Solar Feasibility Assessment Report

for

The Village of Cazenovia

and

The Central New York Regional Planning and Development Board

January 14, 2016

Central New York Regional Planning & Development Board
126 North Salina Street, Suite 200, Syracuse, New York 13202
phone: (315) 422-8276 • mail@cnyrpdb.org • www.cnyrpdb.org

Prepared by:
Optony Inc.
Thomas Yurysta
Senior Project Manager
thomas.yurysta@optonyusa.com
(408) 520-6326

Prepared for:
Village of Cazenovia
Dave Porter
Village Trustee
dbporter@twcny.rr.com
315-289-3140

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EXECUTIVE SUMMARY

The purpose of this report is to provide a detailed technical assessment and financial analysis of potential solar photovoltaic (PV) project development opportunities at the Village of Cazenovia. The information contained in this report will support decision-makers in determining whether to participate in forthcoming collaborative solar PV procurements being coordinated by the Central New York Regional Planning and Development Board (CNY RPDB). This project was made possible through generous funding from the New York State Energy Research and Development Authority (NYSERDA) under PON 2672.

Solar PV Project Summary

Based on information collected during pre-screening assessments and in-person site visits, our team has identified high-potential sites for solar PV deployment as summarized below. Optony has mapped out viable areas on rooftops, parking lots, and open land using a modular approach to provide system and project design flexibility, and has identified site-specific opportunities and constraints. The criteria for site evaluations include on-site electricity usage, physical space available for solar PV installations, existing roof age, condition, and material, building electrical and structural limitations, planned energy or structural renovations, as well as surrounding vegetation and other shading concerns.

Our analysis estimates the potential for 205 kilowatts (kW) of solar PV capacity to be installed cumulative. Installing this maximum solar PV capacity would offset 68% of current municipal electricity usage including lighting accounts, while reducing operating costs, increasing budget certainty, and demonstrating leadership both locally and nationally.

ID	Name	Priority Score	System Type	Azimuth	Tilt	System Size (kW-DC)	Energy Output (kWh/year)
VC1	Water Department	A	Ground	180	25	205	250,600

Financial Summary

Financial modeling has been performed for the leading financing mechanisms: direct purchase and third-party financing. This modeling takes into consideration available incentives from both the Federal Government and the State of New York. The federal incentives are tax related and include the U.S. Internal Revenue Service's Investment Tax Credit for solar installations (which will remain at 30% through 2019) and the Modified Accelerated Cost-Recovery System which allows the PV investment to be depreciated over an accelerated 5 year period (also available through 2019). The state incentive is through the NY-Sun Program and offers rebates or performance based incentives for solar installations depending on project size. These incentives in combination with project aggregation lead to lower pricing, particularly for third-party financing models that monetize the tax-related incentives and pass them through to the customer in the form of lower rates. The financial results are summarized below; detailed cash flow is provided for each site later in the report.

Power Purchase Agreement – 20 Year Totals

ID	Name	Installation	Incentives	O&M	PPA Payments[1]	Utility Bill Savings	Total Savings
VC1	Water Department	$ -	$82,080	$ -	-$347,285	$429,849	$164,644

1. Assumes a PPA rate of $0.06/kWh with a 2% escalator

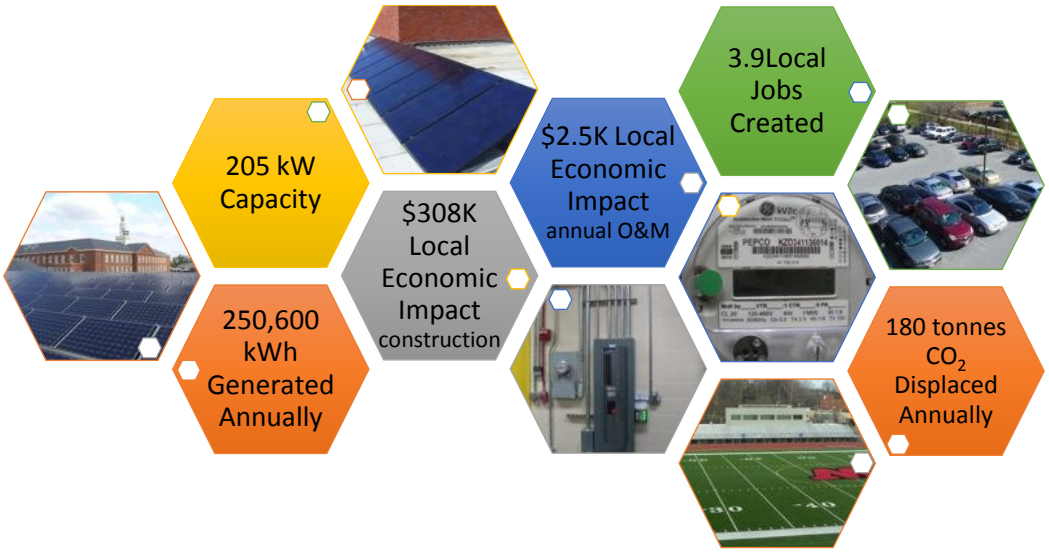
The 'Financial Summary – PPA Option' table above illustrates the potential savings that could occur if the Village of Cazenovia were to enter into a Power Purchase Agreement (PPA) with a third party owner/developer that installs solar PV systems at the most favorable "A" and "B" sites included in this report. Please note that this information is presented for purposes of providing a preliminary estimate only, and is based on data provided by the Village including utility bills and basic site conditions and a brief on-site visit conducted on September 24, 2015. The terms offered by vendors that respond to the Request for Proposals to be issued by the Central New York Regional Planning and Development Board may be different from the assumptions used in the financial modeling included in this report. As such, the financial summary presented here will be revised after vendor bids are received so that the Village can make a judgment about the feasibility of entering into a PPA for the energy produced by solar PV systems at these sites. While the information presented above is an initial estimate only, it does provide a basis for evaluating whether or not there is a potential for sufficient financial savings for the Village to proceed with the collaborative solar PV procurements being coordinated by the CNY RPDB.

