An Economic Justification for Installing Rooftop Solar Arrays in The Con Ed Service Area - Even Without The Investment Tax Credit

Bernie Madoff Type Returns on Investment, But Legal

An Analysis Based Upon Actual Array Operation And 18 Years of Historical Data

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Abstract

An analysis of 18 years of operation of an existing 50 KW Solar Array is presented to show how installing rooftop solar arrays on medium and large buildings operated by for profit companies and several other locations in the Con Ed service area will be very cost effective, even after the recent cancellation of the investment tax credit for solar arrays. As electric rates and solar capacity factor on Long Island are comparable to those in the Con Ed Service area, the analysis will be applicable there, as well. As will be shown, Returns on Investment (ROI) comparable to the 10% - 12% ROI promised by Bernie Madoff are achievable, except it is legal. When the calculations were originally executed, it was intended to only apply to For Profit corporations, but the math turned out to work for all entities in downstate New York because the rate increases have been so egregious over the past 18 years and especially over the past 5 years. Based upon recent utility rate hearings, those increases are not abating. This is an exercise in Physics, Math, and Economics. The results will apply within the assumptions used in the models. Those are a $3.00 per watt installed cost for the array, minimal shading of the solar array, and the ability to use all of the energy within the location where it is generated or have solar net metering so retail cost is applied to all KWh generated. They are also based upon no government monetary support for the installation beyond the solar net metering and a tax rate of 30% to calculate depreciation of the asset. However, the numbers show that the installations will be cost effective even for entities that cannot depreciate the assets. While solar rebates and solar tax credits may have been necessary in the past, the math shows that entities that install solar arrays in the downstate region will see positive returns without those. Further, I have no financial interest in any solar fabrication or installation company, so I have no monetary interest in the results.

Introduction

Allied Converters is located in New Rochelle, NY in the Con Ed Service area, about 17 miles from Times Square. It is a 55,000 square foot building with a 23,000 Square foot upper roof. Allied installed one of the first commercial solar arrays in the downstate region in 2007 with the 50 Kilowatt (KW) DC rated array being activated on September 29, 2007. A photo of the roof of the factory with the solar array is in Figure 1. When the solar net metering law was passed in 2008, the array became a point of contention between Con Ed and Allied Converters because of a pre-existing high efficiency Cogeneration System (CHP – Combined Heat and Power) that had been installed in 2002. It was one of the issues encountered as a result of being an early adopter. Tariffs were not keeping up with technology. The issue was eventually resolved by the Public Service Commission after Allied petitioned for relief and in 2009 the building became the first facility in NY State with multiple sources of grid connected high efficiency generation in NY State. The tariff petitions and utility responses appear in Appendix 3 for those that are interested.

The factory, with its 50 KW rooftop solar array, in New Rochelle

Figure 1

In 2007, the solar array cost $10/watt making the total array cost $500,000 before rebates and tax credits. NYSERDA (NY State Energy Research and Development Authority) rebates at that time were very generous as were Federal and State Tax Credits. If they hadn't been, no one would have installed an array and NYSERDA wanted data on the arrays. 18 years ago NYSERDA actually did cutting edge energy research, as its name implies, and did not do science devoid energy proselytizing. The net cost of arrays installed on commercial facilities can be depreciated, after subtracting the tax credits and rebates. The depreciated cost of the 50 KW array at the factory was approximately $180,000.

Even with all of the tax credits and rebates, I still recognized that installing the array was not a good monetary decision but the engineer in me was curious about the technology and what it was capable of. Under normal circumstances, the investment would have been underwater until this year, 18 years after it was installed. However, fortunately for me, Washington D.C. opened its Solar Renewable Energy Credit (SREC) program to out of District solar arrays in October 2010. I applied for the program two weeks after it opened, and both of my solar arrays were accepted with a 2010 date. So many applications from out of District entities were filed in 2011 that the cost of the SREC's dropped below their desired target and any arrays with a 2011 date were retroactively removed from the program leaving about five out of District arrays with access to the SREC payments, from what I was told.

Since 2009, NYSERDA has had an SREC clause in their solar contracts so that if someone accepts NYSERDA funding for an array, NYSERDA will own all or a portion of the SRECs. However, the array at Allied is so old that it predates SRECs so there was no SREC clause in the 2007 contract. The financial analysis that appears in Figure 4 for the array shows the ROI both with and without

the SREC's included. There is currently no market in which to sell NY State SREC's so the clause in the contract is moot. Even without SREC's, much has changed since 2007 that make the economics of site based solar arrays a lot more favorable in 2026. Array costs have decreased by 70% and Utility costs per Kilowatt-Hour in the Con Ed service area have increased by 66% since 2007 from 14.9 cents to 24.75 cents for commercial entities.

Data for the array has been recorded daily for the past 18+ years and it reflects weather issues as well as maintenance issues that reduced output. There are eight balanced inverters that should all produce approximately the same amount of energy each day. If one's output varies from the others, it is because of a failure of some type. That could be an inverter issue, a wiring issue, a bad connector, or an issue with one of the panels. This is monitored to ensure optimal array operation. The numbers shown in the tables through 2025 are not theoretical estimates.

The following analysis uses actual data from the array along with actual commercial Con Ed billing data for the past 18 years.

Why is Rooftop or Site-Based Solar Preferable to Remote Solar Generation

Rooftop Solar has several advantages over remote solar installations. First, as the energy is used where it is generated, Line Loss is eliminated which can reduce the usable energy of remote generation, including solar output, by between 3% during the winter and 11% during the summer, at least 7% on average over the course of a year. As most solar output occurs during the summer when Line Losses are highest, the average solar energy losses due to Line Loss will range between 8% and 10%. As a result of that, a rooftop array will generate 8% - 10% more usable energy per installed watt of solar array. An explanation of Line Loss appears in Appendix 2. Figure 2 shows the percentage array output by month. Note that 37% of the production occurs between June and August when the conductors and equipment are hottest and Line Loss is highest, but an on-site array is not affected by those factors. Only 11% of production occurs between December and February when utility equipment is coolest and Line Loss is lowest. The February number is distorted by increased snow cover which makes it lower than expected.

Second, rooftop solar does not need additional transmission infrastructure. If the array is sized near the peak load of the building on which it is installed, then the utility infrastructure needed to support the array already exists. That greatly reduces the amount of engineering required for interconnections and the combination of the above factors results in reduced installed costs.

Third, Storage infrastructure is not needed with rooftop solar as almost all of the energy will be used on-site. The current storage technologies are exceedingly expensive with a relatively short life span, far less than the lifespan of the solar array.

Fourth, there is no loss of farmland or wetlands as well as having greatly reduced NIMBY resistance.

The above factors result in a higher energy yield per watt of installed array and no ancillary costs beyond the actual installed array cost for on-site solar arrays.

Solar output just looks like reduced building load to the utility system, no different than turning off a light. The same concepts apply to Solar Parking Lot Canopies installed on the site where the energy will be used although the initial capital cost will be higher.

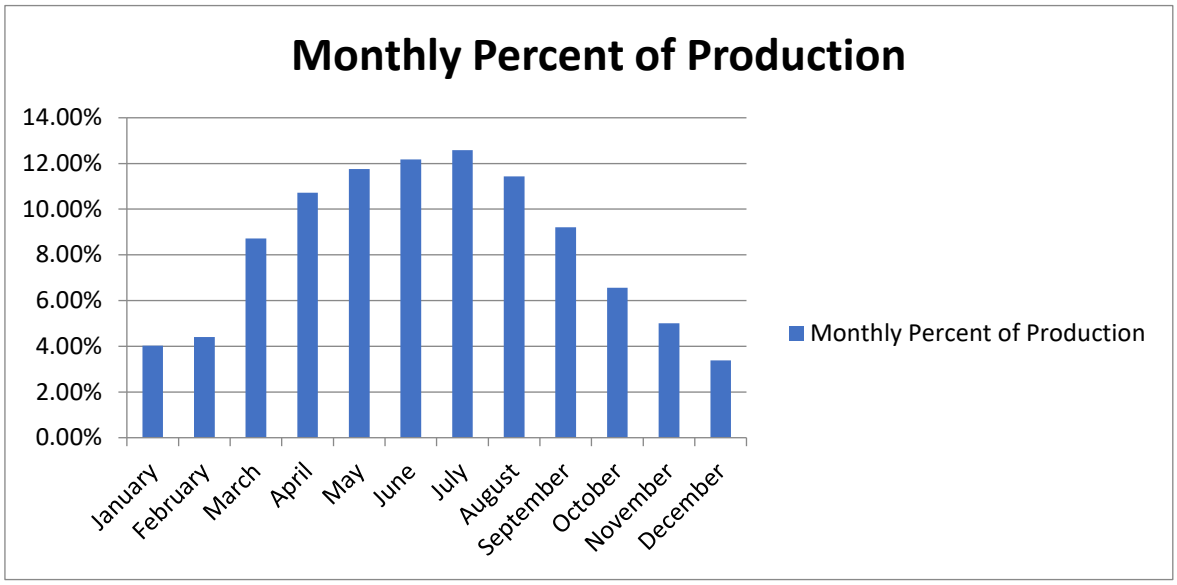

Figure 2 – Percent Solar Production by Month – 18 Year Average

Array Degradation, Utility Costs, and Their Effect on ROI

It is well known that solar arrays lose their effectiveness as they age. During its first year of operation in 2008, the array produced 60,000 KWh. This past year, 18 years after it was installed, the annual output has dropped to 46,500 KWh. That is an average decrease of 1.5% per year, or 760 KWh/year. The graph in Figure 3 shows the 365-day output over time. It starts in September 2008, 365 days after the array was turned on. Each data point is the sum of the prior 365 days of solar output. The steep vertical lines are either snow on the array, a period of high cloud cover (falling), or the effect of normal array operation a year later with no snow or cloud cover (rising).

Just the opposite of falling solar array output has been the increase in utility costs over the same period. Commercial utility bills have two components. There is a "Demand" charge that reflects the maximum Kilowatt Usage over two 15-minute periods during the billing month. Then there is a "Usage" charge that is based upon how many Kilowatt-Hours (KWh) are used in a given month. Many of the surcharges are based upon KWh usage also. Because solar arrays are intermittent, they do not affect the demand charge. They only reduce the KWh usage. In 2009, subtracting the demand charge from the total electric bill yielded a KWh cost of $0.149 per KWh, including surcharges and related taxes. Doing the same calculation in 2025 resulted in a per KWh cost of

$0.2475. That is an average increase in the KWh cost of 3% annually each year for the past 17 years. Because the array output is dropping by 1.5% annually and the utility rates are increasing by 3% annually, the Dollar energy savings per year from the array's output is actually increasing. This is shown in Figure 4, below.

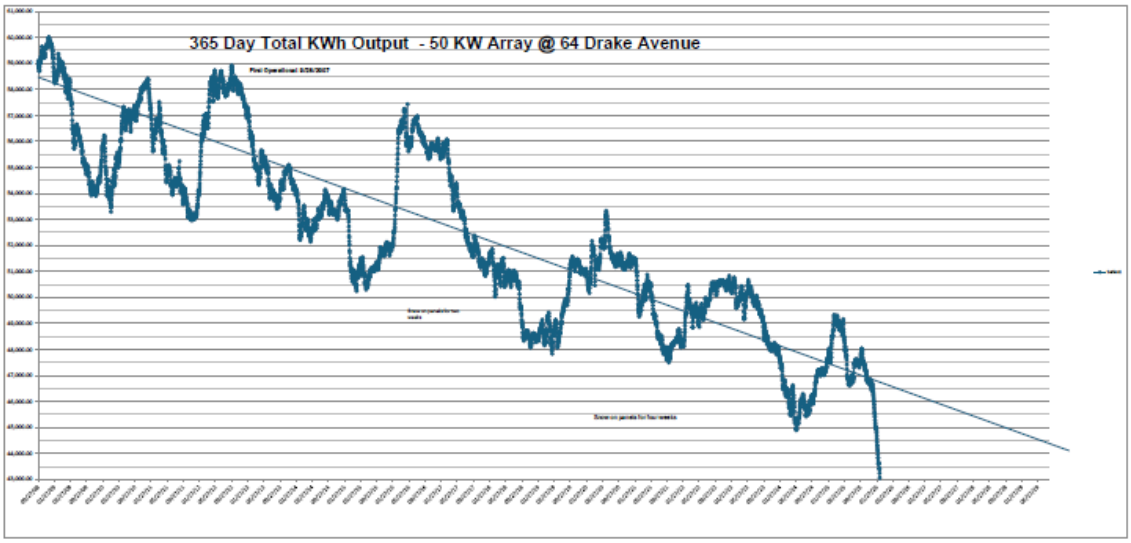

Figure 3 – 365 Day Total KWh Output Between 2008 and 2025

Without the SRECs included, the array would have had a negative ROI until 2025. With the SREC's included, the array has had a positive ROI since 2016 and the average ROI over the life of the array will be 6.26%. Also notice that in 2008, the array offset $8783 dollars on the utility bill. By 2025, despite generating 24% less energy every year, the monetary offset on the utility bill has risen to $11,508, $2725 more per year. As utility bills only go up and not down, this trend should continue. The first 18 years in the table are based upon the actual array output and utility costs. Rows after 2025 (Year 18), highlighted in blue, are based upon an extrapolation of utility costs increasing at their historical rate of 3% per year and the historical array degradation rate of 1.5% (760 kwh) per year. The SREC program stopped for arrays outside of Washington, DC at the end of 2024. In actuality, prior to 2020, the rate increases were lower and since 2020, the rate increases per KWh have been substantially higher. Coincidence or not, 2020 is the year after the CLCPA was passed and state policy added costs to utility bills to implement it. The actual cost on our bill in July 2020 was 18 cents per KWh. That would indicate an average annual rate increase of 1.8% between 2008 and 2020. Since 2020, the average annual rate increase per KWh has been 6.6% so using a 3% rate increase in future calculations is very conservative.

The downstate system in New York is supported by 95% fossil fuel based generation and many of the generating plants are more than 60 years of age. These facts are clearly documented in the 2025-2034 NYISO Reliability Plan on pages 16 – 17. Increasing loads across the country are resulting in increasing costs for fuel used to operate the downstate generating plants which is going to raise energy costs. Additionally, the CLCPA has resulted in an inability for NY State to install or retool aging fossil fuel plants which is going to result in a protracted energy shortage and perpetually higher rates. A recent article in the NY Times documented an expected increase of 12.2% for electric heating costs this year which would correlate to a similar percentage increase in the KWh costs. Expecting utility cost increases to track below their historical average over the next three decades with the current projected load growth and planning for lower increases is a fool's errand.

Array Cost $500,000 $10.00/Watt
Array Cost After Depreciation, Rebates and tax Credits $180,000

	Year	KWh	$/KWh	ANNUAL $ SAVINGS	CUMULATIVE ENERGY SAVINGS	Annual Average $ ROI	%Annual ROI	$ SALES SRECS	ANNUAL SAVINGS INCLUDING SRECS	CUMULATIVE SAVINGS INCLUDING SRECS	Annual $ ROI INCLUDING SRECS	% AVERAGE Annual ROI INCLUDING SRECS
	2007	8,616.59	$0.1450	$1,249.39					$1,249.39			
1	2008	59,752.90	$0.1478	$8,783.68	$10,033.07	-$169,966.93	-161.87%		$8,783.68	$10,033.07	-$169,966.93	-73.98%
2	2009	54,556.00	$0.1499	$8,128.84	$18,161.91	-$80,919.04	-77.07%		$8,128.84	$18,161.91	-$80,919.04	-35.18%
3	2010	58,309.90	$0.1548	$9,026.03	$27,187.94	-$50,937.35	-48.51%		$9,026.03	$27,187.94	-$50,937.35	-22.15%
4	2011	52,991.76	$0.1606	$8,509.85	$35,697.80	-$36,075.55	-34.36%	$15,349.00	$23,858.85	$51,046.80	-$32,238.30	-14.02%
5	2012	57,567.77	$0.1664	$9,578.26	$45,276.06	-$26,944.79	-25.66%	$15,967.22	$25,545.48	$76,592.28	-$20,681.54	-8.99%
6	2013	54,463.34	$0.1722	$9,377.31	$54,653.36	-$20,891.11	-19.90%	$23,660.80	$33,038.11	$109,630.38	-$11,728.27	-5.10%
7	2014	53,719.15	$0.1780	$9,560.43	$64,213.79	-$16,540.89	-15.75%	$23,786.14	$33,346.57	$142,976.95	-$5,289.01	-2.30%
8	2015	51,732.73	$0.1838	$9,506.65	$73,720.44	-$13,284.95	-12.65%	$23,467.61	$32,974.26	$175,951.21	-$506.10	-0.22%
9	2016	55,853.55	$0.1896	$10,587.53	$84,307.97	-$10,632.45	-10.13%	$24,812.40	$35,399.93	$211,351.14	$3,483.46	1.51%
10	2017	50,963.96	$0.1954	$9,955.96	$94,263.93	-$8,573.61	-8.17%	$18,344.25	$28,300.21	$239,651.35	$5,965.14	2.59%
11	2018	48,526.18	$0.2011	$9,760.90	$104,024.83	-$6,906.83	-6.58%	$6,730.07	$16,490.97	$256,142.32	$6,922.03	3.01%
12	2019	50,902.30	$0.2069	$10,533.78	$114,558.61	-$5,453.45	-5.19%	$32,743.44	$43,277.22	$299,419.54	$9,951.63	4.33%
13	2020	51,341.36	$0.2127	$10,922.12	$125,480.73	-$4,193.79	-3.99%	$20,726.43	$31,648.55	$331,068.09	$11,620.62	5.05%
14	2021	48,545.13	$0.2185	$10,608.54	$136,089.27	-$3,136.48	-2.99%	$18,037.35	$28,645.89	$359,713.98	$12,836.71	5.58%
15	2022	50,578.86	$0.2243	$11,346.03	$147,435.30	-$2,170.98	-2.07%	$17,782.53	$29,128.56	$388,842.54	$13,922.84	6.05%
16	2023	47,852.36	$0.2301	$11,011.67	$158,446.97	-$1,347.06	-1.28%	$17,228.25	$28,239.92	$417,082.46	$14,817.65	6.44%
17	2024	47,517.43	$0.2359	$11,209.92	$169,656.89	-$608.42	-0.58%	$19,481.67	$30,691.59	$447,774.05	$15,751.41	6.85%
18	2025	46,500.00	$0.2475	$11,508.75	$181,165.64	$64.76	0.06%	$2,295.67	$13,804.42	$461,578.47	$15,643.25	6.80%
19	2026	45,720.00	$0.2549	$11,655.17	$192,820.81	$674.78	0.64%		$11,655.17	$473,233.64	$15,433.35	6.71%
20	2027	44,940.00	$0.2626	$11,800.02	$204,620.83	$1,231.04	1.17%		$11,800.02	$485,033.66	$15,251.68	6.63%
21	2028	44,160.00	$0.2704	$11,943.07	$216,563.90	$1,741.14	1.66%		$11,943.07	$496,976.73	$15,094.13	6.56%
22	2029	43,380.00	$0.2786	$12,084.08	$228,647.98	$2,211.27	2.11%		$12,084.08	$509,060.81	$14,957.31	6.50%
23	2030	42,600.00	$0.2869	$12,222.81	$240,870.79	$2,646.56	2.52%		$12,222.81	$521,283.62	$14,838.42	6.45%
24	2031	41,820.00	$0.2955	$12,358.98	$253,229.77	$3,051.24	2.91%		$12,358.98	$533,642.60	$14,735.11	6.41%
25	2032	41,040.00	$0.3044	$12,492.32	$265,722.09	$3,428.88	3.27%		$12,492.32	$546,134.92	$14,645.40	6.37%
26	2033	40,260.00	$0.3135	$12,622.54	$278,344.63	$3,782.49	3.60%		$12,622.54	$558,757.46	$14,567.59	6.33%
27	2034	39,480.00	$0.3229	$12,749.33	$291,093.96	$4,114.59	3.92%		$12,749.33	$571,506.79	$14,500.25	6.30%
28	2035	38,700.00	$0.3326	$12,872.37	$303,966.33	$4,427.37	4.22%		$12,872.37	$584,379.16	$14,442.11	6.28%
	TOTAL $ OFFSET			$302,716.93				$280,412.83	$583,129.76			

Between 2008 - 2025

Average Array Decay 780 KWh/Year
Average Increase in KWh cost 3% / Year

2026 - 2035 Extrapolated to those values (Years 19-28)

Figure 4 – Solar Array Dollar Return on Investment – 50 KW array at 64 Drake Avenue 2008 – 2035

I hesitate to mention any increase in fossil fuel costs with regard to NY State because the ideologues, including those that update the NYSERDA website, will try to use that as an excuse to convert locations to electric heat while ignoring the fact that 95% of the electric generation in the downstate region is fossil fuel based. Any increase in the cost of fossil fuels increases the electricity rates even more because of the age of the fossil fuel plants, their inherent inefficiencies, and the state laws that preclude fixing them. That is made clear by the aforementioned NY Times article about a 9.2% increase in heating costs in the following caption:

People who use electric heaters will experience a 12.2 percent increase in heating costs this winter on average, and those who use natural gas will experience an 8.4 percent increase, according to the energy assistance directors group.

