286	3,413	49	51%
505	915	1,190	150	297	757	148	23%
513	458	595	75	168	817	59	26%
532	610	793	100	340	2,009	82	39%
558	3,538	4,599	580	1,635	3,767	282	37%
604	793	1,031	130	908	3,965	129	80%
618	397	515	65	398	2,460	60	70%
620	8,845	11,499	1,450	7,893	8,925	1,114	75%
629	6,100	7,930	1,000	6,392	29,356	885	73%
631	1,220	1,586	200	399	375	158	34%

[a] The reported peak kW is the rated kW of the facility with an adder for sites with absorption chillers.

[b] The evaluated kW is the maximum kW produced at any time during the available data. No information on cooling performance of the absorption chillers was available to calculate the evaluated savings.

Table A-2: Site Details of Performance CHP sites with DERIDS data

	Program Contracted[a]			Evaluated			
	Electric Generation (MWh)	Utilized Heat (MMBtu)	Peak kW	Electric Generation (MWh)	Utilized Heat (MMBtu)	Peak kW[b]	Capacity Factor[c]
Adelphi University	12,500	16,250	1,350	12,151	30,989	1,966	71%
Union College	13,065	16,984	1,156	13,169	92,747	1,930	81%
NYU Langone	65,012	84,516	8,334	50,595	403,352	9,082	56%

[a] The program contracted only part of the total CHP generation for 2 of these 3 sites.

[b] The evaluated kW is the maximum kW produced at any time during the available data.

[c] Based on the reported capacity from DERIDS

Table A-3 shows the year-to-year variation of some sites with multiple years of data and how their use has changed since the project was completed. This also illustrates some of the variation in the startup and commissioning process, as the data starts during the commissioning period prior to the time the CHP is fully operational.

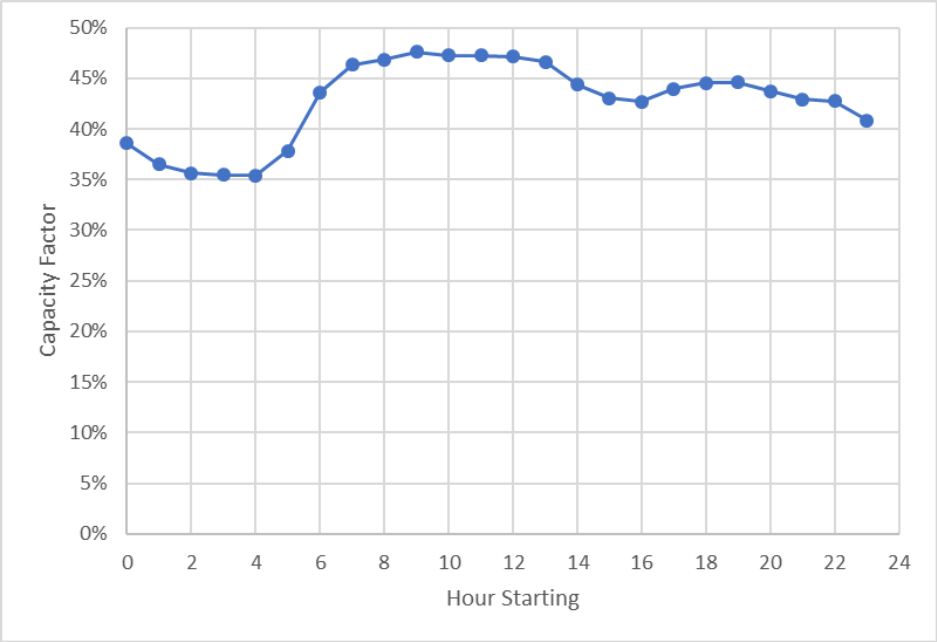
Table A-3: Comparison of Year to Year Changes in Generation

	Electricity Generation (kWh)	Utilized Heat (MMBtu)	Peak kW	Capacity Factor	Notes
Site 227, 2015	355,875	2,592	71.9	54%	Startup
Site 227, 2016	460,044	2,739	67.3	70%	Fully operational in May
Site 227, 2017	417,487	2,679	68.4	64%	
Site 227, 2018	463,012	2,973	68.4	71%	
Site 302, 2016 [a]	833,475	6,150	345	30%	Fully operational in July
Site 302, 2017	541,820	3,319	250	19%	
Site 302, 2018	923,116	4,602	237	33%	
Site 302, 2019[a]	1,046,450	5,435	214	37%	
Site 445, 2017	375,882	2,795	63.3	66%	Startup
Site 445, 2018	381,112	2,945	63.7	57%	Startup
Site 445, 2019 [a]	370,020	3,009	62.1	65%	Startup

[a] Annual Total extrapolated from the partial year of data that was available

Site 227 is an example of a site which had varying capacity factor during its first four years of operation. Site 302 shows its lowest capacity factor the year after startup, but it appears to be rising in subsequent years. Site 445 is an example of a site that has not yet completed its inspection but shows somewhat consistent generation. This site was included in the analysis using the last complete year of data.

Figure A-1: January Hourly Variation in Capacity Factor



There is a similar pattern in the daily load shape (as represented by the capacity factor) across the year, with slightly higher capacity factor in the winter months, as seen in Figure A-1. Despite the lower capacity factor in the summer months the usage did not show clear temperature dependent usage, as seen in Figure A-2.

Figure A-2: July Hourly Variation in Capacity Factor