Direct Purchase – 20 Year Totals

ID	Name	Installation	Incentives	O&M	Utility Bill Savings	Total Savings
VC1	Water Department	-$533,520	$82,080	-$82,707	$429,849	-$104,298

The 'Financial Summary – Direct Purchase Option' table above illustrates the potential savings that could occur if the Village were to purchase and own solar PV systems at the most favorable "A" and "B" sites included in this report. Please note that this information is presented for purposes of providing a preliminary estimate only, and is based on data and assumptions as described above for the PPA Option. Please also note that it is likely that a Direct Purchase Option may not present as favorable a financial return as municipalities and not-for-profit entities cannot take advantage of available federal and state tax credits.

Economic and Environmental Impact Summary



Next Steps

Upon internal stakeholder review and approval, the recommended next step is for the Village of Cazenovia to join other participating Central New York communities in a collaborative solar procurement with a RFP that is expected to be released in early 2016. A memorandum of understanding will be provided for the Village to review and sign to participate in the procurement.

Detailed information concerning next steps, as well as Optony's methodology, findings, and recommendations, are contained in the following sections of this report.

INTRODUCTION

Optony is pleased to present this investment-grade Solar Feasibility Assessment Report to the Village of Cazenovia. The purpose of this report is to provide a thorough technical assessment and financial analysis for sites that will be considered for inclusion in forthcoming collaborative solar photovoltaic (PV) procurements.

This project was made possible through generous funding from the New York State Energy Research and Development Authority (NYSERDA) under PON 2672. This program has brought nearly 30 communities together across the 5 county region within a common framework to drive new installed solar system capacity, increase local economic activity, and improve the regional environment. By aggregating regional efforts to identify and develop solar project sites, significant benefits are realized for participating agencies.

What you will learn from this report

1. How Optony conducted this analysis
2. The best sites for solar PV installations, from both technical and economic perspectives
3. Recommended solar PV system sizes and design characteristics
4. Next steps for pursuing the recommended options with a timeline for implementation

Investments in renewable energy can help the Village of Cazenovia reach its sustainability goals, as well as provide economic and job creation benefits for the host communit. Solar PV installations reduce reliance on utility-generated electricity, while also reducing the customer's operating costs. Through on-site power generation from a clean and renewable resource (sunlight), the Village can reduce its carbon footprint and demonstrate environmental leadership to its residents and peer communities.

This report is organized in four main sections. The first section of this report presents findings from site evaluations, including: site characteristics, electric utility data, solar PV capacity potential, and technical and financial analyses. The second section offers a comprehensive overview of solar financing options, including estimated cost and savings of primary options. The third section of the report provides an overview of the economic and environmental impact potential for this project. Finally, the report concludes with recommendations and next steps that best fit the opportunities and challenges for generating solar energy. Optony's methodology and assumptions are described at the end of the report.

ABOUT SOLARIZE CNY

The Central New York Regional Planning and Development Board's (CNY RPDB) Solarize CNY project was created as part of the Central New York Energy Challenge program and is supported by the national Solar Roadmap Initiative. Solarize CNY is a collaborative public-sector project, led by the CNY RPDB with Independent technical assistance provided by Optony.

Participating government agencies across the region will work together within a common approach for deploying clean energy to drive new installed solar system capacity, increase local economic activity, and improve the regional environment. This initiative is based on a proven model that has been successfully deployed around the country. By aggregating regional efforts to identify and develop solar project sites, significant benefits are realized for participating agencies – both individually and as a group. There is no up-front cost to participate in this program.

The project is funded through generous support from the New York State Energy Research and Development Authority (NYSERDA) under PON 2672.

Several factors make this an ideal time to pursue solar:

- Solar incentives for larger projects are at peak levels under the new MW Block program
- The federal tax benefits have recently been extended and are still available at peak levels
- Solar project costs are at an all-time low statewide
- Various cost-effective financing options are available for the public sector
- NYSERDA and DOE funding has been provided to reduce costs for participants

Learn more here:
http://www.solarroadmap.com/regional-initiatives/solarizecny/

SITE EVALUATIONS

Using information collected during pre-screening discussions and in-person site visits, viable sites on rooftops, parking lots, and open land, have been selected and mapped out using a modular approach to provide system and project design flexibility. Based on the area available for solar, the recommended solar PV system capacity has been estimated at 205 kilowatts (kW) at the Water Department, which would offset 68% of current community-wide electricity usage including lighting accounts. Unless noted otherwise, all solar arrays are assumed to be net metered.

PV Project Summary for All Sites

ID	Name	Priority Score	System Type	Azimuth	Tilt	System Size (kW-DC)	Energy Output (kWh/year)
VC1	Water Department	A	Ground	180	25	205	250,600

In addition to confirming the physical space available for solar PV systems, our team assessed planned energy or structural renovations and other site-specific issues. For open land available for ground-mounted systems, geotechnical concerns and land-use constraints are evaluated as well as distance to the electrical interconnection point. The potential challenges were rated on a scale from *None* (no issues) to *High* (likely to require extensive review or remediation). Below is a description of each criterion.

Technical Feasibility Criteria

Criterion	Description
Shading	Survey the surroundings of the usable areas to identify obstructions that could potentially cast shadows on the solar modules and reduce output, such as rooftop HVAC equipment, rooftop access penthouses, antennas, trees, lampposts, and neighboring buildings. Even minor shading can have a profound negative impact on system performance. In order to assess the amount of direct sunlight available at each usable area, the annual sun path is plotted at various points using industry standard tools and software.
Electrical	Inspect electrical rooms for main breaker and switchgear amperage and voltage ratings, as well as availability of space for additional electrical equipment such as inverters. The location of the utility electrical meter(s) is important, as the distance between the solar modules and the point of connection must be minimized to reduce voltage drop, reduce costs, and increase system efficiency.
Structural	Potential challenges such as roof and structural integrity are evaluated, including the age, condition, and material of the roof as well as the building and building layout. Potential shading sources include tall trees, rooftop mechanical equipment, and surrounding buildings.
Geotechnical	Geotechnical issues pertain to the surrounding area of the overall site such as soil condition, water table levels, and presence of fault lines.
Environmental	Environmental criteria relate to environmental impact report requirements and other such considerations. New York's State Environmental Quality Review Act (SEQR) requires the analysis and disclosure of environmental impacts of proposed projects for certain larger ground mounted solar arrays.

In addition to technical feasibility, each evaluated site has been prioritized and scored with an "A" ranking, being most feasible and ready for immediate solar deployment, to a "C" ranking, which would require the most modifications in order for solar deployment to be feasible. Below is a description of each category.