Without the SREC's included, the array would have yielded an average annual return of 4.22% over 28 years. With SREC's included, that has risen to 6.28%. The average annual ROI is calculated subtracting the cost of the array from the revenue stream. A similar analysis can be done for a new array installed in 2026.

The Math for a New Array Installed in 2026

The table in Figure 5 uses the first 18 years of energy output from the array at 64 Drake Avenue and the same extrapolated decay rate for years 19 – 28. It covers a period from 2026 – 2053. The array costs assume no use of the investment tax credit that was recently terminated by the Federal Government. They also exclude any State Tax credit or NYSERDA Funding. The installed cost also does not figure in any financing costs that will reduce the ROI. A $100,000 commercial loan at 6% for 5 years would incur $16,000 of interest charges and add $11,200 to the array cost after the tax deduction on that, assuming a 30% tax rate. That would reduce the ROI by approximately $400/year over the life of the array and the ROI by 0.4% to 13.14% after 28 years.

The installed cost per watt for a new solar array has fallen to approximately $3.00/watt so the total cost for the array will be $150,000. After depreciation is calculated based upon a 30% tax rate, the net cost of the array is $105,000. The depreciation schedule is shown in Appendix 1. Note that under the tax code, depreciation is only available to for profit commercial entities. Entities that do not pay taxes gain no advantage from depreciation as their tax rate is 0%.

Corporations with a tax rate higher than 30% will get the benefit of more depreciation and have a lower net cost for the array which will increase the ROI. Conversely, a lower tax rate lowers the depreciation.

In the table in Figure 5, the per KWh cost starts with the 24.75 cents per KWh for 2026 that Con Ed is currently charging and then increments that by 3% per year for the next 28 years using the average KWh increase from 2008 - 2025. By 2053, the per KWh cost will have more than doubled to 55 cents.

As can be seen in the right-hand column of the table in Figure 5, the array pays for itself in 7 years and the average ROI rises rapidly after that. Note that the percentage in the right hand column is for the entire life of the array to that point, not for that year. For example, by year 20 the array will have generated $338,933 worth of energy. Subtracting the $105,000 net cost of the array results in $233,963 total net savings, or $11,700 annually over 20 years which is 11.14% of the initial $105,000 investment for each of the first 20 years. Bernie Madoff took in billions of dollars of investment money promising a similar ROI, except this math is real and is not a Ponzi scheme.

It's a win for the solar installer, a win for the array owner, and a win for the downstate region that is desperately short of energy.

RETURN ON INVESTMENT FOR A 50 KW DC RATED 5 DEGREE ANGLE ROOFTOP SOLAR ARRAY IN THE CON ED SERVICE AREA

ARRAY COST BEFORE DEPRECIATION $150,000.00 $3.00/Watt Installed Cost No Investment Tax Credit or Rebates of Any Kind
ARRAY COST AFTER DEPRECIATION $105,000.00

Array Out put Figures in Years 1 - 18 based upon actual data. Years 19 - 28 based upon historical Decay rates.

KWh costs based upon historical rate increases
They may be conservative based upon recent events.

	YEAR	50 KW Solar Array Annual KWh Output Includes Average annual 780 KWh Decay After Year 18	$/KWh 3% Annual Inc	ANNUAL SAVINGS	CUMULATIVE ENERGY SAVINGS	NET $ SAVINGS	Annual $ ROI ($ SAVINGS / YEARS)	AVERAGE % Annual ROI
1	2026	59752.899	$0.2475	$14,788.84	$14,788.84	-$90,211.16	-$90,211.16	-85.92%
2	2027	54556	$0.2549	$13,907.69	$28,696.53	-$76,303.47	-$38,151.73	-36.33%
3	2028	58309.9	$0.2626	$15,310.59	$44,007.12	-$60,992.88	-$20,330.96	-19.36%
4	2029	52991.759	$0.2704	$14,331.62	$58,338.74	-$46,661.26	-$11,665.32	-11.11%
5	2030	57567.765	$0.2786	$16,036.27	$74,375.01	-$30,624.99	-$6,125.00	-5.83%
6	2031	54463.34	$0.2869	$15,626.64	$90,001.65	-$14,998.35	-$2,499.72	-2.38%
7	2032	53719.148	$0.2955	$15,875.51	$105,877.16	$877.16	$125.31	0.12%
8	2033	51732.73	$0.3044	$15,747.12	$121,624.28	$16,624.28	$2,078.04	1.98%
9	2034	55853.547	$0.3135	$17,511.52	$139,135.80	$34,135.80	$3,792.87	3.61%
10	2035	50963.96	$0.3229	$16,457.86	$155,593.66	$50,593.66	$5,059.37	4.82%
11	2036	48526.18	$0.3326	$16,140.74	$171,734.41	$66,734.41	$6,066.76	5.78%
12	2037	50902.3	$0.3426	$17,439.02	$189,173.43	$84,173.43	$7,014.45	6.68%
13	2038	51341.36	$0.3529	$18,117.12	$207,290.55	$102,290.55	$7,868.50	7.49%
14	2039	48545.13	$0.3635	$17,644.31	$224,934.86	$119,934.86	$8,566.78	8.16%
15	2040	50578.86	$0.3744	$18,935.00	$243,869.87	$138,869.87	$9,257.99	8.82%
16	2041	47852.36	$0.3856	$18,451.72	$262,321.59	$157,321.59	$9,832.60	9.36%
17	2042	47517.43	$0.3972	$18,872.25	$281,193.84	$176,193.84	$10,364.34	9.87%
18	2043	46500	$0.4091	$19,022.21	$300,216.05	$195,216.05	$10,845.34	10.33%
19	2044	45720	$0.4214	$19,264.22	$319,480.28	$214,480.28	$11,288.44	10.75%
20	2045	44940	$0.4340	$19,503.63	$338,983.91	$233,983.91	$11,699.20	11.14%
21	2046	44160	$0.4470	$19,740.07	$358,723.98	$253,723.98	$12,082.09	11.51%
22	2047	43380	$0.4604	$19,973.15	$378,697.13	$273,697.13	$12,440.78	11.85%
23	2048	42600	$0.4742	$20,202.44	$398,899.57	$293,899.57	$12,778.24	12.17%
24	2049	41820	$0.4885	$20,427.51	$419,327.07	$314,327.07	$13,096.96	12.47%
25	2050	41040	$0.5031	$20,647.90	$439,974.98	$334,974.98	$13,399.00	12.76%
26	2051	40260	$0.5182	$20,863.14	$460,838.11	$355,838.11	$13,686.08	13.03%
27	2052	39480	$0.5338	$21,072.70	$481,910.81	$376,910.81	$13,959.66	13.29%
28	2053	38700	$0.5498	$21,276.06	$503,186.87	$398,186.87	$14,220.96	13.54%

TOTAL $ OFFSET $503,186.87 $398,186.87

ASSUMPTIONS BASED UPON HISTORICAL DATA OVER THE PAST 18 YEARS

3% Average Increase in KWh Costs
Entire Output of Array Can Be used On-Site or Solar Net Metering is in place
1.5% Linear Average Annual Decay Rate of Array (780 KWh/Year based upon 60,000 KWh Outpur when New)
Rooftop Array with a 5 degree angle and minimal shading

Figure 5 - Solar Array Dollar Return on Investment - 3% year Over Year increase in KWh costs – Historical Average increase between 2008 – 2025 – 50 KW 5 degree array installed in Downstate NY (2026 – 2053)

The chart in Figure 6 shows the same calculations but uses the 6% increase per KWh that has occurred over the past five years between 2020 – 2025. The array will pay for itself in six years, yield a 12.59% annual ROI in 15 years and a 24.51% annual ROI in 28 years. If the current rate of increase of energy costs is duplicated for the next 28 years, energy will cost 4.8 times its current rate at $1.19 per KWh by 2053.

The assumptions used for the calculations shown in Figures 5, 6 , and 7 assume that all of the energy can be priced at the retail energy cost which means that it has to be used on-site or if it is exported, solar net metering must be included in the utility rates. It is based upon 18 years of recorded solar output of the existing array at 64 Drake Avenue which is a 5 degree rooftop array with minimal shading. It also assumes a fixed percentage year over year increase in KWh costs based upon the past 5 year or 18 year historical average, table dependent.

		ARRAY COST BEFORE DEPRECIATION	$150,000	$3.00/Watt	6% Rate increase for KWh costs			
		ARRAY COST AFTER DEPRECIATION	$105,000					
	YEAR	50 KW Solar Array Annual KWh Output Includes Average annual 780 KWh Decay After Year 18	$/KWh	ANNUAL SAVINGS	CUMULATIVE ENERGY SAVINGS	NET $ SAVINGS	Annual $ ROI ($ SAVINGS / YEARS)	AVERAGE % Annual ROI
1	2026	59,752.90	$0.2475	$14,788.84	$14,788.84	-$90,211.16	-$90,211.16	-85.92%
2	2027	54,556.00	$0.2624	$14,312.77	$29,101.61	-$75,898.39	-$37,949.20	-36.14%
3	2028	58,309.90	$0.2781	$16,215.46	$45,317.07	-$59,682.93	-$19,894.31	-18.95%
4	2029	52,991.76	$0.2948	$15,620.72	$60,937.79	-$44,062.21	-$11,015.55	-10.49%
5	2030	57,567.77	$0.3125	$17,987.80	$78,925.59	-$26,074.41	-$5,214.88	-4.97%
6	2031	54,463.34	$0.3312	$18,038.85	$96,964.44	-$8,035.56	-$1,339.26	-1.28%
7	2032	53,719.15	$0.3511	$18,859.91	$115,824.34	$10,824.34	$1,546.33	1.47%
8	2033	51,732.73	$0.3721	$19,252.26	$135,076.60	$30,076.60	$3,759.58	3.58%
9	2034	55,853.55	$0.3945	$22,032.96	$157,109.56	$52,109.56	$5,789.95	5.51%
10	2035	50,963.96	$0.4181	$21,310.38	$178,419.94	$73,419.94	$7,341.99	6.99%
11	2036	48,526.18	$0.4432	$21,508.49	$199,928.43	$94,928.43	$8,629.86	8.22%
12	2037	50,902.30	$0.4698	$23,915.37	$223,843.80	$118,843.80	$9,903.65	9.43%
13	2038	51,341.36	$0.4980	$25,568.95	$249,412.76	$144,412.76	$11,108.67	10.58%
14	2039	48,545.13	$0.5279	$25,626.96	$275,039.72	$170,039.72	$12,145.69	11.57%
15	2040	50,578.86	$0.5596	$28,302.60	$303,342.32	$198,342.32	$13,222.82	12.59%
16	2041	47,852.36	$0.5931	$28,383.54	$331,725.86	$226,725.86	$14,170.37	13.50%
17	2042	47,517.43	$0.6287	$29,875.97	$361,601.83	$256,601.83	$15,094.23	14.38%
18	2043	46,500.00	$0.6665	$30,990.45	$392,592.28	$287,592.28	$15,977.35	15.22%
19	2044	46,500.00	$0.7064	$32,849.88	$425,442.15	$320,442.15	$16,865.38	16.06%
20	2045	46,500.00	$0.7488	$34,820.87	$460,263.02	$355,263.02	$17,763.15	16.92%
21	2046	46,500.00	$0.7938	$36,910.12	$497,173.14	$392,173.14	$18,674.91	17.79%
22	2047	46,500.00	$0.8414	$39,124.73	$536,297.87	$431,297.87	$19,604.45	18.67%
23	2048	46,500.00	$0.8919	$41,472.21	$577,770.08	$472,770.08	$20,555.22	19.58%
24	2049	46,500.00	$0.9454	$43,960.54	$621,730.62	$516,730.62	$21,530.44	20.51%
25	2050	46,500.00	$1.0021	$46,598.18	$668,328.80	$563,328.80	$22,533.15	21.46%
26	2051	46,500.00	$1.0622	$49,394.07	$717,722.87	$612,722.87	$23,566.26	22.44%
27	2052	46,500.00	$1.1260	$52,357.71	$770,080.58	$665,080.58	$24,632.61	23.46%
28	2053	46,500.00	$1.1935	$55,499.17	$825,579.75	$720,579.75	$25,734.99	24.51%

Figure 6 - Solar Array Dollar Return on Investment - 6% year Over Year increase in KWh costs – Historical Average increase between 2020 – 2025 – 50 KW array installed in Downstate NY (2026 – 2053)

Additionally, solar technology has improved over the past two decades so that the degradation rate should be lower and after 28 years, the array will be producing more energy than what the table shows for the older array. Even without that improvement figured into the numbers, the ROI is sufficient to justify the technology. What makes this process work is that NY State has so crippled its utility system that the resulting exorbitantly high downstate rates make installing rooftop solar under the stated parameters extremely cost effective.

When I started this effort, I had only planned to include an analysis for taxable corporations. However, the utility rate increases have been so high that the effort will be cost effective for anyone in the downstate area that can use the full energy output of their solar array or benefit from solar net metering and can install the array for $3.00/watt. That will apply to homeowners, non-profits, or government buildings. Figure 7 shows the rate of return with no depreciation of

the solar asset calculated. After 15 years, a 6% return on investment will be realized based upon a 3% year over year increase in utility rates. After 28 years, the ROI increase to 12.75%.

If the year over year KWh rate increases track those of the past five years, the ROI will be substantially higher. Figure 8 shows the expected utility rates with three different rate increase scenarios.

		ARRAY COST BEFORE DEPRECIATION	$150,000	$3.00/Watt	3% Increase in per KWh costs			
		ARRAY COST AFTER DEPRECIATION	$150,000	No Depreciation				
	YEAR	50 KW Solar Array Annual KWh Output Includes Average annual 780 KWh Decay After Year 18	$/KWh	ANNUAL SAVINGS	CUMULATIVE ENERGY SAVINGS	NET $ SAVINGS	Annual $ ROI ($ SAVINGS / YEARS)	AVERAGE % Annual ROI
1	2026	59,752.90	$0.2475	$14,788.84	$14,788.84	-$135,211.16	-$135,211.16	-128.77%
2	2027	54,556.00	$0.2549	$13,907.69	$28,696.53	-$121,303.47	-$60,651.73	-57.76%
3	2028	58,309.90	$0.2626	$15,310.59	$44,007.12	-$105,992.88	-$35,330.96	-33.65%
4	2029	52,991.76	$0.2704	$14,331.62	$58,338.74	-$91,661.26	-$22,915.32	-21.82%
5	2030	57,567.77	$0.2786	$16,036.27	$74,375.01	-$75,624.99	-$15,125.00	-14.40%
6	2031	54,463.34	$0.2869	$15,626.64	$90,001.65	-$59,998.35	-$9,999.72	-9.52%
7	2032	53,719.15	$0.2955	$15,875.51	$105,877.16	-$44,122.84	-$6,303.26	-6.00%
8	2033	51,732.73	$0.3044	$15,747.12	$121,624.28	-$28,375.72	-$3,546.96	-3.38%
9	2034	55,853.55	$0.3135	$17,511.52	$139,135.80	-$10,864.20	-$1,207.13	-1.15%
10	2035	50,963.96	$0.3229	$16,457.86	$155,593.66	$5,593.66	$559.37	0.53%
11	2036	48,526.18	$0.3326	$16,140.74	$171,734.41	$21,734.41	$1,975.86	1.88%
12	2037	50,902.30	$0.3426	$17,439.02	$189,173.43	$39,173.43	$3,264.45	3.11%
13	2038	51,341.36	$0.3529	$18,117.12	$207,290.55	$57,290.55	$4,406.97	4.20%
14	2039	48,545.13	$0.3635	$17,644.31	$224,934.86	$74,934.86	$5,352.49	5.10%
15	2040	50,578.86	$0.3744	$18,935.00	$243,869.87	$93,869.87	$6,257.99	5.96%
16	2041	47,852.36	$0.3856	$18,451.72	$262,321.59	$112,321.59	$7,020.10	6.69%
17	2042	47,517.43	$0.3972	$18,872.25	$281,193.84	$131,193.84	$7,717.28	7.35%
18	2043	46,500.00	$0.4091	$19,022.21	$300,216.05	$150,216.05	$8,345.34	7.95%
19	2044	46,500.00	$0.4214	$19,592.88	$319,808.93	$169,808.93	$8,937.31	8.51%
20	2045	46,500.00	$0.4340	$20,180.66	$339,989.59	$189,989.59	$9,499.48	9.05%
21	2046	46,500.00	$0.4470	$20,786.08	$360,775.68	$210,775.68	$10,036.94	9.56%
22	2047	46,500.00	$0.4604	$21,409.67	$382,185.34	$232,185.34	$10,553.88	10.05%
23	2048	46,500.00	$0.4742	$22,051.96	$404,237.30	$254,237.30	$11,053.80	10.53%
24	2049	46,500.00	$0.4885	$22,713.51	$426,950.81	$276,950.81	$11,539.62	10.99%
25	2050	46,500.00	$0.5031	$23,394.92	$450,345.73	$300,345.73	$12,013.83	11.44%
26	2051	46,500.00	$0.5182	$24,096.77	$474,442.50	$324,442.50	$12,478.56	11.88%
27	2052	46,500.00	$0.5338	$24,819.67	$499,262.17	$349,262.17	$12,935.64	12.32%
28	2053	46,500.00	$0.5498	$25,564.26	$524,826.43	$374,826.43	$13,386.66	12.75%

Figure 7 - Solar Array Dollar Return on Investment - 3% year Over Year increase in KWh costs – Historical Average increase between 2008 – 2025 – 50 KW array installed in Downstate NY (2026 – 2053) No Depreciation Included for entities that do not pay taxes or cannot depreciate capital improvements

For homeowners, the benefits may be greater as both the supply and delivery costs are KWh based and the current cost per KWh is approximately $0.33 - $0.35 with taxes included and the increase in rates has averaged 7% over the past few years which is confirmed by the 30% figure in the NY Times article (1.07^4=31%). Interest on financing may or may not be tax deductible which could change the math and the ROI and it would have to be analyzed on a case-by-case basis. Also from the aforementioned NY Times article there is the following caption and NEADA link.