Project Development Priority Ranking

Score	Description
A	Sites with an "A" score have excellent solar potential and current conditions support immediate deployment. Generally, these projects have roofs that are less than five years old, have minimal to no shading or other technical feasibility concerns.
B	Sites with a "B" score also have solar potential and could be developed immediately, but have minor site-specific challenges related to roof condition, shading, or other. Generally, these projects have roof layers that are 5-10 years old, experience minimal shading, may have issues related to all other technical feasibility criteria, such as the potential need for minor electrical equipment upgrades. Sites that are clean but only allow for a small system size are placed in this category.
C	Sites with a "C" score have high-risk technical issues or are otherwise troublesome sites. While a PV system may still be feasible, it is unlikely that these systems will be able to provide economic savings to justify the cost of the systems at this time. These sites will not be included in the procurement.

Water Department

Site Overview

Address:	Chenango St, Cazenovia, NY 13035
Utility Provider and Tariff:	National Grid, SC-2 D
Electricity Supplier:	National Grid
Annual Energy Usage:	133,520 kWh
Monthly Demand Peak:	51 kW max, 43 kW min, 46 kW average over last 12 months

PV System Overview

System Size:	205 kW recommended
Expected Output in Year 1:	250,600 kWh/yr
Electricity Offset:	>100% at this site, about 68% of Village-wide consumption

PV System Summary

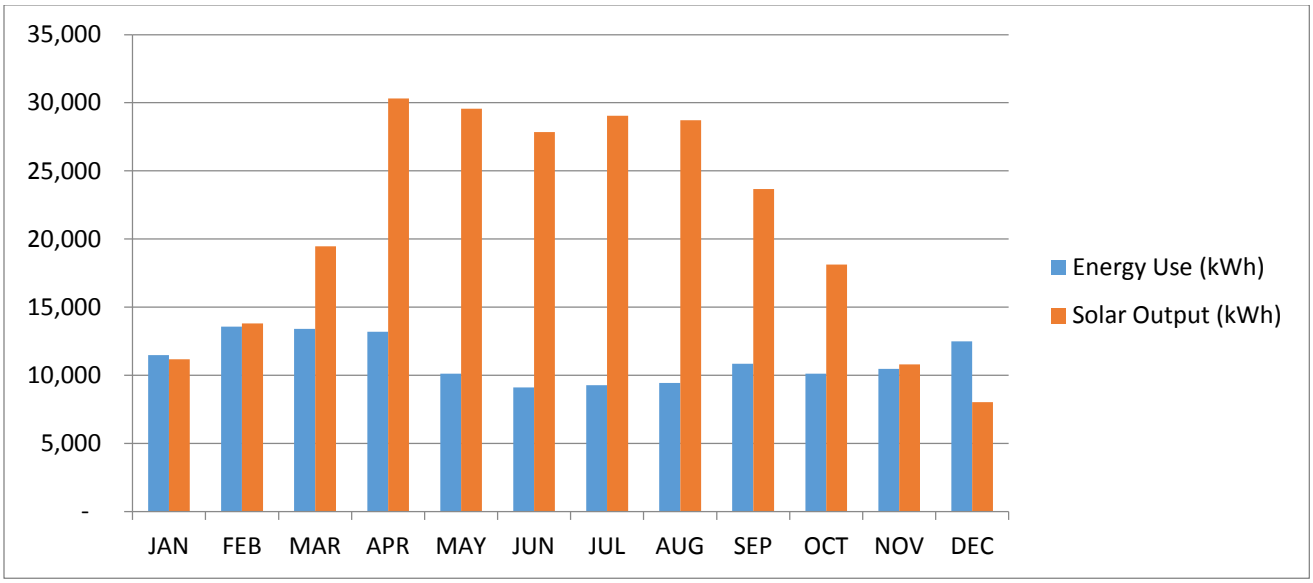
The Water Plant has a large area of open land which is suitable for a ground mounted solar array. There is enough space to install a system capable of offsetting all electric usage at the Plant with excess credits left over. These credits would be distributed to other Village electric accounts using remote net metering.

The Water Plant site is located over the Village aquifer. There is some concern about ground condition due to water rising naturally to the surface. Find more information about this on the next page.

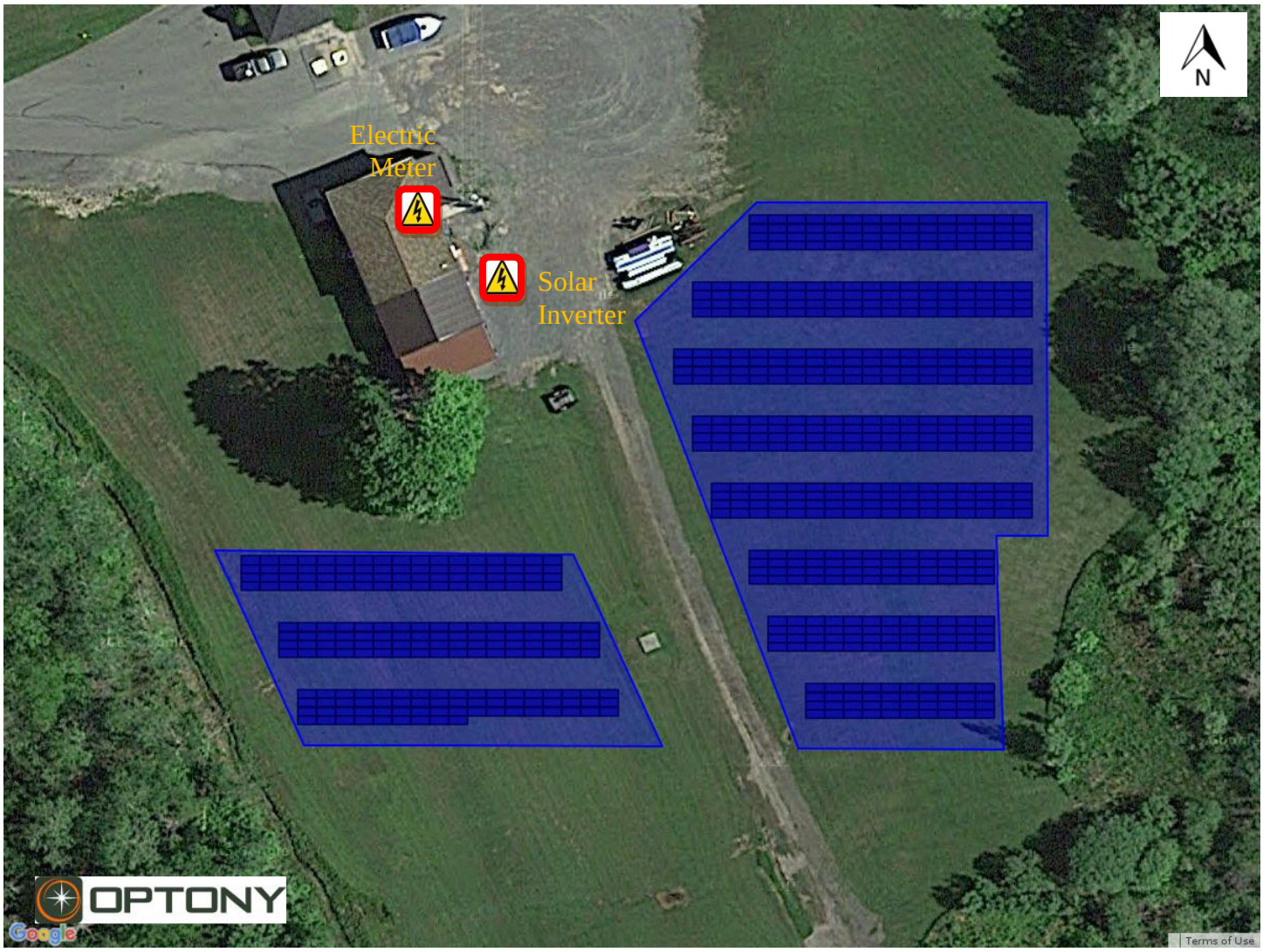
The other consideration here will be interconnection. As the system is oversized, interconnection approval at the full recommended system size is not guaranteed. However, we feel approval at or near the recommended size is likely.

Otherwise this is an attractive site for solar and looks to be a clean installation.

Energy Use and Solar Generation Profile



Proposed Solar PV Design Layout



The layout above shows viable areas for solar PV project development highlighted in blue with individual modules in dark blue. The layout above can accommodate approximately 205 kW as a ground mount array on open land. The energy yield for proposed solar array is 1,221 kWh/kW per year.

This site is above the Village aquifer. The aquifer is an artesian well, which means ground water naturally rises to the surface. Pumps keep the ground from becoming too saturated, though the open areas in the northeast and southwest portions of the property have been avoided since these two patches of land tend to collect water. The areas being utilized for solar in the layout above tend to stay drier throughout the year. With the pumps running, the water table drops to about 12’ below the surface. In any case, a ballasted racking system should be strongly considered.

The lawn is neatly mowed and maintained.

The tree line around the perimeter is around 25 to 30 ft tall. These can be trimmed; there is no ordinance to prevent it. However the layout as shown shouldn’t require much trimming to avoid shade.

Solar Array Technical Specifications

Sub-array Location	Description	Azimuth	Tilt	System Size (kW-DC)
East	Standard ground mount, probably will required ballasted racking	180	25	146
West	Standard ground mount, probably will required ballasted racking	180	25	59

Solar Array Utility Considerations

The electrical service is 400A, 480V 3-phase. There is a pole-mounted transformer on site owned by National Grid. The main service is located inside the building on the east wall as indicated on the layout on the previous page. There is plenty of room for the solar inverter just outside the main building near the utility drop.

This site will be heavily dependent on net metering as the solar capacity will be upwards of 205 kW and the peak demand on site is only around 46 kW.

This site is also designed to serve as a host site for remote net metering. This means the array will produce more energy than is consumed during the summer months and also on an annual basis. Under remote net metering, all solar output each month will first be used to offset the usage charges on the Water Department electric bill. Any excess credits are then converted to a dollar value and used to offset demand and billing charges on the Water Department bill. Finally, if excess credits are still remaining, they are directed to other accounts owned by the Town.

Note: it is unknown whether the Village lighting accounts are eligible to be satellite recipients of remote net metering credit. For this report, credits are assumed to be delivered to facility meters only.

Due to being oversized, this array will be subject to interconnection approval from the utility and may not be approved at the full size proposed herein. An interconnection application has not been filed for this site. In either case, a service upgrade should not be required as the existing 480V service has sufficient capacity to handle the PV array.

There is a generator on site.

Technical Assessment Summary

Shading	Electrical	Structural	Geotech.	Enviro.	Comments
Med	Low	None	Med	Low	There are trees around the perimeter of the site, however most shading is avoidable. The ground condition is not ideal as the water level is very close to the surface. A ballasted racking system may be required, and the wettest areas of site should be avoided. Interconnection approval of the recommended size is not guaranteed. In either case, the main service should not need to be upgraded to accommodate this new PV system.