Residential electricity prices and bills this year have risen much faster than overall inflation. Since 2021, the average cost of electricity per kilowatt-hour has risen almost 30 percent.

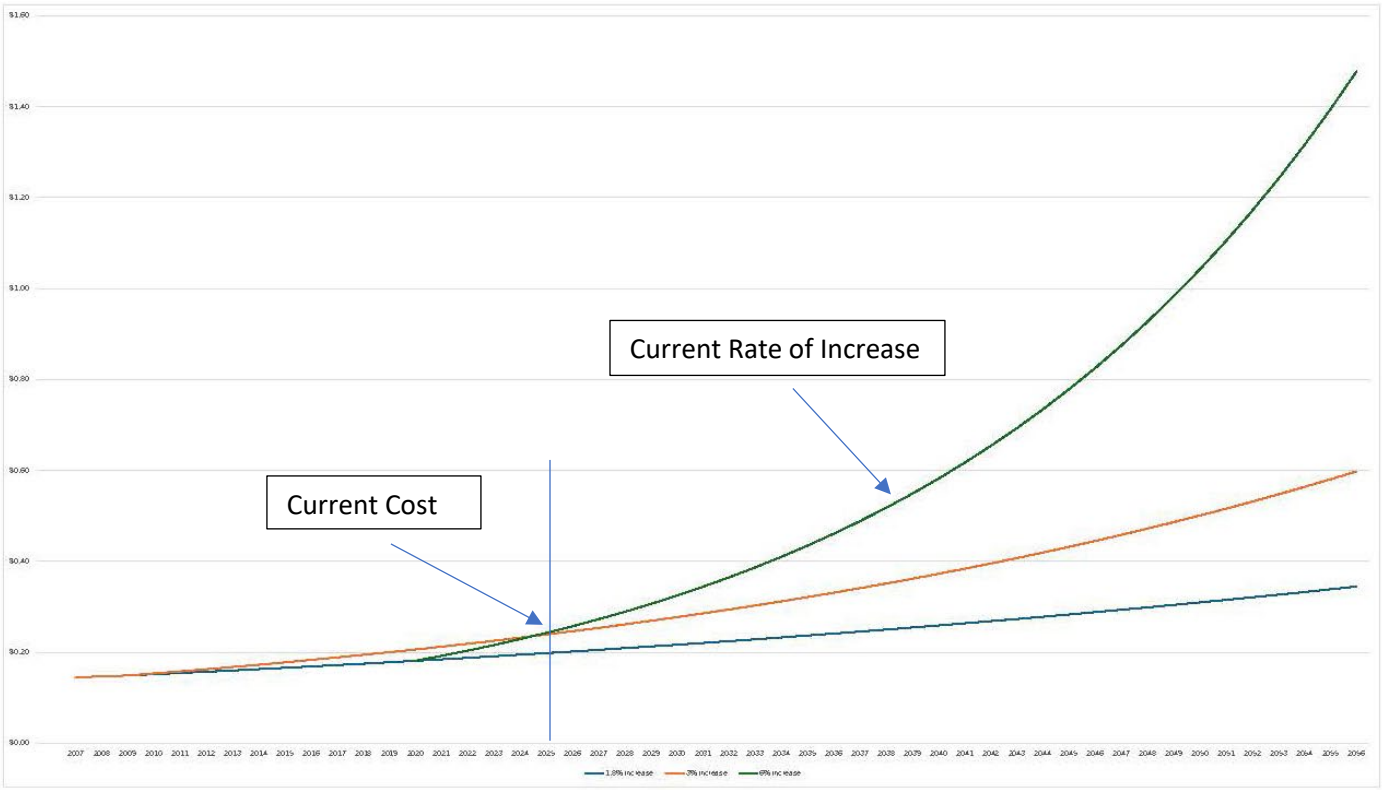

Figure 8 – Expected Utility Rates Under Three Different Cost Increase Scenarios – Commercial Cost /KWh

In the graph in Figure 8 are three different cost increase scenarios. The blue line shows what the per KWh costs would have been had the 1.8% rate increases between 2007 – 2020 been the norm. That "What If" scenario which would have resulted in a $0.33/KWh cost in 2053 no longer exists. The orange line shows the costs if the 3% average rate increase between 2008 – 2025 is continued with a $0.55/KWh cost in 2053 . The green line shows what the rates will be if the 6% increases between 2020 -2025 continue with a $1.24 cost/KWH in 2053. As things are progressing, the reality will likely fall between the orange line and the green line, depending on state policy. Many factors such as commodity costs, equipment lead times, and the physics of generation are not under the control of state policy makers. That is a fact that many of them cannot seem to grasp and as a result, the realities of the orange and green lines will be the ratepayer realities. Under the current scenario, it will soon be impossible to run a competitive business in New York State and those businesses that don't take extreme measures to control their energy costs will be unable to compete if they remain in New York. The Data for Figure 8 is in Appendix 4.

Conclusion

Over a period of 28 years, a 13% annual return on investment is possible in the Con Ed Service Area from installing rooftop solar and if energy costs increase as they have for the past five years, higher returns than that will be likely. That is based upon calculations done assuming no Investment Tax Credit and no government financial assistance of any kind beyond solar net metering. The calculations err on the conservative side based upon a higher rate of array degradation than is likely to occur with a new array. The results clearly show that without government assistance of any kind, those that can install a rooftop solar array under conditions near those used for the model will see a significant annual return on investment. Past performance is no guarantee of future results, however NY State policy makers have proven to be reliably bad in this regard which will likely guarantee the higher utility rates.

As a comparison, the S&P has returned 10% - 10.5% over the past 30 years and the Dow Jones has had an ROI of between 9.3% and 10.4% over that time frame. NY State's predictability at implementing policies that will increase energy costs makes the solar arrays a more risk free investment than the financial markets for anyone that has a shade free roof.

The models should also be a warning to state policy makers to show how their regulations are driving utility rates to a point where they will be entirely unaffordable within two decades.

Appendix 1 – Depreciation Schedule for a $150,000 solar Array for a Business with a 30% Tax Rate

A $150,000 commercial solar array placed in service after 2026 (under current law) gets no bonus depreciation but still qualifies as 5-year MACRS property, so it is depreciated over six tax years using the standard 5-year MACRS half-year convention rates. At a 30% tax rate, the total tax savings from this depreciation are $45,000, so the net after-tax cost is $105,000. library +2

Depreciation schedule after 2026

Solar energy systems used in a trade or business are classified as **5-year** property under MACRS. With no ITC and no bonus depreciation after 2026, the full $150,000 cost is depreciated using the standard 5-year MACRS half-year convention rates. library +3

Standard 5-year MACRS (half-year convention) percentages and dollar amounts for a $150,000 array:

Year	MACRS rate	Depreciation amount	Tax savings at 30%
1	20.00%	$30,000	$9,000
2	32.00%	$48,000	$14,400
3	19.20%	$28,800	$8,640
4	11.52%	$17,280	$5,184
5	11.52%	$17,280	$5,184
6	5.76%	$8,640	$2,592

These percentages are the standard IRS MACRS 5-year GDS rates for property like solar, and the total depreciation sums to the full $150,000 basis. artinenergy +1

Net after-tax cost

- Total depreciation deductions over Years 1–6: $150,000. library
- Total tax savings at 30%: $150{,}000 \times 0.30 = 45{,}000$. library
- **Net after-tax cost** of the array: $150{,}000 - 45{,}000 = 105{,}000$. library

This assumes:

- Business use qualifying for MACRS (not personal/residential). greenridgesolar +1

Appendix 2 – Explanation of Line Loss

Power (P) = Current (I) x Voltage (V). P=I x V. As the system voltage is constant, as loads increase, power demand increases and current increases proportionally.

Wires are not perfect conductors. They have a resistance (R) and the energy losses are measured in watts (W). Losses on the wires equal I2 x R. So as the power demands increase, the current increases and the line loss increases. Line loss appears as heat in the wires and components of the utility system, such as transformers. If the load doubles, P doubles, I doubles and the line loss increases by a factor of four. Line loss costs are paid for by the ratepayers as part of the "Delivery" portion of the bill.

As wires get hotter, their resistance increases. Simply put, for every 18 degree increase in temperature above 70 degrees-F, the resistance of aluminum or copper (the primary conductors used on the utility system) will increase by 4% and line loss for those components will increase by 4%. When I received a grant from the state in 2010 to analyze line losses and mitigate them, Con Ed mounted power monitors I built onto their poles that measured the before and after of the process. However, these monitors also measured the temperature of the transformers that they were connected to. On a 90 degree summer day, the metal shell of the transformers reached over 140 degrees-F, indicating at least a 16% increase of resistance. If the exterior of the transformer in the open air was 140 degrees, the interior was likely substantially hotter.

Below is an analysis of line losses on Con Ed's System for 2007, the last year that they published one. As loads increase and as components age, line loss increases so it will not have gone down since then.

Con Edison's total electric system line loss for 2007 was

6.64% of net generation and purchases. The exact annual line loss percentage for every year from 2008 to the present is not readily available in public summaries, as these figures are typically part of detailed annual reports and reliability filings with the New York State Public Service Commission (NYS PSC).

2007 Line Loss Breakdown

For the calendar year ending December 31, 2007, the total system losses were 4,156,218 MWh.

The losses were categorized as follows:

- **Technical Losses (5.81%):**
    - Transmission Cable: 0.68%

- Substation Equipment: 1.07%
- Distribution Cable: 2.89%
- Distribution Equipment: 1.17%

- **Non-Technical Losses (0.83%):**
  - Customer Metering: 0.18%

Most of the system is just 18 years older than it was in 2007 so expecting that line losses would have decreased over that time is unrealistic.

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TEMPERATURE COEFFICIENT OF RESISTANCE

$$R = R_{ref}\,[1 + \alpha(T - T_{ref})]$$

Where,

$R =$ Conductor resistance at temperature "T"

$R_{ref} =$ Conductor resistance at reference temperature T_{ref}, usually 20° C, but sometimes 0° C.

$\alpha =$ Temperature coefficient of resistance for the conductor material.

$T =$ Conductor temperature in degrees Celcius.

$T_{ref} =$ Reference temperature that α is specified at for the conductor material.

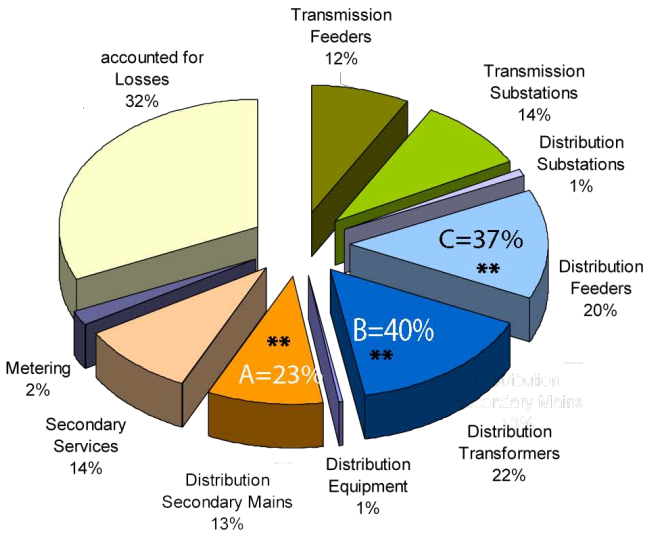
α For Copper and Aluminum is 0.004

For every 10 degree increase in temperature (deg-C), 18 degress-F, wire resistance increases by 4% and line losses increase by 4%.

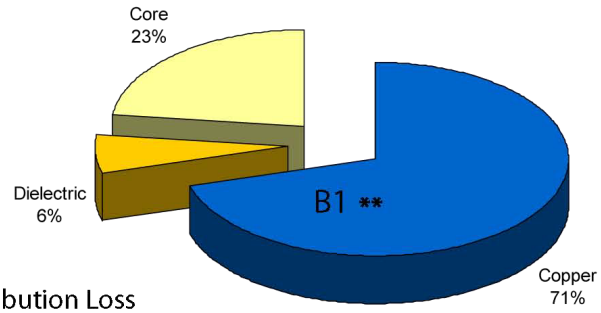
From Con Ed Presentation to PSC July 17, 2008
Notations Added 9/2009 marked by " ** "

Transmission & Distribution Losses

Con Edison



- 1.2% Transmission Losses
- 3.6% Distribution Losses
- 2.2% Other Losses



** A+B+C=100% of Distribution Loss
B1=Transformer Copper Loss
Copper Loss={(.71 x .4) + .23 + .37} x .Distribution Loss
=.88 x Distribution Loss

Appendix 3 – Solar Net Metering Tariff Petition 2008

The following documents are the original tariff petition filing made by Allied Converters, the responses of the utilities, additional response of Allied Converters, and the ruling of the commission. Case 08-E-1426

TO: Jaclyn A. Brilling, Secretary
NYS Public Service Commission
Three Empire Plaza
Albany, NY 12223-1350

FROM: Allied Converters, Inc.
64 Drake Avenue
New Rochelle, NY 10805

DATE: November 17, 2008

SUBJECT: **Petition for a Declaratory Ruling on the administration of solar net metering provisions at locations where multiple (hybrid) energy efficient generation technologies are installed.**

Background

Allied Converters is a manufacturing company in New Rochelle, NY. During 2002- 2003, with NYSERDA's assistance, a grid connected cogeneration facility was installed at 64 Drake Avenue. Two 30 KW Capstone micro-turbines generate up to 48 KW of electricity. The waste heat from the turbines is captured and used to heat the building in the winter and cool the building during the summer months. The overall efficiency of the system exceeds 65%, which is well in excess of the 60% efficiency requirement needed to be FERC (Federal Energy Regulatory Commission) compliant. The micro-turbines load follow and only generate as much power as the facility is demanding, less 7 KW, up to their maximum 48 KW output. As they load follow, exporting of power from the cogeneration system has never been an issue during their 5 years of operation. Consolidated Edison (Con Ed) approved the interconnection in 2003.

During 2007, again with NYSERDA's assistance, a 50 KW solar array was installed. During times when our factory is operating, we can use the entire output of the array. During the summer months, the array has generated as much as 342 KWH in a single day. On weekends and holidays when the factory is closed, we have the capability to export up to 240 KWH of electricity from the solar array. That figure is acquired by subtracting the 100 KWH per day base load of the building from the 342 KWH maximum output per day of the solar array. That exported energy is enough to power between three and five homes for an entire day.

Appendix A documents the operation of the solar array on days when the facility is open, and also when it is closed.

Discussion

Because the solar array has export capability on days when the factory is not operating, interconnection of the array with the utility has been an issue. Without interconnecting the array to the utility, we will be forced to shut it down on weekends and discard nearly 20,000 KWH of solar energy annually. One of our earlier attempts at interconnection is described in Appendix B.

While we have been able to operate the system under test, we need to find a viable, cost effective way to legally interconnect the array to the utility in order to not have to discard valuable, greenhouse gas free energy at a time when it is most needed. When solar net metering was implemented, we thought that would be the solution to the problem. However, the following appears in Rider R, which is the net metering interconnection tariff:

(3) Except as specified in General Rules III-13 (D) and III-13 (E) of this Rate Schedule, if there is a generator on the premises in addition to solar, farm waste, or wind electric generating equipment, the Customer will not qualify for service under this Rider unless the Customer segregates the additional equipment and associated load so that it is not served under this Rider.

We submitted the one line diagram in figure 3 (Appendix C) to the utility that isolates the metering of the solar array from that of the generator. As Con Ed has been preoccupied with the new tariffs they neither accepted it, nor rejected it. However, it is not allowed within the framework of their new tariff. The three meter configuration, while more complicated than the single meter configuration in Con Ed's new net metering tariff, insures that the solar output can be isolated from the output of the generator. As such, the output of the generator cannot be net metered. The net power used can be obtained by subtracting the output on the Solar KW meter from the usage on the Utility KW meter. The ratcheting demand meter will determine the facilities peak inbound demand. We separated the utility KW meter and the utility demand meter. Combining the two meters could result in the facility potentially being billed for demand charges on solar power that never traveled on the utility's transmission network. The transfer switch on the solar output will allow the facility to make use of the solar power during a blackout.

The purpose of the solar net metering legislation was to help promote the installation of solar arrays throughout New York State. While the subject of a facility with both technologies, solar and cogeneration, was not specifically addressed in the recent legislation, the legislation did specifically state that one goal was,

"to increase the efficiency of energy end use, to shift demand from periods of high demand to periods of low demand and to facilitate the development of cogeneration;"

The current and proposed tariffs are in opposition to those goals. No customer with a solar array will attempt to install a cogeneration system and no customer with a cogeneration system will attempt to install a solar array under the current tariff arrangement. Had we known in advance of the issues that we have encountered with the tariffs over the last

fourteen months, we would not have installed the solar array. When net metering was limited to residential locations, this was not an issue as cogeneration is not cost effective in that small of a service. However, with the net metering limits having been increased to two megawatts and with commercial entities now qualifying, there will be customers that could potentially have both technologies. Also, a customer with the mindset to want to install one "green" technology might also have the mindset to want to install more than one type.