Cash Flow with Remote Net Metering – Direct Purchase											
	A	B	C	D	E	F	G = A*F	H	J = (B-A)*H	K=C+D+E+G+J	K(running total)
Year	**Energy Usage on Host Meter (kWh)**	**Solar Output (kWh)**	**Solar Installation Cost**	**Solar O&M Cost**	**NYSERDA Solar Incentive**	**Solar Offset Value on Host Meter**	**Solar Savings on Host Meter**	**Solar Offset Value on Remote Meter(s)**	**Solar Savings on Remote Meter(s)**	**Net Solar Benefit (annual)**	**Net Solar Benefit (cumulative)**
1	133,520	250,557	-$533,520	-$3,078	$20,520	$0.059	$7,866	$0.078	$9,122	-$499,089	-$499,089
2	133,520	249,304	$0	-$3,170	$20,520	$0.061	$8,102	$0.080	$9,295	$34,747	-$464,342
3	133,520	248,058	$0	-$3,265	$20,520	$0.063	$8,346	$0.083	$9,471	$35,071	-$429,271
4	133,520	246,817	$0	-$3,363	$20,520	$0.064	$8,596	$0.085	$9,650	$35,402	-$393,869
5	133,520	245,583	$0	-$3,464	$0	$0.066	$8,854	$0.088	$9,831	$15,220	-$378,648
6	133,520	244,355	$0	-$3,568	$0	$0.068	$9,119	$0.090	$10,015	$15,566	-$363,082
7	133,520	243,133	$0	-$3,675	$0	$0.070	$9,393	$0.093	$10,201	$15,919	-$347,163
8	133,520	241,918	$0	-$3,786	$0	$0.072	$9,675	$0.096	$10,391	$16,280	-$330,883
9	133,520	240,708	$0	-$3,899	$0	$0.075	$9,965	$0.099	$10,583	$16,649	-$314,234
10	133,520	239,505	$0	-$4,016	$0	$0.077	$10,264	$0.102	$10,778	$17,026	-$297,208
11	133,520	238,307	$0	-$4,137	$0	$0.079	$10,572	$0.105	$10,976	$17,412	-$279,796
12	133,520	237,116	$0	-$4,261	$0	$0.082	$10,889	$0.108	$11,177	$17,805	-$261,990
13	133,520	235,930	$0	-$4,388	$0	$0.084	$11,216	$0.111	$11,381	$18,208	-$243,783
14	133,520	234,750	$0	-$4,520	$0	$0.087	$11,552	$0.114	$11,587	$18,619	-$225,164
15	133,520	233,577	$0	-$4,656	$0	$0.089	$11,899	$0.118	$11,796	$19,039	-$206,124
16	133,520	232,409	$0	-$4,795	$0	$0.092	$12,256	$0.121	$12,008	$19,469	-$186,656
17	133,520	231,247	$0	-$4,939	$0	$0.095	$12,623	$0.125	$12,223	$19,907	-$166,748
18	133,520	230,090	$0	-$5,087	$0	$0.097	$13,002	$0.129	$12,441	$20,356	-$146,393
19	133,520	228,940	$0	-$5,240	$0	$0.100	$13,392	$0.133	$12,662	$20,814	-$125,579
20	133,520	227,795	$0	-$5,397	$0	$0.103	$13,794	$0.137	$12,885	$21,282	-$104,298
…	…	…	…	…	…	…	…	…	…	…	…
25	133,520	222,157	$0	-$6,257	$0	$0.120	$15,991	$0.158	$14,044	$23,778	$9,492
Total	3,338,000	5,902,104	-$533,520	-$112,222	$82,080		$286,806		$286,347	$9,492	

Assumptions: Solar EPC pricing at $2.60/watt-DC. Utility cost escalator 3%. Electric load profile of typical commercial facility. Peak demand 46 kW before solar, no reduction assumed after solar since peak pumping load could occur at night. Satellite accounts are assumed to be on both SC-2 ND and SC-2 D rate tariffs per information provided by the Town; the solar value on remote meters shown above is a blend of the value on these two rate tariffs (weighted toward SC-2 D). Solar savings are higher if non-demand meters are chosen as the satellite accounts due to the higher usage charges on these meters.

Notes: Cash flows are not discounted. SREC value is not considered, there is no market for SRECs in New York currently. Electric supply charges are based on average pricing during 1 year period from July 1 2014 – June 30 2015.

Cash Flow with Remote Net Metering – PPA at $0.06/kWh											
	A	B	C	D = B*C	E	F	G = A*F	H	J = (B-A)*H	K = D+E+G+J	K(running total)
Year	**Energy Usage on Host Meter (kWh)**	**Solar Output (kWh)**	**PPA Rate**	**PPA Bill**	**NYSERDA Solar Incentive**	**Solar Offset Value on Host Meter**	**Solar Savings on Host Meter**	**Solar Offset Value on Remote Meter(s)**	**Solar Savings on Remote Meter(s)**	**Net Solar Benefit (annual)**	**Net Solar Benefit (cumulative)**
1	133,520	250,557	$0.060	-$15,033	$20,520	$0.059	$7,866	$0.078	$9,122	$22,475	$22,475
2	133,520	249,304	$0.061	-$15,257	$20,520	$0.061	$8,102	$0.080	$9,295	$22,660	$45,136
3	133,520	248,058	$0.062	-$15,485	$20,520	$0.063	$8,346	$0.083	$9,471	$22,852	$67,987
4	133,520	246,817	$0.064	-$15,715	$20,520	$0.064	$8,596	$0.085	$9,650	$23,050	$91,038
5	133,520	245,583	$0.065	-$15,950	$0	$0.066	$8,854	$0.088	$9,831	$2,735	$93,772
6	133,520	244,355	$0.066	-$16,187	$0	$0.068	$9,119	$0.090	$10,015	$2,947	$96,719
7	133,520	243,133	$0.068	-$16,428	$0	$0.070	$9,393	$0.093	$10,201	$3,166	$99,885
8	133,520	241,918	$0.069	-$16,673	$0	$0.072	$9,675	$0.096	$10,391	$3,393	$103,278
9	133,520	240,708	$0.070	-$16,922	$0	$0.075	$9,965	$0.099	$10,583	$3,627	$106,905
10	133,520	239,505	$0.072	-$17,174	$0	$0.077	$10,264	$0.102	$10,778	$3,869	$110,773
11	133,520	238,307	$0.073	-$17,430	$0	$0.079	$10,572	$0.105	$10,976	$4,119	$114,892
12	133,520	237,116	$0.075	-$17,689	$0	$0.082	$10,889	$0.108	$11,177	$4,377	$119,268
13	133,520	235,930	$0.076	-$17,953	$0	$0.084	$11,216	$0.111	$11,381	$4,643	$123,912
14	133,520	234,750	$0.078	-$18,220	$0	$0.087	$11,552	$0.114	$11,587	$4,919	$128,830
15	133,520	233,577	$0.079	-$18,492	$0	$0.089	$11,899	$0.118	$11,796	$5,203	$134,034
16	133,520	232,409	$0.081	-$18,767	$0	$0.092	$12,256	$0.121	$12,008	$5,497	$139,530
17	133,520	231,247	$0.082	-$19,047	$0	$0.095	$12,623	$0.125	$12,223	$5,799	$145,330
18	133,520	230,090	$0.084	-$19,331	$0	$0.097	$13,002	$0.129	$12,441	$6,112	$151,442
19	133,520	228,940	$0.086	-$19,619	$0	$0.100	$13,392	$0.133	$12,662	$6,435	$157,876
20	133,520	227,795	$0.087	-$19,911	$0	$0.103	$13,794	$0.137	$12,885	$6,768	$164,644
…	…	…	…	…	…	…	…	…	…	…	**…**
25	133,520	222,157	$0.097	-$21,440	$0	$0.120	$15,991	$0.158	$14,044	$8,595	$203,852
Total	3,338,000	5,902,104		-$451,381	$82,080		$286,806		$286,347	$203,852	

Assumptions: PPA rate escalator 2%. Utility cost escalator 3%. Electric load profile of typical commercial facility. Peak demand 46 kW before solar, no reduction assumed after solar since peak pumping load could occur at night. Satellite accounts are assumed to be on both SC-2 ND and SC-2 D rate tariffs per information provided by the Town; the solar value on remote meters shown above is a blend of the value on these two rate tariffs (weighted toward SC-2 D). Solar savings are higher if non-demand meters are chosen as the satellite accounts due to the higher usage charges on these meters.

Notes: Cash flows are not discounted. SREC value is not considered, there is no market for SRECs in New York currently. Electric supply charges are based on average pricing during 1 year period from July 1 2014 – June 30 2015.

Cash Flow with Remote Net Metering – PPA at $0.09/kWh											
	A	B	C	D = B*C	E	F	G = A*F	H	J = (B-A)*H	K = D+E+G+J	K(running total)
Year	**Energy Usage on Host Meter (kWh)**	**Solar Output (kWh)**	**PPA Rate**	**PPA Bill**	**NYSERDA Solar Incentive**	**Solar Offset Value on Host Meter**	**Solar Savings on Host Meter**	**Solar Offset Value on Remote Meter(s)**	**Solar Savings on Remote Meter(s)**	**Net Solar Benefit (annual)**	**Net Solar Benefit (cumulative)**
1	133,520	250,557	$0.090	-$22,550	$20,520	$0.059	$7,866	$0.078	$9,122	$14,959	$14,959
2	133,520	249,304	$0.092	-$22,886	$20,520	$0.061	$8,102	$0.080	$9,295	$15,032	$29,990
3	133,520	248,058	$0.094	-$23,227	$20,520	$0.063	$8,346	$0.083	$9,471	$15,110	$45,100
4	133,520	246,817	$0.096	-$23,573	$20,520	$0.064	$8,596	$0.085	$9,650	$15,192	$60,292
5	133,520	245,583	$0.097	-$23,924	$0	$0.066	$8,854	$0.088	$9,831	-$5,240	$55,052
6	133,520	244,355	$0.099	-$24,281	$0	$0.068	$9,119	$0.090	$10,015	-$5,147	$49,905
7	133,520	243,133	$0.101	-$24,643	$0	$0.070	$9,393	$0.093	$10,201	-$5,048	$44,857
8	133,520	241,918	$0.103	-$25,010	$0	$0.072	$9,675	$0.096	$10,391	-$4,944	$39,913
9	133,520	240,708	$0.105	-$25,383	$0	$0.075	$9,965	$0.099	$10,583	-$4,834	$35,079
10	133,520	239,505	$0.108	-$25,761	$0	$0.077	$10,264	$0.102	$10,778	-$4,718	$30,361
11	133,520	238,307	$0.110	-$26,145	$0	$0.079	$10,572	$0.105	$10,976	-$4,596	$25,764
12	133,520	237,116	$0.112	-$26,534	$0	$0.082	$10,889	$0.108	$11,177	-$4,468	$21,296
13	133,520	235,930	$0.114	-$26,929	$0	$0.084	$11,216	$0.111	$11,381	-$4,333	$16,963
14	133,520	234,750	$0.116	-$27,331	$0	$0.087	$11,552	$0.114	$11,587	-$4,192	$12,772
15	133,520	233,577	$0.119	-$27,738	$0	$0.089	$11,899	$0.118	$11,796	-$4,043	$8,729
16	133,520	232,409	$0.121	-$28,151	$0	$0.092	$12,256	$0.121	$12,008	-$3,887	$4,842
17	133,520	231,247	$0.124	-$28,571	$0	$0.095	$12,623	$0.125	$12,223	-$3,724	$1,117
18	133,520	230,090	$0.126	-$28,996	$0	$0.097	$13,002	$0.129	$12,441	-$3,553	-$2,436
19	133,520	228,940	$0.129	-$29,428	$0	$0.100	$13,392	$0.133	$12,662	-$3,375	-$5,811
20	133,520	227,795	$0.131	-$29,867	$0	$0.103	$13,794	$0.137	$12,885	-$3,188	-$8,999
…	…	…	…	…	…	…	…	…	…	…	…
25	133,520	222,157	$0.145	-$32,159	$0	$0.120	$15,991	$0.158	$14,044	-$2,125	-$21,838
Total	3,338,000	5,902,104		-$677,072	$82,080		$286,806		$286,347	-$21,838	

Assumptions: PPA rate escalator 2%. Utility cost escalator 3%. Electric load profile of typical commercial facility. Peak demand 46 kW before solar, no reduction assumed after solar since peak pumping load could occur at night. Satellite accounts are assumed to be on both SC-2 ND and SC-2 D rate tariffs per information provided by the Town; the solar value on remote meters shown above is a blend of the value on these two rate tariffs (weighted toward SC-2 D). Solar savings are higher if non-demand meters are chosen as the satellite accounts due to the higher usage charges on these meters.

Notes: Cash flows are not discounted. SREC value is not considered, there is no market for SRECs in New York currently. Electric supply charges are based on average pricing during 1 year period from July 1 2014 – June 30 2015

Site Photos


Main service and National Grid meter #05538513


Service drop and area for inverter


Looking east/southeast from main building


Looking south along driveway


Looking north toward main building


Looking east at south end of property

FINANCE AND ECONOMIC DETAILS

A cost/benefit analysis was conducted based on the review of the Village's historical energy usage, which allows for a detailed projection of potential avoided energy and demand costs. Financial modeling has been performed for both primary ownership options: a direct purchase and a power purchase agreement. The results are presented within the detailed section for each site. The analysis includes only arrays with development priority scores of "A" which are recommended for immediate deployment.

Avoided costs from energy and demand charges provide the primary financial benefit of a solar PV system. The key drivers to ensure maximum avoided costs are a proper system design, which affects system production and long-term operations, as well as the utility rate schedule, which determines the value for the energy produced. The financial analysis assumes the solar output reduces kWh energy charges at the retail rate, which is the valuation structure under a net metering tariff. As for demand charges, it is possible for a solar PV system to reduce the maximum demand in a given month and/or year. However, the demand reduction percentage is difficult to reliably predict in any given month due to the variability of energy usage and solar output, among other factors. This financial analysis assumes a conservative estimate of 10% demand reduction from solar PV – that is, utility demand charges will be reduced by 10% of the PV system nameplate size.

Additional financial analysis and explanation of financing options and incentives is included in the next section.