Unless a rational solution is developed where commercial entities can **cost effectively** interconnect their multiple energy efficient technologies, large customers will hesitate to implement them and the legislation will be limited in its success.

We have achieved over 65% efficiency in our energy usage, while the utility can only deliver electricity to the customer with approximately a 33% energy efficiency. For us to be induced by the tariffs to "throw out" greenhouse gas free solar energy is counter intuitive in a world where energy is in short supply and global warming is a major problem. At the same time that New York State is devoting a large amount of resources to improve energy efficiency, we are being penalized by quirks in the tariffs for trying to become energy efficient. We are evidently the first case, but very likely will not be the last case, as energy costs are expected to rise again within the next few years.

Requested Action

We request that the Commission approve the use of multiple energy efficient technologies within the context of the solar net metering law as long as they can be separately metered and the energy that qualifies for net metering can be isolated.

Thank you for your prompt attention in this matter.

Sincerely,

Richard Ellenbogen
President

Allied Converters, Inc.
64 Drake Avenue
New Rochelle, NY 10805

(914) 235-1585
richard@garb-o-liner.com

APPENDIX A

With the array under test, we have collected data. Graphs appear in figure 1 and figure 2 (Appendix A). Figure 1 shows the energy usage and power output on July 2, 2008 when the factory was closed. The dark blue curve is the output of the solar array. The total solar output of the array that day was 295.77 KWH. The yellow line is the generator output. They did not turn on that day as there was insufficient load. The light blue curve is the power consumption of the building, which is approximately 4 KW. The red curve is the usage from the utility. As it is below zero for much of the day, that amount of excess solar energy was exported to the utility. The exported energy that day was approximately 195 KWH. The purple curve shows reactive power and is not relevant in this discussion.

Figure 2 shows the energy usage on April 15, 2008 when the factory was open. Solar output that day was 310.97 KWH. Please note that the generator output (yellow) rises and falls with the building load. There was a minimal amount of solar energy exported from the facility prior to opening at 8:00 AM and again after closing at 5:00 PM.

Figure 1 – Solar Output on a day in which the factory was closed

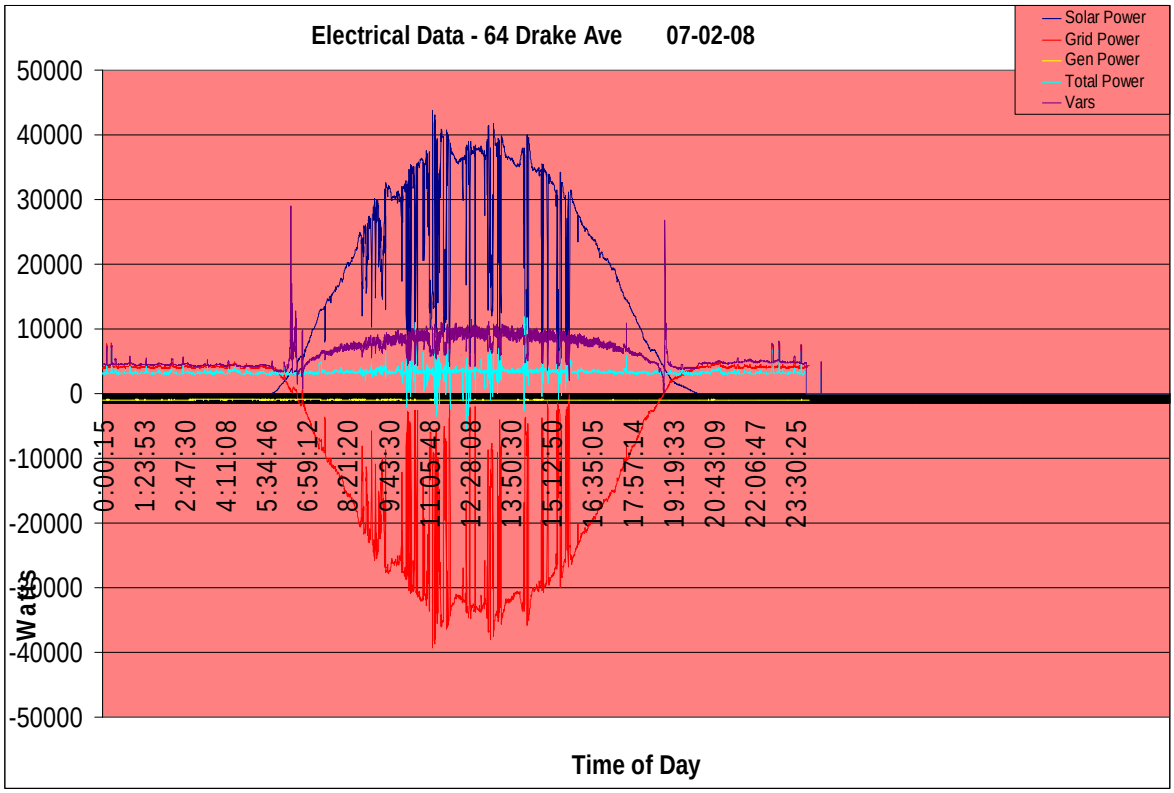
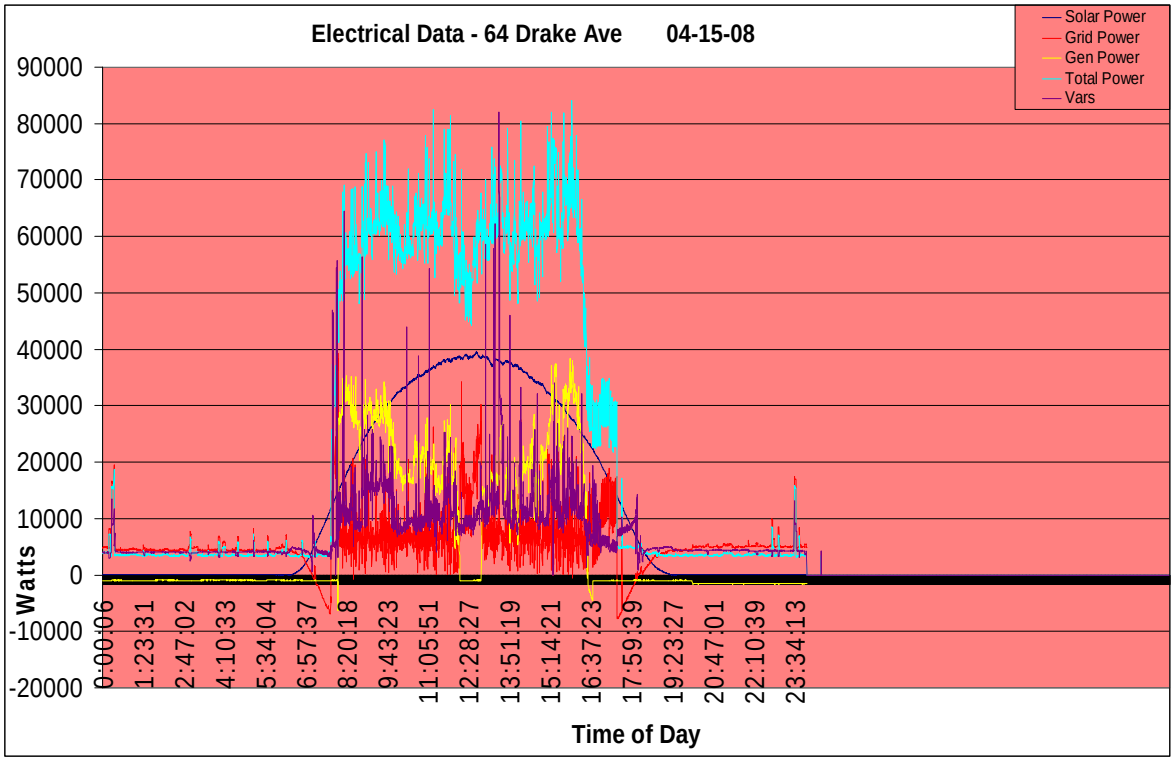


Figure 2 – Solar Output on a day in which the factory was open



APPENDIX B

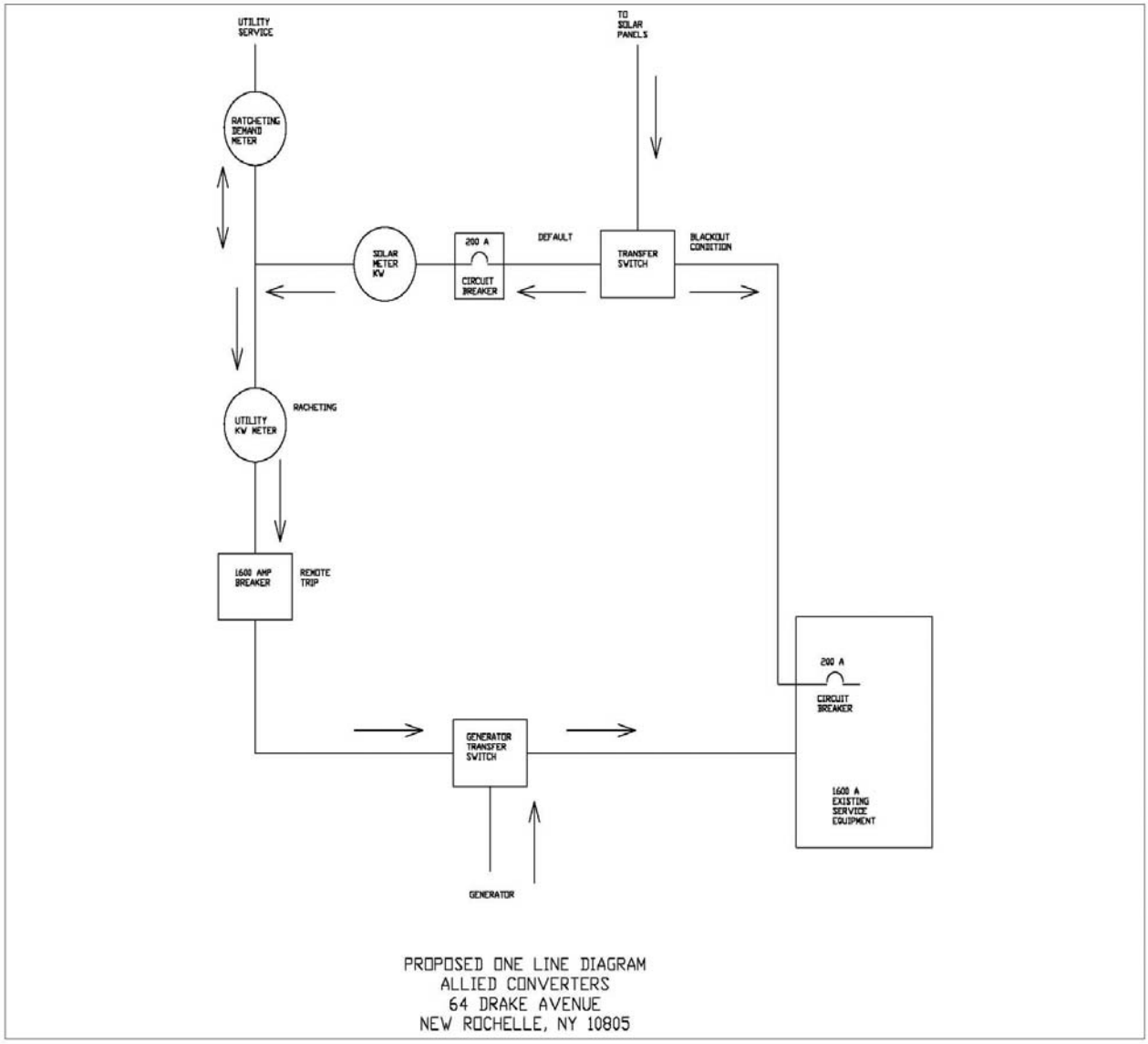
In 2007, we contacted Consolidated Edison to interconnect the array to the grid using tariff SC-11. At that time, we found out that we would have to pay the utility more money to export the excess solar energy than we would be paid for the exported power. This is because we would essentially be paying the utility as though we were using the transmission capability of their entire service area, as opposed to just the wires on our block where the exported power would be used. We were told that SC-11 is a legacy of PURPA (Public Utility Regulatory Policies Act**)** from 1978 and was never designed with small, localized generation in mind. As such, to legally connect the solar array to the utility without net metering, we have two options.

The first option is to pay the utility more to export the solar power than we would be reimbursed for the energy. The net cost to our business for exporting approximately 20,000 KWH of Solar Power under SC-11 would be range between $ 1500 to $ 3000 annually.

The second option is to turn off the array when we are closed and throw out the solar energy entirely.

APPENDIX C

Figure 3 – Proposed One Line Interconnection diagram that provides for the isolation of the solar metering from the generator output.



APPENDIX 3 -1

CON ED RESPONSE TO TARIFF PETITION

conEdison
a conEdison, inc. company

Consolidated Edison Company
of New York, Inc.
4 Irving Place
New York NY 10003
www.conEd.com

January 26, 2009

Honorable Jaclyn A. Brilling
Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, New York 12223-1350

Re: Case 08-E-1426 – Allied Converter, Inc. – Petition for a Declaratory Ruling on the Administration of Solar Net Metering Provisions at Locations Where Multiple (Hybrid) Energy Efficient Generation Technologies Are Installed

Dear Secretary Brilling:

Consolidated Edison Company of New York, Inc. ("Con Edison") and Orange and Rockland Utilities, Inc. ("O&R") [collectively the "Companies"] hereby file an original of their comments in response to the above-referenced petition for a declaratory ruling by Allied Converters, Inc., ("Allied"), noticed in the New York State Register on December 19, 2008, and the Notice Establishing Comment Procedures ("Notice") issued by the Public Service Commission on the same date, regarding administration of solar net metering at locations of "hybrid" technologies, *i.e.*, where both net-metering eligible generators and non-eligible generators (such as fossil fuel burning generators) are installed. The triggering petition by Allied to the Public Service Commission for a declaratory ruling seeks approval for a specific interconnection arrangement. The Commission's Notice, however, recognizes that the broader issue of interconnecting hybrid technologies may be common to other utilities and thus provides the opportunity for general comment.[1] As discussed below, while at first blush, Allied's petition is

[1] Con Edison reserves its rights to participate in any further proceedings with respect to Allied's petition.

simple, on closer examination, Allied seeks net metering for two undifferentiated types of generation, one of which is not eligible for that treatment. Thus, as the Commission recognized, net metering for this type of mixed hybrid facility poses difficult policy and implementation concerns.

As a preliminary matter, the Companies emphasize their support, and implementation within their systems, of the State's net metering initiatives exemplified by legislative amendments to Public Service Law § 66-j and 66-l, which extend net metering from 10 kW to 25 kW for residential solar and residential wind electric generators, extend net metering from 400 kW to 500 kW for farm waste electric generators, extend net metering from 125 kW to 500 kW for farm wind electric generators, and provide for net metering up to 2,000 kW for nonresidential solar and nonresidential wind electric generators. The Companies also have been strong supporters of an environmentally sustainable economy represented by the State's RPS goal[2] and the State's energy efficiency goal.[3]

The Companies have no objection to hybrid facilities in which a customer is eligible for net metering for each type of generation, such as wind plus solar so long as the combined total generation does not exceed the eligibility requirements for a single type of generation. (For non-residential solar or wind generators, this would be the lesser of 2 MW or the customer's peak load in the prior 12 months.) But the Companies do have concerns with hybrid generation where the customer has more than one technology but only one is eligible for net metering under the law. Allowing fossil burning

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[2] Case 03-E-0188, Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard, Order Concerning Modification of the Funding of the Customer-Sited Tier, (Oct. 1, 2008).
[3] Case 07-M-0548, Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard, Order Establishing Energy Efficiency Portfolio Standards and Approving Program (June 23, 2008).

generators to be included in net metering under a "hybrid" arrangement provides the perverse incentive to customers to maximize the size of the fossil burning generator (and the amount of time it runs) and minimize the size of the renewable energy source, thereby effectively frustrating the intent of the net metering law to promote clean, emission-free renewable energy.

Background

Sometime in 2002-2003, Allied first interconnected two combined heat and power ("CHP") microturbines with a total nameplate capacity of 60 kW. With this, Allied began taking service from Con Edison as a customer served under SC 14-RA - Standby Service but billed under the firm-rate option, because the customer's CHP qualifies as a Designated Technology exempt from billing under standby service rates. In addition to this favorable rate treatment, Allied also benefitted from partial funding of the CHP by NYSERDA, which was funded by New York State ratepayers through the System Benefits Charge.[4]

Thereafter, in 2007, prior to the recent amendment of the Public Service Law extending net metering to non-residential customers with solar generation, Allied installed a solar generation array with a 50 kW nameplate capacity. Con Edison believes that the combined nameplate capacity of the microturbines and the solar generation array (110 kW) exceeds Allied's peak load demand of 90 kW. That much generation capacity would make Allied ineligible for nonresidential net metering if it were all solar or solar plus another eligible technology, because the law provides that the nameplate rating of the generator should not exceed the customer's peak demand during the prior 12 months.

[4] NYSERDA also contributed to the funding of the solar generation. State and federal tax incentives are also available for CHP and solar generation.

(Public Service Law § 66-j(d)). The treatment of excess generation is much more problematic when part of the generation is not eligible for net metering.

It bears emphasis that the CHP microturbines are not themselves eligible for net metering under current law and that the solar generation array, even if metered separately, would only become eligible for net metering after the Company's net metering tariff changes are approved in Case 08-E-1306. The effective date of those tariff changes, which is subject to Commission approval, rejection or modification, is February 27, 2009. Indeed, it should be noted that the Companies require under their current net metering tariffs[5] (on Fourth Revised Leaf No. 158-H-1) that generation eligible for net metering be segregated from the ineligible generation in order to qualify for net metering, and they propose a continuance of this policy in their pending tariff changes.

Contrary to the impression of disregard suggested by the petition, Con Edison has consistently sought to work with Allied to develop a solution to accommodate these installations, which are addressed neither by law nor tariff.[6] Con Edison representatives have met with Allied at its site on multiple occasions and have tried to work with Allied to develop a mutually acceptable solution to permit net metering of the solar generation. That no solution satisfactory to both Allied and Con Edison has been reached is reflective of the complex challenge of the problem and not an unwillingness of Con Edison to work with Allied.

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[5] Con Edison - Fourth Revised Leaf No. 158-H-1 and O&R - Second Revised Leaf No. 22L-28 and First Revised Leaf No. 22L-39.