Direct Purchase Option

The municipal agency would use existing cash reserves to purchase the system outright (or finance the purchase through a loan). Under this scenario, the agency is responsible for all ownership concerns, including O&M, regular system cleaning, insurance, and monitoring of system production. This requires a significant up-front capital expenditure and on-going operational costs.

Third-Party Financing Option

The municipal agency would enter into a contract (typically 15 to 20 years with optional extensions) with a third party to purchase all energy produced by a solar PV system installed on property owned by the agency. This third party would own the solar PV system and be fully responsible for all ownership costs, including financing, O&M, insurance, and system output. This structure allows the tax incentives for solar installations to be monetized by the third party. The PPA cash flow chart(s) show 25 year totals, which assumes the PPA deal is renewed at the current rate up to 25 years.

The agency pays a fixed rate for the electricity produced by the solar array. Ideally, this rate is lower than the current cost for electricity supply. PPA's typically have a yearly price escalator of between 0-3%. The value of this escalator relative to the rate at which utility prices increase will affect the savings in future years.

In general, the Direct Purchase option provides the greatest savings over the long-term for an entity with a tax appetite, but does require a significant initial project investment and ongoing O&M for the systems. The third-party option typically provides the greatest savings for tax-exempt entities. Monthly payments tend to be lower than current or projected utility bills starting on day one.

Utility Solar Programs and Tariffs in New York

Type	Description	Availability
Net Metering[1]	*Overview:* Net metering is a policy that allows your electric meter to spin backwards, so that if your solar PV system is producing more power than you are using at any given moment, you are credited for this power rather than losing it to the utility. Utilities in New York offer net metering tariffs that allow customers to obtain full retail value for any solar generation that exceeds real-time demand at the facility. *Size limit:* The state imposes a 2,000 kW limit on the size of net metered solar PV systems. *Excess generation for non-demand meters:* If the PV system generates more electricity than you use in a given billing cycle, the kWh credits roll over to the next billing cycle until they are depleted. *Excess generation for demand meters:* If the PV system generates more electricity than you use in a given billing cycle, the excess kWh credits are converted to a dollar amount to offset demand, customer, and other fixed charges on your bill. The kWh to $ conversion rate is equivalent to your supply price for electricity (including all $/kWh charges on your bill for both supply and T&D). After all eligible charges are offset any excess credits remaining are converted back to kWh and rollover to the next month until depleted.	YES
Remote Net Metering[2]	*Overview:* Utilities in New York offer remote net metering. This means if you produce more solar power than you use on a monthly basis, the excess energy can be credited to other electric accounts in your name. An oversized PV array can be connected to a "host" meter and the excess credits can be allocated to "satellite" meter(s) of the agency's choosing. This requires that both the host and satellite meter(s) have the same customer account name, utility, and NYISO zone. *Credit Value:* The allocation of credits is volumetric rather than monetary (it is the kWh's that are credited to the satellite account, not a $ amount). This means that the offset value solar provides on the satellite account will be based on the usage charges on that meter, rather than on the host meter. *Interconnection Considerations:* Since the host PV system may be significantly oversized relative to on-site usage and will backfeed power into the grid, the utility will more closely scrutinize the system before giving interconnection approval. It is possible that a smaller system size than what is proposed herein will be approved, or that grid infrastructure upgrades will have to be performed at the municipal agency's expense. Interconnection applications are being filed for some projects to make this determination before RFP.	YES

Available Solar Incentives in New York

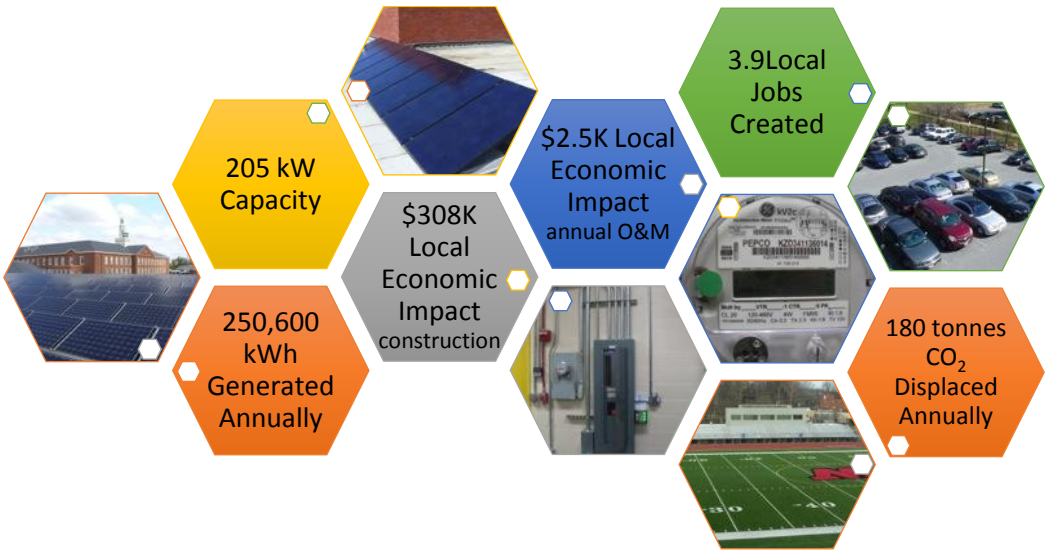
Type	Description	Availability
Federal[3]	Investment tax credit and MACRS accelerated depreciation.	YES
State[4]	NY-Sun Incentive Program. For systems under 200kW, offers a rebate paying a fixed price per watt. For systems over 200kW, a production based incentive paid over 4 years.	YES
Local	No local incentives currently available.	NO

[1] For more information, visit: http://programs.dsireusa.org/system/program/detail/453
[2] For more information, visit: http://programs.dsireusa.org/system/program/detail/453
[3] For more information, visit: http://programs.dsireusa.org/system/program/detail/658
[4] For more information, visit: http://ny-sun.ny.gov/Get-Solar/NY-Sun-Incentive-Program-Overview

ECONOMIC & ENVIRONMENTAL IMPACT

The Village of Cazenovia would realize significant economic and environmental benefits by deploying recommended solar PV systems across campus. The table below summarizes the potential impact that could be achieved by deploying the maximum solar PV capacity.