[6] SC 11 contract demand charges recover costs of local facilities, not system facilities. (System costs are recovered through as-used daily demand charges.) Further, SC 11 provides that a customer served under SC 14RA standby rates pay contract demand charges only for the incremental contract demand. (See Fifth Revised Leaf No. 204).

Comments

While Allied already enjoys benefits from its CHP and solar generation installations, it requests Commission approval for "the use of multiple energy efficient technologies within the context of the solar net metering law as long as they can be separately metered and the energy that qualifies for net metering can be isolated." Petition at 3. While Allied's solar generation would be eligible for net metering if it were separately metered and billed under its own account when the new tariffs become effective this February, Allied instead has asked that Con Edison combine billing on one account, which would require significant administration and cost incurrence related to meter reading and billing if the utility were required to track and bill the eligible generation and ineligible generation in different ways.

Indeed, Allied's specific problem illustrates the complexity of the general issue of hybrid net metering. Con Edison has worked with the customer and visited the customer's premises on two separate occasions in an effort to find alternatives, including separating the customer's electric usage over two accounts (one of which would be fed by solar generation and allowed to export net energy). However, Con Edison could not find a suitable alternative arrangement for separately metering and billing. Allied has interpreted this as lacking responsiveness on Con Edison's part. This is simply not true. As the Public Service Commission itself recognized, there are fundamental difficulties in moving from theoretical benefits to implementation of net metering hybrid facilities.[7] In declining to adopt specific proposals for hybrid net metering for two types of *renewable, eligible* generation developed in a technical conference, the Commission wrote: "It

[7] Cases 05-E-0697 et al., Tariff Filings to Establish Standards for the Net Metering and Interconnection of Residential and Farm Wind Electric Generation Equipment in Compliance with Public Service Law Section 66-1, Order on Net Metering of Hybrid Facilities (Aug. 25, 2006).

appears that developing interconnection and pricing requirements for hybrid facilities is best accomplished by awaiting actual experience with the operation of such facilities, instead of attempting to implement policies that, in the absence of actual experience, might fail in practice."[8]

That thinking should apply in the even more challenging situation posed by net metering renewable and non-renewable generation, or the type of hybrid proposed here. The Public Service Law was only recently amended to extend the kW threshold for residential and farm generators. It was also only recently changed to extend net metering to nonresidential solar and wind generators, and, in fact, the tariffs of the New York State utilities to reflect these changes are still not in effect. If implementation of a net metering policy for hybrid facilities already eligible for net metering requires gradualism to ensure implementation that is safe, reliable, sound and reasonable, implementation of net metering for hybrid facilities requires even greater consideration to avoid unintended consequences.

Additional reasons support care in implementing this type of hybrid net metering. There is the possibility that participants could game the net metering law by supplementing fossil fuel burning technologies[9] with only a modest amount of solar generation to gain net metering without the wider benefits of renewable generation envisioned by the Legislature. Without imputing any bad faith to Allied, Allied requested net metering for CHP and solar served under one account, even though the

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[8] Id. at 3.

[9] When capital has already been invested in CHP generation, the cost of its operation on the weekend is modest—simply the cost of fuel and incremental O & M—thereby encouraging net metering.

primary generation at the premises is CHP,[10] not solar. While both the CHP and solar installations are in keeping with the State's broad energy goals, the microturbines draw upon fossil fuels, with concomitant emissions, while the solar array is renewable energy without any emissions component. In other words, without careful implementation of net metering for hybrid facilities, a customer's full load could be supplied by the CHP with a single 1 kW solar panel making the entire account eligible to net meter and the customer's excess generation from the CHP credited upon export. The attached charts illustrate how the presence of CHPs under the same account with solar generation could encourage customers to use the CHPs to boost the amount of power that would be net metered - in essence extending the net metering credits to, albeit efficient, fossil fuel generation.

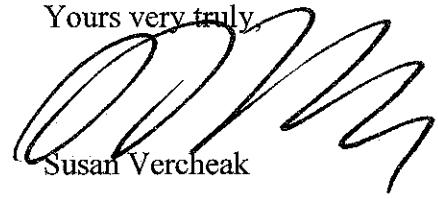
Extending net metering to CHP would then have the effect of requiring utility customers to subsidize non-renewable, carbon-based technologies, which was not intended by the Legislature when it enacted changes to state law regarding net metering of solar, wind and farm waste generators. Even in a fairly balanced system (equal capacity of solar and non-eligible generation), there is no doubt that hybrid systems could significantly increase the amount of net metered power regardless of whether the fossil generator is curtailed during low load conditions. In response to any of the foregoing points, a utility should not be expected to launch an enforcement effort, supported by other customers, to ensure the absence of a customer's gaming through use of its solar power for on-site needs and CHP for export to offset utility charges. It is conceivable

[10] Although Allied claims that it has only 48 kW CHP generating capacity, the nameplate ratings of its CHP total 60 kW.

that larger customers could install a 1,999 kW CHP unit and a 1kW solar panel and essentially open the door for net metering of large CHP.

In sum, the Companies urge the Commission to await further experience before development of mixed renewable/non-renewable net metering policies and dismiss the petition.

Yours very truly,



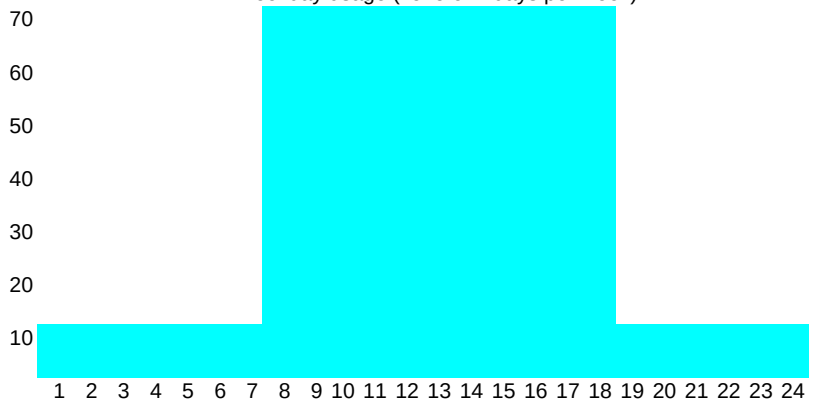
Susan Vercheak

Attachment

C: Service List (by e-mail)

#1. Illustrative view of Customer Like Allied Converter (no generation):

Weekday usage (i.e. 5 of 7 days per week)



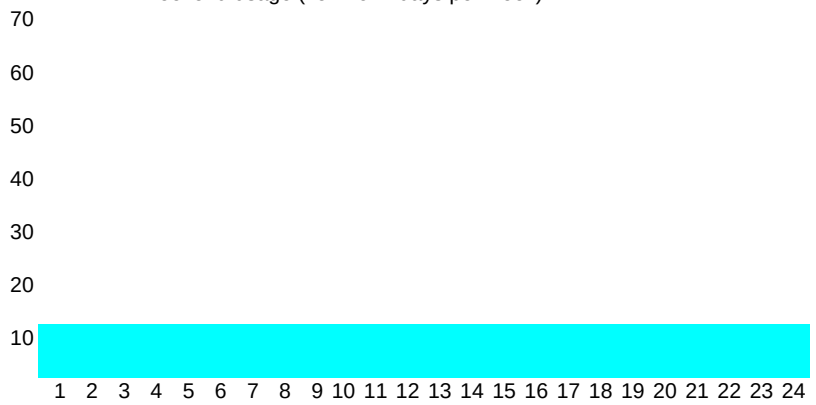
Note: Each box = 10 kWh

1800 kWh required per weekday

9960 kWh total weekly usage

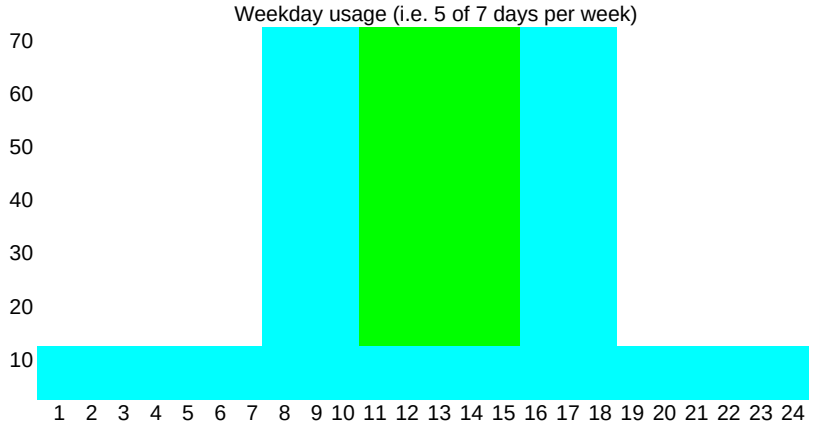
9960 kWh purchased from grid

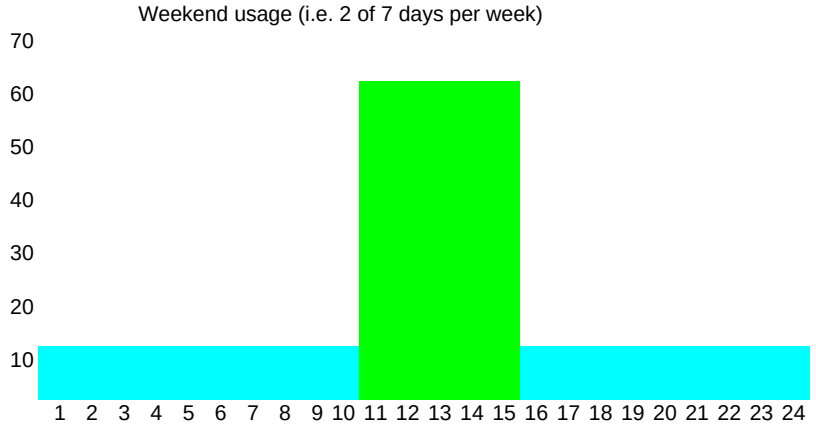
Weekend usage (i.e. 2 of 7 days per week)



480 kWh required per weekend (facility essentially shut)

#2. Illustrative view of customer like Allied Converter with pure solar solution under net metering law:





600 kWh solar produced per day
1200 kWh grid purchases
0 kWh net metered

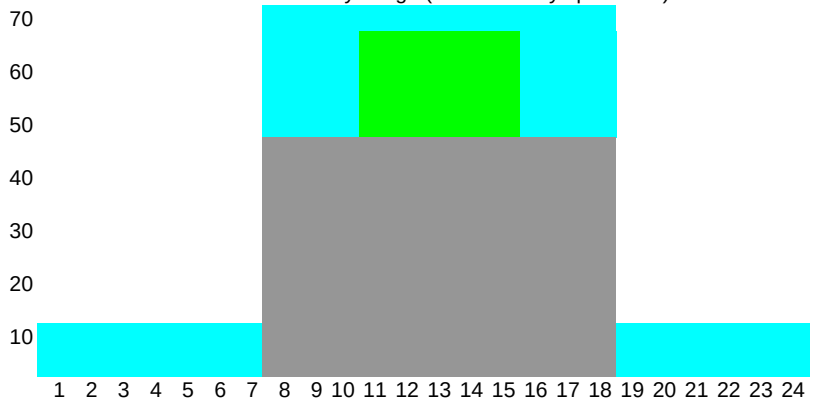
600 kWh solar produced per day
380 kWh grid purchases
500 kWh net metered

4200 kWh solar produced per week **PV average 60 kWh produces 42% of total load**
6760 kWh grid power required per week
-1000 kWh net metered credits per week
9960 kWh total Weekly Usage

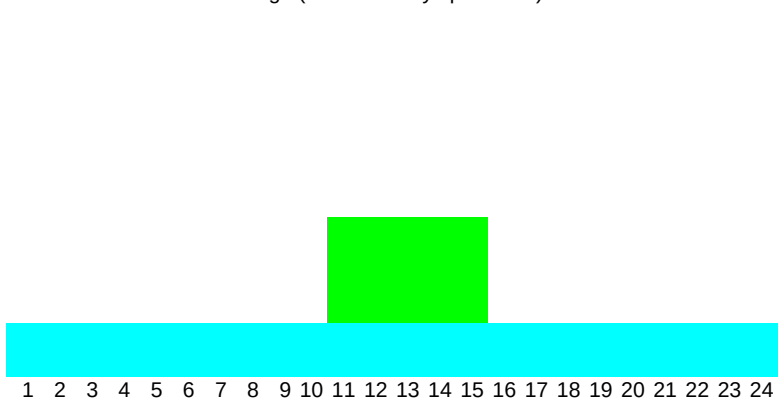
5760 kWh actual power purchased by customer

#3. Illustrative view of customer like Allied Converter with hybrid solution:

Weekday usage (i.e. 5 of 7 days per week)



Weekend usage (i.e. 2 of 7 days per week)



Weekday operation:

200 kWh Solar Production
990 kWh Microturbine Production
610 kWh Grid purchases
0 kWh net metered

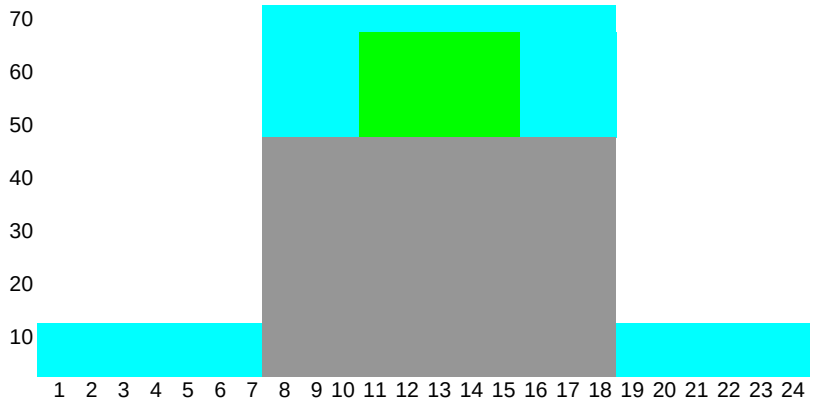
200 kWh Solar Production
0 kWh Microturbine Production
480 kWh Grid purchases
200 kWh net metered

1400 kWh solar produced per week **PV averaging 20 kWh produces 14% of total load***
4950 kWh produced from microturbine per week
4010 kWh grid power required per week
-400 kWh net metered credits per week
9960 kWh total Weekly Usage

***LITERALLY 1/3 THE AMOUNT OF EMISSION FREE ENERGY**

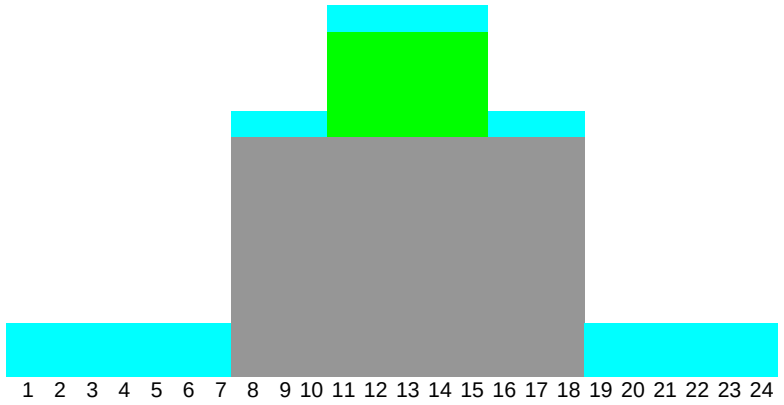
3610 kWh actual power purchased by customer

#4. Illustrative view of customer like Allied Converter hybrid solution (Exploiting Net Metering with Existing Design):



Weekday operation:

200	kWh	Solar Production
990	kWh	Microturbine Production
610	kWh	Grid purchases
0	kWh	net metered



Weekend operation:

200	kWh	Solar Production
990	kWh	Microturbine Production
370	kWh	Grid purchases
1080	kWh	net metered

1400	kWh	solar produced per week
6930	kWh	produced from microturbine
3790	kWh	grid power required per week
-2160	kWh	net metered credits per week
9960	kWh	total Weekly Usage

PV averaging 20 kWh produces 14% of total load*

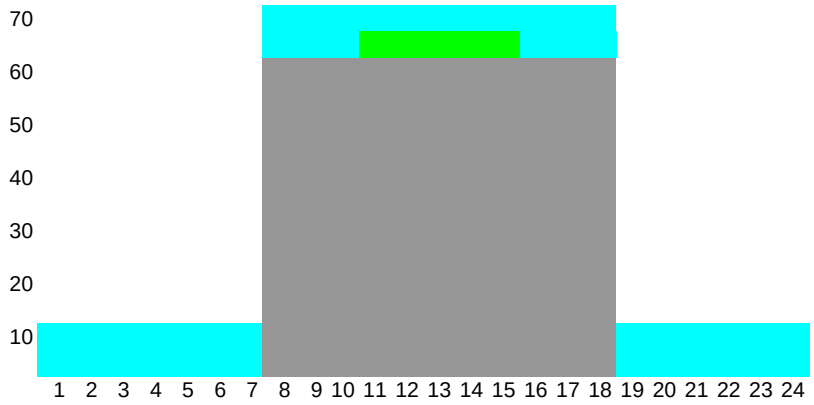
Customer makes decision to run microturbine on weekend to offset retail power.

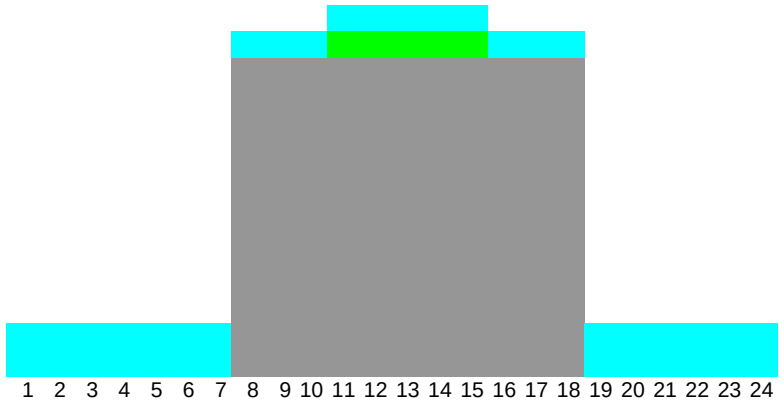
Benefit to running microturbine is significantly lower retail power purchases

***LITERALLY 1/3 THE AMOUNT OF EMISSION FREE ENERGY**

1630 kWh actual power purchased by customer

#5. Illustrative view of FUTURE customer like Allied Converter hybrid solution (Exploiting Net Metering with New Design):





Weekday operation:

50 kWh Solar Production
1320 kWh Microturbine Production
430 kWh Grid purchases
0 kWh net metered

Weekend operation:

50 kWh Solar Production
1320 kWh Microturbine Production
370 kWh Grid purchases
1260 kWh net metered

350 kWh solar produced per week
9240 kWh produced from microturbine per
2890 kWh grid power required per week
-2520 kWh net metered credits per week
9960 kWh total Weekly Usage

Solar produces 3.5% of total load*

***Customer makes decision to oversize microturbine and run on weekend to offset retail power.** ##

##

***LITERALLY 1/12 THE AMOUNT OF EMISSION FREE ENERGY**

370 kWh actual power purchased by customer

APPENDIX 3 -2

NYSEG AND RG&E RESPONSE TO TARIFF PETITION

DEWEY & LEBOEUF

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January 26, 2009

BY HAND DELIVERY

Honorable Jaclyn A. Brilling
Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, New York 12223

Re: Case 08-E-1426 – Petition for a Declaratory Ruling on the Administration of Solar Net Metering Provisions at Locations Where Multiple (Hybrid) Energy Efficient Generation Technologies Are Installed

New York State Electric & Gas Corporation ("NYSEG") and Rochester Gas and Electric Corporation ("RG&E") (together, the "Companies") hereby submit these Comments in response to the New York State Public Service Commission's ("Commission") December 19, 2008 Notice Establishing Comment Procedures in the above-referenced case. Specifically, the Commission seeks comments on the type of interconnection arrangements that should be utilized when interconnecting a hybrid facility to a utility, so that only the qualified generation source receives the benefit of net metering.

The Companies agree with the Commission that the issues presented in the Allied Petition are common to the installation of hybrid facilities at other utilities, including NYSEG and RG&E. Therefore, the Companies offer an alternative one-line interconnection diagram for the Commission's consideration. The Companies' proposal addresses all of the concerns raised in the Allied Petition and will allow hybrid facilities to connect successfully to the utility such that only qualified generation receives the benefit of net metering.

Background

On December 4, 2008, Allied Converters, Inc. ("Allied") filed a Petition for a Declaratory Ruling requesting that the Commission "approve the use of multiple

energy efficient technologies within the context of the solar net metering law as long as they can be separately metered and the energy that qualifies for net metering can be isolated."[1] According to the Petition for Declaratory Ruling, Allied is a manufacturing company whose hybrid facility consists of two 30 kW micro-turbines producing up to 48 kW of electricity and a 50 kW solar generation array. The solar array has the capability of exporting electricity on days when the factory is not operating, which will amount to approximately 20,000 kWh annually. Allied believes that it will be entitled to net metering of production from the solar generator, once the amendments to the New York State Public Service Law §66-j enacted in 2008 are implemented.

Allied alleges that, under Consolidated Edison Company of New York, Inc.'s ("Con Edison") existing tariff arrangements, it is unable to connect legally its solar array to Con Edison's system in a cost-effective manner. Allied states that it would be forced to pay Con Edison more money to export the excess solar energy than it would be paid for the exported power. Essentially, Allied asserts that it would be paying the utility as though Allied was using the transmission capability of the entire service area, as opposed to just the wires on Allied's block (where the exported power would be used). Allied argues that, without net metering, it is forced to either pay the utility more to export the solar power than it would be reimbursed for the energy (at a cost of $1,500 to $3,000 annually) or discard the surplus energy.

Allied's Proposal

In the Petition for Declaratory Ruling, Allied explains that it submitted to Con Edison a proposed one-line interconnection diagram that attempts to isolate the solar metering from the generator output.[2] As depicted in Appendix C to Allied's Petition, its proposal consists of a three-meter configuration, which Allied believes will isolate the solar output from the output of the micro-turbine generator, thereby preventing the micro-turbine generator from being net metered. Allied states that the net power used can be obtained by subtracting the output of the solar kWh meter from the usage of the utility kWh meter. Allied's proposal also includes a ratcheting demand meter that will determine the facilities peak in-bound demand. The proposal separates the utility kWh meter from the ratcheting demand meter because combining the two meters could allegedly result in the facility potentially being billed for demand charges on solar power that never traveled on the utility's transmission network. Finally, Allied states that its

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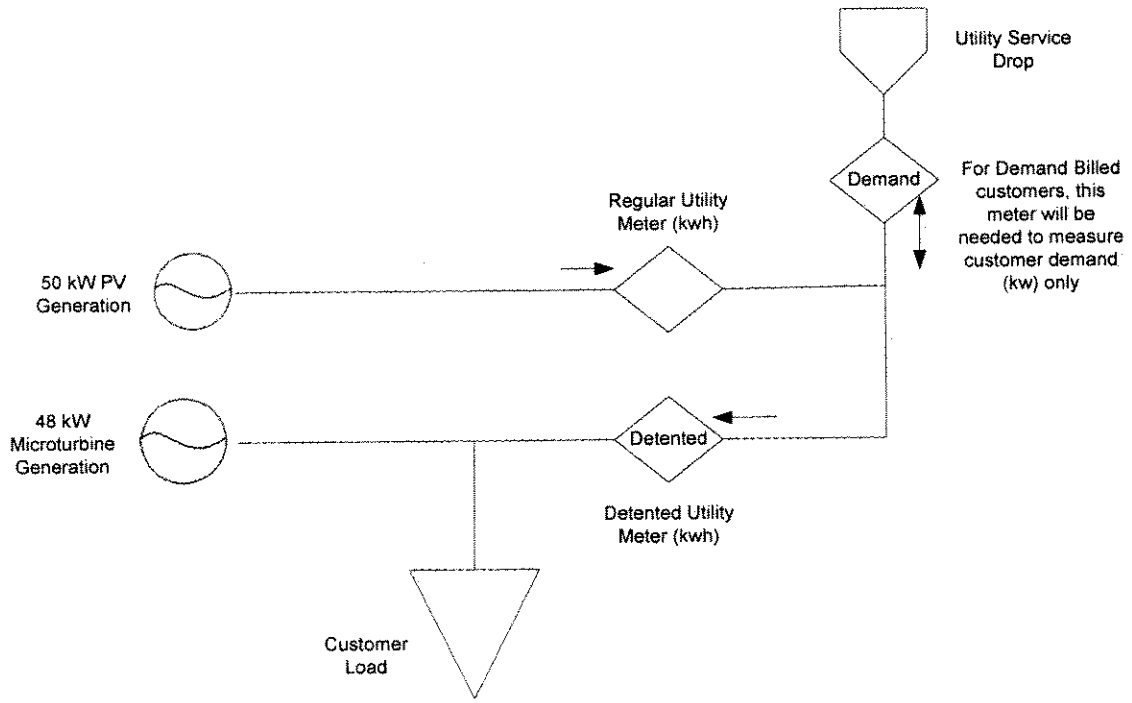
[1] Case 08-E-1426 – Petition for a Declaratory Ruling on the Administration of Solar Net Metering Provisions at Locations Where Multiple (Hybrid) Energy Efficient Generation Technologies Are Installed, Petition, at 3 (Dec. 4, 2008).

[2] Allied states that since Con Edison has been preoccupied with new tariffs, it has neither accepted or rejected its proposal.

proposal places a transfer switch on the solar output to allow the facility to make use of the solar power during a blackout.

NYSEG's and RG&E's Proposal

While Allied's proposal may accomplish the desired results, it is not the most effective interconnection solution. Instead of Allied's proposed interconnection, the Companies recommend the one-line interconnection diagram depicted below as the proper method for the interconnection of a multiple generator system.



As shown above, the Companies' proposal incorporates two meters with a meter reading/billing accounting system that is capable of netting readings from the two meters. Under this approach, the system will allow accurate net metering of only the allowed generators (in Allied's case, the solar array). The two-meter system for net metering is common among the more recent net metering installations. Furthermore, most utility accounting systems should be able to process the two-meter reads.

A third demand-only meter would only need to be installed for demand billed customers, in order to properly measure the coincident contribution by the photovoltaic ("PV") system and offset the customers' demand. In such circumstances, a third demand-only meter that effectively nets the customers total load and generation is

required to allow the utility to bill for exactly the demand used by the customer during the billing period.

Additionally, customers with installed generation capacity may qualify for service under a stand-by tariff. However, net metering technologies should not be a factor when calculating whether a customer qualifies for the stand-by tariff. Rather, the calculation should only consider the size of the micro-turbine generation (and not the PV generation) in relation to the customer's overall peak load. If the generation nameplate rating is sufficient based on this calculation, then the customer would be billed under a stand-by tariff.

The table below provides examples of the impact of the Companies' proposal on non-demand billed customers' monthly meter reads and resulting bills.[3]

Example	A PV Output (From PV Meter)	B Micro Turbine Output	C Load	D Physical Flow through Detented Meter	D Detented Meter Reading	E Net Meter Reading D-A
1	50	48	120	72	72	22
2	50	48	40	-8	0	-50
3	10	25	120	95	95	85
4	0	0	120	120	120	120

In Example #1, the customer would be charged its stand-by rate and for the 22kWh of energy it used. In Example #2, the customer would be charged its stand-by rate, but the customer's account would be credited with 50kW of generation. Under this scenario, the customer would have also placed 8 kWh of excess generation onto the utility grid without compensation. Examples #3 and #4 are provided to show how different levels of generation and load will result in straightforward and easy to understand net meter charges. Under these examples, the stand-by service charges would also apply.

Conclusion

The Companies proposal will allow hybrid facilities to connect to utility systems so that only the qualified generation receives the benefit of net metering, in a

[3] Demand billed customers would also be charged based on a reading from the demand meter pictured in the diagram above.

cost-effective manner. Therefore, the Companies respectfully submit that the approach set forth herein should be adopted by the Commission.

Respectfully submitted,

Noelle M. Kinsch

NMK:cd (100745)

cc: Active Party Service List (via e-mail and First Class Mail)

APPENDIX 3 -3

CENTRAL HUDSON RESPONSE TO TARIFF PETITION

Paul E. Haering
Vice President
Engineering & Environmental Services

Central Hudson
Gas & Electric Corporation

January 26, 2009

Hon. Jaclyn A. Brilling, Secretary
New York State Public Service Commission
Three Empire State Plaza
Albany, NY 12223-1350

Re: Case 08-E-1426 – Allied Converters, Inc. – Petition for a Declaratory Ruling on the Administration of Solar Net Metering Provisions at Locations Where Multiple (Hybrid) Energy Efficient Generation Technologies are Installed

Dear Secretary Brilling:

Central Hudson Gas & Electric Corporation (herein referred to as "Central Hudson" or "the Company") hereby submits the attached comments on the above referenced notice. Copies of these comments are also being served electronically.

Sincerely,

Paul E. Haering
Vice President – Engineering and Environmental Services

.ENC

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STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

Allied Converters, Inc. – Petition for a Declaratory Ruling on the Administration of Solar Net Metering Provisions at Locations Where Multiple (Hybrid) Energy Efficient Generation Technologies are Installed.

Case 08-E-1426

Initial Comments

Dated: January 26, 2009

CENTRAL HUDSON GAS & ELECTRIC CORPORATION
284 South Avenue
Poughkeepsie, NY 12601

Central Hudson Gas & Electric Corporation
Case 08-E-1426

Background

On December 19, 2008, the New York State Public Service Commission issued a Notice Establishing Comment Procedures on Allied Converters, Inc. – Petition for a Declaratory Ruling on the Administration of Solar Net Metering Provisions at Locations Where Multiple (Hybrid) Energy Efficient Generation Technologies are Installed ("Notice"). Central Hudson responded to this Notice on January 14, 2009, stating its intent to file and receive comments.

Central Hudson has supported the Public Service Commission's net metering objective, and continues its support of net metering for generators entitled to such arrangement.

Central Hudson's Comments

Central Hudson does not oppose interconnection of customer generation solely based on it being located at a facility that contains both generators that are and are not entitled to net metering. In addition, the Company fully supports the net metering of the generator that qualifies for such arrangement under PSL §66-j or §66-l. To determine eligibility for net metering of the qualified generator technology at a "hybrid generation facility" [1], the aggregate rated capacity of all generators at the facility should be applied to PSL §66-j or §66-l. For example, a residential customer installing a solar generator and a micro CHP unit should be limited to a combined nameplate rating of 25kW. A commercial customer installing a solar generator and a CHP unit with a peak load as determined by PSL §66-j and §66-l of 100kW should be limited to a combined nameplate rating to 100kW. This aligns with the intent of the net metering laws in terms of how much generation is sent back to the grid.

Customers proposing to interconnect generation at a hybrid generation facility with aggregate nameplate ratings up to 2MW should utilize the New York State Standardized Interconnection Requirements ("NYSSIR") for the application procedure, technical requirements, and interconnection costs. Where interconnection requirements (including costs) vary based upon nameplate rating of the proposed generation, the aggregate nameplate rating should be used to determine which requirements to apply.

The total interconnection and metering costs associated with generators entitled and not entitled to net metering is often greater when located at a single hybrid generation facility, as opposed to separate facilities. All incremental interconnection, metering, and other costs that would not have been incurred but for the interconnection and metering of hybrid generation should be paid by the customer, regardless of the limits under PSL §66-j and §66-l and the NYSSIR. These costs should include, but not be limited to, metering costs to allow net metering of the qualifying generator in conjunction with non-net metering of the non-qualifying generator(s), as well as all interconnection costs associated with the generator not subject to PSL §66-j, PSL §66-l, or NYSSIR cost limits.

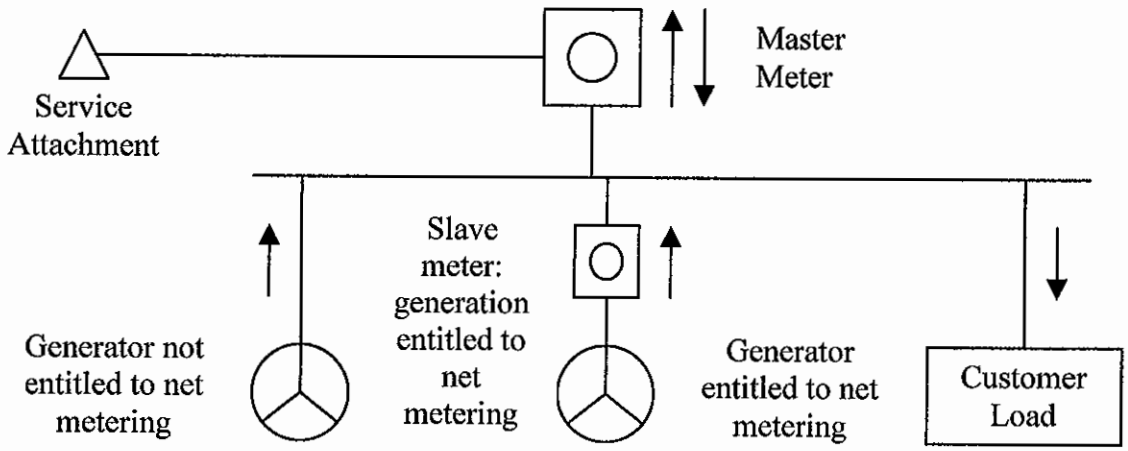
Central Hudson notes that such a metering arrangement of hybrid generation facilities, while technically feasible, would be costly and complex. Any metering arrangement would

[1] "Hybrid generation facility" means all generators and customer load served from the same electric service point, of which some generators are entitled to net metering and some are not entitled to net metering.

require interval metering data, so that it can be determined whether excess generation within each time interval was produced from a source that is entitled or not entitled to net metering. This would require that the customer maintain a dedicated phone line to the primary meter that would transfer data to the Company's MV-90 metering system. An acceptable interval at which to obtain data would have to be determined.

One example of a metering arrangement for this scenario would utilize two meters in a master-slave configuration: a master meter (measuring the hybrid generation facility) and a slave meter (measuring the generation from the generator that qualifies for net metering). The master meter would maintain separate registers for inflow to the customer and outflow from the generation at the hybrid generation facility, for each required interval (see Figure 1). An inflow value during a particular interval would constitute "net delivery", and an outflow value would constitute "net generation". Inflow would occur when there was not enough generation to meet the customer usage during a metering interval, and outflow would occur when generation was greater than the customer usage during a metering interval. The MV-90 system would calculate how to accrue these values for billing following each interval.

Figure 1. Hybrid Net Metering Arrangement



While this metering arrangement would be acceptable for billing purposes, it would not provide transparent data to the customer on the generation and load requirements of each device in the hybrid generation facility. To provide the customer with on-site data from each generator, a meter would have to be placed on each generator, as well as the customer load, with a serial connection to the master meter. The complexity of the programming of the displays would greatly increase from this already complicated approach.

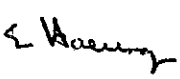
Billing of these customers would also be difficult and likely require a manual approach. Rate classifications for each generator would also have to be considered. The generator entitled to net metering should be billed under its applicable rate classification, and the customer would be subject to SC14 standby rates for the nameplate rating of the generator not eligible for net metering (unless the customer was exempt from the charges on the basis of its Special Provisions).

Conclusion

Central Hudson fully supports net metering of generators entitled to net metering, even when sited in conjunction with generators not entitled to net metering. The aggregate nameplate rating of all generators located at a hybrid generation facility should be applied to the load limitations in PSL §66-j and PSL §66-l to determine customer eligibility for net metering of the qualified generator technology. Also, the metering arrangement is complex and costly. All incremental interconnection, metering, and other costs that would not have been incurred but for the interconnection and metering of hybrid generation should be paid by the customer, regardless of the limits under PSL §66-j and §66-l and the NYSSIR. The needs of each customer will be specific, and the utilities require practical experience before specific metering arrangements can be recommended for inclusion in rate tariffs.

Central Hudson believes that the approach in the August 23, 2006 Order on Net Metering of Hybrid Facilities can be extended to Hybrid Generation Entitled and Not Entitled to Net Metering. The utilities should, "work with those customers on a case-by-case basis to arrive at the reasonable interconnection and generation pricing arrangements that best accommodate the actual circumstances presented."[2]

Respectfully submitted,



Paul E. Haering
Vice President – Engineering and
Environmental Services

[2] Case 05-E-0715 et. al. Order on Net Metering of Hybrid Facilities, issued August 23, 2006, pg. 3.

APPENDIX 3 -4

ALLIED CONVERTER'S RESPONSE TO UTILITY RESPONSES TO TARIFF PETITION

TO: Jaclyn A. Brilling, Secretary
NYS Public Service Commission
Three Empire Plaza
Albany, NY 12223-1350

FROM: Allied Converters, Inc.
64 Drake Avenue
New Rochelle, NY 10805

DATE: January 29, 2009

SUBJECT: **Case 08-E-1426 Allied Converters , Inc. - Petition for a Declaratory Ruling on the administration of solar net metering provisions at locations where multiple (hybrid) energy efficient generation technologies are installed.**

Dear Secretary Brilling:

We have received and read the responses to our petition and have the following comments.

Comments on interconnection solutions of multiple generating sources where some of them <u>are not</u> eligible for net metering :

We are very encouraged by the response of Central Hudson and of NYSEG and RG&E where they agree that multiple generating sources should be allowed under the net metering program, even if one source is not eligible for net metering. In particular, NYSEG and RG&E acknowledge that the three meter solution that we proposed will properly net meter solar output in a facility where there are multiple generating sources and some of them **<u>are not</u>** eligible for net metering. As most facilities that would contain multiple generating technologies would have a larger service, most of these interconnects will require the third demand meter. Central Hudson's solution, while it will work, seems extremely complicated. NYSEG and RG&E, while agreeing with the three meter concept, disagree with our location of the second transfer switch on our solar connection, and have instead located the solar interconnect on a common link below the demand meter. They do not specify the location of the transfer switch in their drawing which is a critical issue. A copy of their diagram appears in Appendix A. If the transfer switch is located on the customer side of the utility meter (labeled "A"), the solar output will be lost during a blackout. If the transfer switch is located just below the demand meter (labeled "B"), during a blackout or any time that the facility is operating off-line, the solar output will be available to the facility. There is an additional reason that the location of the transfer switch is important that is addressed later in this document. While the one line diagram that we presented offers the exact same functionality as the NYSEG and RG&E one line diagram, and while both will meter usage identically, we agree that their one line diagram is simpler than

the one that we presented. For new installations, theirs would be the preferred one line diagram to use as it requires less equipment. For our pre-existing installation, we might be able to use the NYSEG and RG&E one line diagram, depending on where the utility requires the meters to be located. Ours was one of the earlier micro-turbine cogeneration facilities in New York State. At that time, the utility was unsure of the protective relays that were built into the generation equipment. As a result, our interconnection is more elaborate and has far more redundancy than later systems that have been interconnected by the utilities. That could limit where the meters can be placed, should the petition be approved. If that is the case, our facility could be easily retrofitted to the one line that we presented with no difference in metering functionality from the NYSEG and RG&E one line diagram.

While the exact locations for the three meters may be a matter for discussion, what we are asking the utility to implement is not very different than what they accomplished five years ago on our gas service. As our cogeneration facility is FERC compliant with an efficiency in excess of 68%, we are entitled to use the Rider H gas tariff that provides favorable rates for gas consumption used for high efficiency generation (efficiencies in excess of 60%). The balance of our gas usage, such as space heating, is billed on the standard tariff. We only have one 4 inch gas line entering our facility but Con Ed, using multiple meters, has been successfully billing us at two different rates for over five years. The fact that they have chosen to invoice us on two different accounts is a function of their internal billing system. It is not an engineering issue. With Con Ed having recently added AMR capability to our gas meters, their meter readers no longer enter our facility to read the gas meters. As such, we do not understand their reference to "significant administration costs related to meter reading and billing", that they refer to on page 5 of their response. With existing technology, it is no more difficult to read the three meters in our proposed arrangement than to read the two meters on our gas service or the one meter of their proposed tariff. The demand charge would be determined from the demand meter. The usage charge would be obtained by subtracting the value on the solar meter from the value on the utility meter. As our generation is undersized, that value would never be negative in a given month.

Additional comments regarding Consolidated Edison's reply to our petition:

First, Allied Converters never stated that Con Ed was lacking in its response as they claim on page 5 of their reply. We merely stated that Con Ed's current and proposed tariffs do not fully support the state's goals,

"to increase the efficiency of energy end use, to shift demand from periods of high demand to periods of low demand and to facilitate the development of cogeneration;"

No impression of disregard was stated, suggested or implied, contrary to the statements on page 4 of the Con Ed reply. Members of Con Ed's staff have responded to all of our

questions. We have not always liked the answers, but their staff has been reasonable, courteous, and documented the reasons for their responses.

Unfortunately, the harsh reality is that we have been attempting to interconnect our PV (photo voltaic) system for almost eighteen months and we have still not been successful because of quirks in older tariffs that were written without these technologies being considered. The new Con Ed tariff does not address the issue either, which is why we filed the petition. In a state that is spending an incredible amount of effort to become energy efficient, the fact that the existing tariffs would hinder any aspect of that effort is, to put it simply, wrong. Energy efficiency will only be improved by solving the many small pieces of a larger puzzle. Public policy or tariffs should not restrict any tested technology that assists that process and instead, should encourage them.

Furthermore, Con Ed has implied on page 3 of their response that we are using solar net metering in an attempt to try and squeeze more money from the rate structure, despite our already having received "favorable rate treatment" and "benefiting from partial funding of the CHP[1] by NYSERDA which was funded by New York State ratepayers." If they were not implying that, why were the above underlined phrases, and several other related footnotes, even mentioned in their reply? The sources of equipment funding and tax rebates are certainly not relevant to the interconnection or metering discussion. However, as greed on our part has been implied, an explanation is required to set the record straight.

A balanced look at the facts would show that the grant offers were posted by NYSERDA. We applied for, and were awarded, the CHP grant through a competitive award process because NYSERDA determined that our project had merit. The grant for the PV was obtained through our installer, as all of them are. The favorable rate structure was set on a state wide level by hearings and negotiations between the utilities and the DPS, in the same manner that all of the rates are set. It was not a result of our lobbying. We only applied for, and were granted, what the state offered to everyone on a fair basis, as they are now offering net metering to all other utility customers with solar arrays. Those other customers have received NYSERDA grants for their PV arrays, funded by the New York State ratepayers, and are also being offered net metering and tax credits.

The application for net metering under this petition **has not** been made to squeeze more funding from the New York State ratepayers. It has been made as a last resort to get our solar array legally interconnected with a non-negative cash flow. No other permanent solution[2] that the utility has been able to offer within their current or proposed tariff structure has come close to achieving that goal for nearly eighteen months. Under current tariffs without a legal interconnect, the solar array is required to be shut down on weekends and weekday mornings prior to our facility opening. As a result, the additional greenhouse gas free energy, almost 31% of the arrays capacity (18,600 KWH)[3], is discarded. It is safe to say that was not the legislature's intention when they passed the net metering law.

The $3,000 additional annual revenue for the weekend generation that would be recouped under net metering is miniscule when compared to the $500,000 capital outlay that we made to install the two systems. ($892,000 with the grants included). In addition, research data obtained at our facility, the result of hundreds of hours of work and a large additional financial expenditure on our part, has been provided to the DPS at no cost to the New York State ratepayers. This data, with the associated report and presentation, has assisted the DPS during the EPS proceedings on Case 08-E-0751. The cost of labor and equipment for that effort has exceeded ten times our potential annual return on net metering. If we are trying to squeeze more money from the New York State ratepayers, we are not doing it very well.

Con Edison stated that our Capstone generators have a nameplate capacity of 60 KW. That rating is based on climatic conditions that do not occur in the Con Ed service area. During 5 years of operation, they have never exceeded 48 KW at the turbine output and 45 KW at the service entrance after the CHP system overhead was subtracted. This derating of turbine capacity is a well known shortcoming of the older micro-turbines when they operate at sea level or temperatures above 40 degrees-F. However, the newer micro-turbines will operate closer to nameplate capacity. The solar array is rated at 49.6 KW DC and has a maximum AC output of 46 KW. The total combined maximum real output of the two efficient technologies is 91 KW AC at the service entrance. That is less than the potential total facility load of approximately 124 KW that would be present if there was no onsite generation. On January 27, 2009 our average facility load varied between 68 KW and 76 KW over a half hour period (72 KW average). That load only includes our lighting and manufacturing machinery in January. If we add in the potential load of the 47 tons of package rooftop air conditioning that we have measured at 1200 watts per ton, that increases the load by 56.4 KW for a total peak load of 128.6 KW. That is well in excess of the true combined AC ratings of the two systems. Even using the nameplate ratings of 110 KW, we would qualify under the proposed tariffs for the generation capacity that we have installed.

On this topic, another question that must be answered is whether the nameplate rating of a solar array is its DC output, or its AC output which is approximately 8% lower. As the peak load standard that the utility refers to in Rider R is an AC value, it would make sense that the AC capacity of the array should be used to remain consistent in the comparison. However, in their reply Con Ed was using the DC capacity for our array of 50 KW, and not its AC capacity of 46 KW.

Con Edison has mentioned the potential use of non-energy efficient fossil fuel generation in their reply to our tariff petition. However, the title of the petition specifically states “Energy Efficient Generating Technologies”. We believe that only energy efficient generating technologies should qualify, as promoting energy efficiency was the intent of the net metering law. The most efficient utility scale fossil fuel plant, a combined cycle gas generator, is approximately 55% efficient. Transmission losses account for an additional 7% to 8% efficiency reduction, resulting in a maximum

delivered electrical efficiency to the customer service entrance of 48%. If all generating technologies are included, the net utility efficiency is far lower. Our CHP facility is producing power with a 68% average efficiency. That is 20% better than the utility's best fossil fuel generating plant, even though we are both using the same fossil fuel (natural gas). While New York State is working to achieve a 15% efficiency gain, Consolidated Edison is indirectly stating in their reply that our 20% efficiency improvement over the most efficient fossil fuel utility generation and transmission available should be considered inadequate. As 60% efficiency is the qualifying standard for the Rider H gas tariff, it would seem to be the correct efficiency value to qualify a grid connected, non-net metered generator for operation in conjunction with solar net metering.

In Con Ed's reply, they mention the complexity of our interconnection issue. That is why we proposed using three meters to solve the problem, instead of the one meter that Con Ed proposed with their standard solar net metering interconnect under Rider R. Yet in figures 4 and 5 of their reply, they treat the facility as though it is metered under their standard one meter Rider R, and not the three meter system that we proposed and that NYSEG and RG&E agree will work. The scenario that Con Ed portrays in figures 4 and 5 of their reply cannot occur with the three meter system. There is no way for the CHP generator power to pass through the solar net meter under the three meter scenario in our one line diagram. Also, using the three meters segregates the eligible generation from the ineligible generation, a requirement on Con Ed's fourth revised tariff leaf No. 158-H-1. We paid for the additional metering equipment required when we installed the CHP system. We were willing to pay for the metering equipment when we were discussing a temporary SC-11 interconnect, and we believe that we (the utility customer) should pay for the additional metering equipment required to implement the solar net metering . Our interconnect is pre-existing and dates to the installation of the CHP system. There are three levels of protective redundancy on the CHP interconnect.[4] Those would be retained under the three meter one line diagram. Similarly, the solar interconnect would also have three levels of protective redundancy at our site. The protective relays have been tested within the past ten months and are working properly.

One additional observation that we have is that any customer that has a generator on site and a solar array should have the net metered technology interconnect on the customer side of the transfer switch. In our three meter design with our one line diagram including two transfer switches, or in the NYSEG and RG&E one line diagram with one transfer switch located at the demand meter, that is the case. As such, the concerns that Con Ed expressed in their reply are not valid. However, if the solar interconnect is on the utility side of the transfer switch, Con Ed's concerns about inefficient generation could be realized. Under that scenario, an inefficient backup generator that is not grid connected could be used to provide all of the site power and 100% of the solar energy could be exported.

Furthermore, the entire discussion of potential fraud that the utility has initiated in their reply could be easily resolved if they would implement a very simple safeguard.

From our discussions with the utility, it seems that they are not going to record the theoretical annual output of the solar array in their customer specific account data. This is an enormous mistake. For a utility that seems to be extremely concerned with fraud, not recording this value is the same as sending an invitation to those that would commit theft of service. The New York State ratepayers will eventually suffer as a result of this omission.

The annual power output of every solar array can be accurately predicted. A solar array on a 3 degree angle at the latitude of the Con Ed service area will annually generate 1200 times the DC rating of the array in AC KWH. For example, a 50 KW DC rated array will generate 60,000 KWH AC annually, plus or minus 5%. Solar installers, prior to array installation, can accurately predict the annual output of any array based upon location, latitude, panel angle and shading. Using our three meter system or the NYSEG and RG&E two or three meter system, if the solar meter reads substantially more than the possible array output, the utility will know that another generating source is being routed through the solar meter. Even with the proposed Con Ed Rider R one meter interconnect, an annual consumption at the site of a solar array that decreases much more than the potential output of the installed array would indicate a potential theft of service. Recording the arrays annual output capacity value and using it to perform calculations on all accounts where solar arrays are installed would eliminate any opportunity for fraud through the misuse of net metering. The time to start recording those values in the customer files is at program inception. It will cost far more to collect that data and implement the system at a later date. The calculated value for the array could be certified by NYSERDA at project completion to prevent the values from being inflated. Our understanding is that a similar analysis, while not as precise, exists for wind generation so the same technique could be applied to wind net metering..

As was stated in the original petition, we need a rational solution so that commercial entities can **cost effectively** interconnect their multiple **energy efficient** technologies to the utility network. What we have proposed, which NYSEG and RG&E verified will work, is a reasonable and fair way to interconnect these technologies within the existing, available regulatory framework.

Sincerely,

Richard Ellenbogen
President
Allied Converters, Inc.

NOTES:

1 - CHP – Combined heat and power or cogeneration. Waste heat from the Electrical generation process is used to make hot water, which is then used within the facility. That offsets other energy that would have to be used to make the hot water. When properly installed, CHP Systems can have energy efficiencies between 65% and 75%.

2 - During early 2008, we had reached an agreement with Consolidated Edison to interconnect under SC-11 on a temporary basis until a better solution could be found. Con Ed had agreed to refund the "negative revenue" that would have resulted from this interconnection. It would have resulted in no net revenue for the exported solar. It was only a temporary solution, but it would have been much better than the status quo for both parties. We had an approved one line diagram and Con Ed sent field personnel to determine where a meter could be installed.

At our cost, we rewired our interconnect to accommodate the one line diagram that Con Ed approved for SC-11 and had an outside testing company verify that all of the protective relays were functioning properly. Very shortly thereafter, the net metering legislation gained a lot of momentum in Albany. When it appeared that the net metering legislation would be passed in the near future and a permanent solution would be available, the SC-11 interconnect was no longer pursued by the utility. We, and the Con Ed staff involved in the SC-11 interconnect, were unaware that the net metering would not be allowed if a grid connected co-generation facility was present. Contrary to the impression that a third party to these proceedings might infer, we have had a very positive working relationship with the engineering staff at Con Ed, although at times, the relationship has been strained because of this issue. After eighteen months, we need a permanent solution to the problem. The net metering tariff is the only potential tariff available to resolve the problem.

3 - The average US home uses 8900 KWH annually. (Source: The Physics Factbook™ Edited by Glenn Elert) The 18,600 KWH of solar energy that we are presently required to discard annually, without a legal interconnect, would provide all of the electrical power needed by two average US homes for over a year.

4 - The three levels of protective redundancy that would remain on the CHP system, under the three meter arrangement, are as follows:

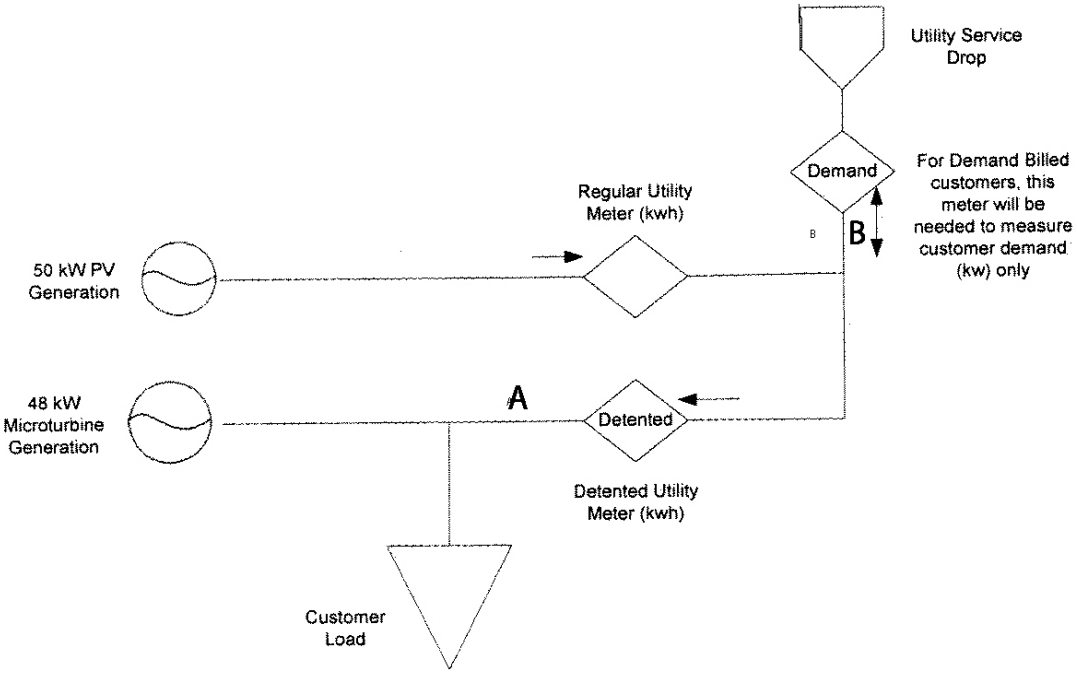
1 - Relays on the micro-turbines

2 - Relays on the transfer switch

3 - A remote trip on the 1400 amp service entrance circuit breaker that is triggered by a Basler relay that monitors the service.

The solar array under the three meter arrangement would use the protective relays from levels 2 and 3 of the CHP interconnect. The functionality of the level 1 relays would be duplicated by the protective relays in the solar inverters.

APPENDIX A – NYSEG and RG&E Proposed One Line Diagram



Transfer Switch Located at "A"

During a power outage or if the facility is off line, solar (PV) generation is not available to the customer load.

Transfer Switch Located at "B"

During a power outage or if the facility is off line, solar (PV) generation is available to the customer load.

Non efficient backup generators cannot be used to offset solar output.

APPENDIX 3 -5

PUBLIC SERVICE COMMISSION DECLARATIORY RULING ON TARIFF PETITION

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

At a session of the Public Service Commission held in the City of Albany on May 14, 2009

COMMISSIONERS PRESENT:

Garry A. Brown, Chairman
Patricia L. Acampora
Maureen F. Harris
Robert E. Curry, Jr.
James L. Larocca

CASE 08-E-1426 - Allied Converters, Inc. – Petition For a Declaratory Ruling on the Administration of Solar Net Metering Provisions at Locations Where Multiple (Hybrid) Energy Efficient Generation Technologies Are Installed.

DECLARATORY RULING ON METERING AND BILLING OF A HYBRID GENERATION FACILITY

(Issued and Effective May 19, 2009)

BY THE COMMISSION:

BACKGROUND

In a petition filed on December 4, 2008, Allied Converters, Inc. (Allied) proposes to interconnect a 50 kW solar generator to the distribution system operated by Consolidated Edison Company of New York, Inc. (Con Edison). According to Allied, output from that generator is entitled to net metering under the amendments to Public Service Law (PSL) §66-j that took effect August 5, 2008. Pursuant to those statutory amendments,[1]

[1] Case 08-E-1305, et al., Central Hudson Gas and Electric Corporation, et al., Order Modifying and Authorizing Net Metering Tariffs (issued February 13, 2009)(Net Metering Order).

the tariff authorizing net metering at commercial locations like Allied's became effective on February 27, 2009.

The interconnection of Allied's solar generator with Con Edison is complicated by Allied's earlier installation of a cogeneration facility powered by two gas-fueled micro-turbines, each with a nameplate rating of 30 kW. Allied and Con Edison have been unable to agree upon interconnection arrangements that will properly separate the micro-turbine generation, which is not entitled to net metering, from the solar generation, which qualifies for net metering.

Responses to a petition for a Declaratory Ruling are due within the 21-day period prescribed under the Rules of Procedure, 16 NYCRR §8.2(c). In a Notice Establishing Comment Procedures issued December 19, 2008 in this proceeding, however, the time for filing responses to the petition was extended to January 26, 2009. Additionally, reply comments, due by February 10, 2009, were authorized. Initial comments and one reply comment were filed in conformance with those procedures, and those comments are presented below.

POSITIONS OF THE PARTIES

Allied's Petition

Allied begins by explaining that, during 2002 and 2003, it installed a cogeneration facility at its New Rochelle, New York factory consisting of two micro-turbines that are collectively capable of generating no more than 48 kW, even though the nameplate rating of each is 30 kW. After waste thermal energy from the turbines is captured and used to heat and cool the building, Allied continues, the overall efficiency of its cogeneration system exceeds 65%, in excess of the 60% efficiency requirement the Federal Energy Regulatory Commission (FERC) imposes for attaining qualifying facility (QF) status

under the Public Utility Regulatory Policies Act of 1978 (PURPA). Generation output from the micro-turbines, Allied explains, follows the factory's load and is not exported to Con Edison's system.

In 2007, Allied relates, it installed a 50 kW solar array. According to Allied, at times when its factory is operating, the manufacturing process consumes the entire output of the array and the micro-turbines, but, on weekends and holidays when the factory is dormant, up to 240 kWh of solar electricity can be exported to Con Edison. Allied believes that excess generation from the solar array can be net metered through a three-meter configuration. A utility meter would measure the factory's usage, while a second meter would measure the output from the solar array. The micro-turbines would be located behind the utility usage meter, where they would offset usage that would otherwise travel through that meter. The solar array's output, as separately metered, would be subtracted from the remaining usage, and any excess of production over usage would be net metered. The third meter would record the peak demand the factory imposes on Con Edison's system, reflecting the effect of both the solar and micro-turbine generation on demand.

Allied complains that Con Edison has not either rejected or accepted the proposed three-meter configuration. Allied argues that this configuration furthers public policy behind the net metering statutory amendments, which is to promote the installation of additional solar generation systems throughout New York. While conceding that its dual micro-turbine and solar array arrangement is the first of its kind in New York, Allied maintains that its proposed configuration could further the growth of solar installations in conformance with

New York's policies, when those installations are sited at locations where other forms of generation are present.

Allied also claims that, if its solar output is not net metered, it must pay Con Edison to export the generation, at a cost higher, under Con Edison's S.C. No. 11 tariff, than the amount it would be reimbursed for the value of the solar energy. Allied complains that the S.C. 11 rate is based on the cost of the transmission capability for the utility's entire service territory instead of just the cost of the distribution system near to its location where the electricity would be used.

The Comments

A. Central Hudson

After voicing its support for net metering in conformance with PSL §66-j, Central Hudson Gas & Electric Corporation (Central Hudson) proposes to aggregate the capacity of all the generators comprising a hybrid facility operated by a non-residential customer seeking net metering. That combined capacity, Central Hudson believes, should be used in determining if the customers' generation is sized at less than its load, which is a requirement for obtaining net metering at non-residential locations under the statutory amendments. Once it is determined that the generation facilities are sized in conformance with the statutory limit, Central Hudson would impose all incremental interconnection, metering and other costs attributable to the hybrid features of the generation facility on the customer.

Although Central Hudson believes that hybrid generation facilities can be properly metered, it asserts that the arrangements will be costly and complex. Interval metering data will be needed so that excess generation within any given time period can be accurately allocated between generators that qualify for net metering and generators that do not. Central

Hudson believes that one acceptable configuration might involve a master meter measuring flows to and from the customer and a separate meter measuring output from the generator entitled to net metering. Inflows would be treated as net deliveries. Data from the meters would be used to determine which outflows would be treated as net generation.

While this configuration would supply the data necessary to measure the amount of generation entitled to net metering and to bill the customer, Central Hudson cautions that the customer would not necessarily obtain the data necessary for it to determine its overall generation production. Moreover, Central Hudson asserts, the inflow generation would have to be separated into usage replacing unavailable solar generation, priced at the applicable standard rate classification, and other usage, both replacing output from the generator that is not net metered and serving load not met by on-site generation, priced at standby rates.

Central Hudson does not believe that generic rules should be developed for hybrid facility installations. Instead, it asserts that each hybrid facility must be carefully evaluated based on its own individual circumstances, and metering and interconnection arrangements should be arrived at only after the evaluation is complete.

B. Con Edison

In voicing its support for net metering as contemplated by PSL §66-j, Con Edison explains that interconnecting hybrid facilities consisting of two or more types of generation entitled to net metering at one site may be feasible. The utility characterizes as more problematic hybrid arrangements where one generator is entitled to net metering and another is not. Turning to Allied's circumstances, the utility notes that net metering of the micro-turbines, which are fossil-

fueled, would not further the goal of the net metering statutes, which is to promote renewable-fueled generation.

Con Edison protests that it has not disregarded Allied's circumstances, but has met with it on multiple occasions and has sought to work out a mutually-acceptable solution. That no solution has been arrived at, Con Edison claims, is attributable to the complex challenges Allied's generation facilities present, not the utility's unwillingness to address the issue.

Con Edison maintains that the nameplate ratings of Allied's generators total 110 kW, but that Allied's peak load is 90 kW. Since a net metered installation under the statutory amendments must be sized at no more than the customer's peak load, Con Edison questions if Allied is entitled to net metering at all.

Even if it is decided that Allied's solar array is eligible for net metering, Con Edison contends that it is not able to bill Allied on one account that would combine net metering and other usage. The utility explains that it explored alternatives to a combined account, including separating Allied's electric usage into two accounts, one of which would accommodate the net metering of the solar array. Nonetheless, Con Edison maintains, a suitable alternative arrangement could not be readily ascertained. Con Edison argues this outcome is not surprising, given that obstacles to the net metering of hybrid facilities have been detailed in the past, even where the hybrid facility consisted of two types of generation entitled to net metering.[2]

[2] Case 05-E-0697, et al., Central Hudson Gas and Electric Corporation, et al., Order on Net Metering of Hybrid Facilities (issued August 25, 2006).

Con Edison believes that net metering of hybrid facilities should await actual experience with the operation of those facilities over an extended period of time. Such a careful approach to the problem, Con Edison contends, is necessary to avoid circumstances where fossil-burning technologies would be supported with benefits intended only for renewable technologies. For example, Con Edison warns, customers owning hybrid facilities might boost the output from non-qualifying generators, or avoid curtailing them during low load conditions, if they can thereby improperly enlarge upon the amount of excess electricity deemed to qualify for net metering.

C. National Grid

National Grid supports the development of renewable technologies, but cautions that it is difficult to solve the complexities Allied's hybrid installation presents. The utility also warns that the complex configurations attending installation of a hybrid facility can create costs out of proportion to the benefits of the project.

National Grid finds the information presented in Allied's petition insufficient for the utility to propose a solution for accomplishing net metering of its hybrid facility. Instead, National Grid suggests that either a generic proceeding be opened to establish guidelines on hybrid installation interconnections or that, if Allied's petition is granted, its precedential effect be limited to its circumstances.

D. NYSEG/RG&E

New York State Electric & Gas Corporation and Rochester Gas and Electric Corporation (NYSEG/RG&E) believes that a more effective interconnection solution can be devised than the one Allied proposes. The utility presents a metering configuration where a utility meter that cannot run in reverse measures the usage Allied takes from the utility system, beyond

the usage it self-supplies, and a second meter measures output from the solar array. A third meter would measure demand, reflecting the contributions of both the solar array and the micro-turbines in offsetting that demand.

NYSEG/RG&E maintains that, under this metering configuration, Allied's usage would be met first from the micro-turbine output, which reduces the usage flowing through the utility meter. The solar output, as metered, can then be subtracted from any remaining usage, and if there is an excess over usage, that amount would qualify for net metering benefits. If micro-turbine output were to exceed load, however, that excess would not be net metered, because the meter measuring usage cannot run in reverse and so would not record that output as excess generation.

As with customers owning on-site generation generally, NYSEG/RG&E would assign hybrid facility customers to standby service tariffs by comparing the nameplate rating of the non-net metered generation to the customer's overall peak load. In making that assignment, NYSEG/RG&E would not reflect the capacity of the net metered generator.

Reply Comments

A. Allied

Allied analogizes the electric metering and billing required for implementation of net metering to the gas metering and billing that already exists at its site for the purpose of allocating gas delivery service to two different tariff rates. One rate, Allied states, is applicable to delivery of the gas that fuels its micro-turbine cogeneration facility while the other rate is applicable to its use of gas for heating purposes. Even though only one gas line enters its factory, Allied continues, separate meters measure the two different forms of gas usage, and it is billed on two different Con Edison

accounts. Allied argues that the costs of administering this form of gas service billing are not excessively burdensome, and administrative costs should not preclude a similar approach to electric metering and billing.

After stating that it is encouraged by the comments of Central Hudson and NYSEG/RG&E, which pose metering solutions to problems attending hybrid facility installations, Allied expresses its preference for the approach presented by NYSEG/RG&E. Allied believes its hybrid facility could be retrofitted to accomplish the metering functionality that NYSEG/RG&E diagrams, although Allied cautions that the protective relays built into its existing system could limit the location where meters may be placed.

Allied disputes what it says is Con Edison's implication that operation of the hybrid facility could be manipulated to create a claim for net metering benefits to which Allied is not entitled, and contends that it is only attempting to comply with the statutory amendments to PSL §66-j. Allied reports that it has spent $892,000 on its hybrid generation system, including $500,000 in its own capital (with the remainder obtained through New York State Energy Research and Development Authority grants). Allied maintains that the $3,000 in annual revenue it will obtain from net metering its solar generation on weekends is small in comparison to its investment.

Contradicting Con Edison's analysis of its generation capacity and demand at its factory, Allied explains that its micro-turbines have never exceeded 48 kW in output even though rated at 60 kW, because that nameplate rating can be achieved only in perfect conditions that are never experienced at its location. Allied also contends that the maximum AC output of its solar array is 46 kW, even though it can generate 49.6 kW of DC output. It therefore calculates its total combined

generation capacity at 94 kW, which is substantially less than the total factory peak load of approximately 124 kW, experienced in the summer when air conditioning is in service.

B. Con Edison

According to Con Edison, Allied misunderstands both the practical difficulties and the underlying policy implications attending hybrid facility installations. The utility argues that by operating the micro-turbines and solar array together, Allied blurs the distinction between generators entitled to net metering and those that are not.

Analyzing Central Hudson's proposed metering solution, Con Edison warns that it will be expensive and depends upon manual billing of the customer. As to the NYSEG/RG&E proposal, Con Edison believes that it will result in the netting of micro-turbine and solar capacity, when only the latter qualifies for net metering benefits. Therefore, Con Edison concludes that interconnection of Allied's facility should await more experience with production and usage patterns experienced during actual operations at Allied's location.

DISCUSSION AND CONCLUSION

Allied's request to net meter a hybrid generation facility consisting of one generator that qualifies for net metering and two generators that do not raises complex issues. Those issues, however, can be resolved, so that the benefit of Allied's clean, renewable energy is not lost.[3]

[3] Because net metering is available to Allied, it is not necessary to address here its criticisms of an export fee provided for in Con Edison's S.C. 11 buy-back tariff. Department of Public Service Staff, however, shall inquire into whether such a tariff provision is a barrier to our policies for promoting development of renewable-fueled generation.

Net metering of solar generation at Allied's hybrid generation facility location raises several issues. First, a metering configuration should be designed to prevent Allied from obtaining net metering benefits for micro-turbine generation that does not qualify for net metering. Second, arrangements should be made for properly billing Allied for its usage and crediting it for its net metered solar generation that is entitled to net metering.

The metering configuration that NYSEG/RG&E has designed appears promising. It is similar to Allied's proposed configuration, but by installing a utility meter measuring usage that does not run in reverse, the NYSEG/RG&E configuration prevents the recording of micro-turbine output as excess generation. If turbine output were to exceed usage, the utility meter would not recognize that excess, which would, in effect, be delivered to the utility's grid at no cost, and so the generation would not receive net metering benefits. Only solar generation, as measured by a separate meter, could be deemed excess generation, if the amount on that second meter exceeds the usage measured by the utility meter. To successfully calculate the amount of any excess generation, both meters must record data in the same time of use intervals. The third, demand meter in this configuration is placed so as to record only actual overall demand as offset by both the turbine and solar generation.

Under this configuration, it is theoretically possible that all of the solar generation Allied produces could be treated as net metered, if, at any point in time, the micro-turbine generation offsets all of Allied's usage. Under these circumstances, there is nothing improper in such an outcome. Allied will not realize excessive profit, because its generators are sized reasonably in relationship to its load. Indeed,

Allied's overall generation is sized less than its load, notwithstanding Con Edison's arguments to the contrary. Allied's peak load during the past year exceeds 120 kW, which is more than the size of Allied's generation, even at the 110 kW amount that Con Edison's calculates.[4] Therefore, even if the size of all of the generation at Allied's site were cumulated for purposes of determining qualification for net metering under PSL §66-j,[5] Allied would meet the standard.[6]

Because Allied takes service at standard tariff classification rates, the arguments various parties raise concerning standby rates need not be considered here. As a result, billing and crediting can be accomplished by subtracting the relevant time of use solar array output from the relevant time of use consumption, all calculated at the standard tariff rates. As PSL §66-j provides, any excess generation that accumulates during the billing period would be credited to the next bill at the generally applicable standard rate.

Crediting solar generation against usage under this approach eliminates the need for two separate accounts. Although the resulting bills must be prepared manually, Con Edison's personnel can perform that function, and it may not escape its obligation to undertake that obligation merely

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[4] Allied calculates the size of its generation at 94 kW; since the calculations of both parties yield a size for generation that is less than load, we need not determine which is correct.

[5] As a result, Central Hudson's proposal to limit the overall size of hybrid facilities to no more than peak load at a site, regardless of the size of the net metered generator, need not be addressed in this proceeding.

[6] As with any declaratory ruling, this Ruling addresses only the facts and circumstances presented, and it is not a binding precedent necessarily applicable to other circumstances.

because its billing system will not process this complex arrangement automatically. Therefore, Con Edison's objections to net metering at Allied's location are rejected, and it shall proceed with interconnecting Allied's hybrid facility as discussed above.

The Commission finds and declares:

1. The hybrid solar array and micro-turbine generation facility installed by Allied Converters, Inc. shall be net metered, pursuant to Public Service Law §66-j, in accordance with the discussion in the body of this Ruling.

2. This proceeding is closed.

By the Commission,

(SIGNED) JACLYN A. BRILLING
Secretary

APPENDIX 4 - DATA TABLE FOR FIGURE 8

KWh Costs Using 3 Different Scenarios

	Year	1.8% increase	3% increase	6% increase
	2007	$0.1450	$0.1450	
1	2008	$0.1470	$0.1470	
2	2009	$0.1490	$0.1490	
3	2010	$0.1517	$0.1535	
4	2011	$0.1544	$0.1581	
5	2012	$0.1572	$0.1628	
6	2013	$0.1600	$0.1677	
7	2014	$0.1629	$0.1727	
8	2015	$0.1658	$0.1779	
9	2016	$0.1688	$0.1833	
10	2017	$0.1719	$0.1887	
11	2018	$0.1750	$0.1944	
12	2019	$0.1781	$0.2002	
13	2020	$0.1813	$0.2063	$0.1813
14	2021	$0.1846	$0.2124	$0.1922
15	2022	$0.1879	$0.2188	$0.2037
16	2023	$0.1913	$0.2254	$0.2159
17	2024	$0.1947	$0.2321	$0.2289
18	2025	$0.1982	$0.2391	$0.2426
19	2026	$0.2018	$0.2463	$0.2572
20	2027	$0.2054	$0.2537	$0.2726
21	2028	$0.2091	$0.2613	$0.2890
22	2029	$0.2129	$0.2691	$0.3063
23	2030	$0.2167	$0.2772	$0.3247
24	2031	$0.2206	$0.2855	$0.3442
25	2032	$0.2246	$0.2941	$0.3648
26	2033	$0.2286	$0.3029	$0.3867
27	2034	$0.2327	$0.3120	$0.4099
28	2035	$0.2369	$0.3213	$0.4345
29	2036	$0.2412	$0.3310	$0.4606
30	2037	$0.2455	$0.3409	$0.4882

	Year	1.8% increase	3% increase	6% increase
31	2038	$0.2500	$0.3511	$0.5175
32	2039	$0.2545	$0.3617	$0.5485
33	2040	$0.2590	$0.3725	$0.5815
34	2041	$0.2637	$0.3837	$0.6163
35	2042	$0.2684	$0.3952	$0.6533
36	2043	$0.2733	$0.4071	$0.6925
37	2044	$0.2782	$0.4193	$0.7341
38	2045	$0.2832	$0.4318	$0.7781
39	2046	$0.2883	$0.4448	$0.8248
40	2047	$0.2935	$0.4581	$0.8743
41	2048	$0.2988	$0.4719	$0.9267
42	2049	$0.3042	$0.4860	$0.9824
43	2050	$0.3096	$0.5006	$1.0413
44	2051	$0.3152	$0.5156	$1.1038
45	2052	$0.3209	$0.5311	$1.1700
46	2053	$0.3267	$0.5470	$1.2402
47	2054	$0.3325	$0.5635	$1.3146
48	2055	$0.3385	$0.5804	$1.3935
49	2056	$0.3446	$0.5978	$1.4771
		1.03	1.018	1.06