Economic and Environmental Impact Summary



Economic Impact

Economic benefits include not only reductions to and predictability of future energy expenses, but also local economic activity and job creation. The recommended solar PV projects would stimulate approximately $308K in new, local economic activity during construction and an additional $2.5K per year in operations and maintenance. It would also create 3.9 additional job-years (the equivalent of that many full time jobs for one year).[5]

Environmental Impact

Environmental benefits include the reduction of greenhouse gas emissions, which could support the achievement of the community's sustainability goals, as well as other emissions that negatively impact public health. The installation of 205 kW of solar capacity would generate 250,600 kWh of solar power annually, which would displace over 180 tonnes of CO_2 from being released into the atmosphere from current power sources every year.

[5] The economic impact results provided in this report are based on the National Renewable Energy Laboratory's Jobs and economic Development Impact (JEDI) model and assume that direct local spending and job creation benefits do not include induced impacts, such as waitresses hired to support additional construction workers. Furthermore, manufacturing jobs creation benefits are not included in the estimates, as it is assumed that equipment will come from outside the region.

NEXT STEPS

This report represents the final step in the solar feasibility assessment process and now requires Village internal stakeholder review. CNY RPDB encourages the agency to continue participation in the Solarize CNY project by selecting some or all recommended sites for inclusion in the forthcoming RFP solicitation. Optony has found that participants in collaborative solar procurements often realize significant savings in both total system costs and transactional time and costs when compared to single-site solar procurements.

If the Village decides to join the RFP with selected sites, the following next steps have been identified to move this project along quickly and achieve the desired impact on cost reduction and renewable energy production.

1) **Review Findings.** Use the report's findings to select sites to include in the RFP.
2) **Sign MOU.** Commit to participating in the procurement so the bid package can be finalized.
3) **Finalize and Issue RFP.** After the RPDB project team has received sites from each agency the team will publish and disseminate it widely on behalf of the buying group.
4) **Evaluate Vendors, Proposals, Benefits, and Costs.** In terms of design, price, performance, and capabilities, ensuring industry best practices are offered and contracted.
5) **Select Vendor(s) and Negotiate Contracts**. Select vendor(s) and review contract language to ensure maximum benefit for each participant.
6) **Plan for Construction in 2016.** Finalize financial arrangements, system design, and required building documents to begin installation and construction phase.

METHODOLOGY & ASSUMPTIONS

Optony uses a rigorous methodology and client-focused approach to evaluate potential solar sites that goes well beyond the effort that is provided by system installers, finance companies, or even the utility companies. We combine our extensive experience in the solar field to balance the tradeoffs between technology, system design, rebates and incentive opportunities, electric demand and rate schedules, solar economics, and available funding sources to develop an independent assessment of the realistic options at each site to meet the client's specific needs and goals.

Technical Assessment Methodology Used in this Report:

- Optony uses a proprietary approach to performing a solar site technical analysis that uses dynamic scenario creation and evaluation processes along with publicly and privately developed software and tools to determine all the relevant variables and tradeoffs between options. These tools may include Helioscope, PVsyst, Measure Map Pro, Google Earth, AutoCAD, and others.
- Solar access is defined as the availability of direct sunlight that reaches the photovoltaic panels. A higher solar access percentage reflects fewer shading obstructions. Shading obstructions may include surrounding buildings, mechanical and other equipment on rooftops, architectural features of the building, tall trees, and other surrounding vegetation. To calculate available space at each site, the Optony team visits the site (where applicable), compares available areas with aerial views from Google Earth and performs shading analysis using Solmetric SunEye.
- Optony uses industry standard tools as well as proprietary financial modeling software with local utility rate schedules and typical meteorological year (TMY) 3 data, and neutral to conservative inflation, renewable energy certificate/credit and Investment Tax Credit assumptions in all financial modeling. This approach allows Optony to present the client with realistic forecasting that reduces risks and estimates realistic project returns.
- Project timing is very important in the overall economics of a solar system installation due to the time-sensitive nature of the various Federal, state, utility, and local incentives. Optony has evaluated the impact for construction completion by August 31, 2017.

Financial Assumptions Used in this Report:

The assumptions and price points used in the financial modeling are based on current local market conditions in New York, as of October 2015, for a mid-range scenario. While conservative and aggressive scenarios have also been analyzed, the results are not included in this report.

- **Utility Supply and Delivery Rates:** Obtained from customer's electricity bills and/or utility tariff.
- **Utility Escalation Rate:** 3% per year. While difficult to predict on a year-to-year basis, 3% is the long term (50+ year) historical average.
- **O&M Cost:** $15/kW per year for all system types. For PPA's, O&M is included in the PPA price.
- **O&M Escalation Rate:** 3% per year.
- **Panel Degradation Rate:** 0.5% per year.
- **Discount Rate:** Not used. Future cash flows are shown undiscounted.
- **Incentives:** The NY-Sun incentive values are tiered and drop over time as more capacity is installed. This report assumes incentives will be in Block 8 for the under 200kW program and Block 2 for the over 200kW program.

Disclaimer: This report is provided as an illustration of the potential benefits of a solar energy system. The information presented in this report should not be construed as legal, tax or accounting advice. You should consult with professional advisors familiar with your particular factual situation for advice concerning specific matters before making any decision. Furthermore, this report may contain references to certain laws, regulations, tax incentives, rebates, programs and third party provided information, which will change over time.

ABOUT CNY RPDB

The Central New York Regional Planning and Development Board (CNY RPDB) is a public agency that was established in 1966 by Cayuga, Cortland, Madison, Onondaga, and Oswego Counties under the provisions of Article 12B of the New York State General Municipal Law.

The CNY RPDB is governed by a board of directors that is appointed by its five member counties. Financial support for the agency is provided by member county contributions, state and federal grants, and contract service revenue. The CNY RPDB provides a comprehensive range of services associated with the growth and development of communities in Central New York

For more information, visit http://www.cnyrpdb.org/

ABOUT OPTONY

Optony Inc. is a global research and consulting services firm focused on enabling government and commercial organizations to bridge the gap between clean energy goals and real-world results. Optony's core services offer a systematic approach to planning, implementing, and managing commercial and utility-grade renewable power systems, while simultaneously navigating the dramatic and rapid changes in the solar industry; from emerging technologies and system designs to government incentives and private/public financing options. Leveraging our independence, domain expertise and unique market position, our clients are empowered to make informed decisions that reduce risk, optimize operations, and deliver the greatest long-term return on their solar investments. Based in Silicon Valley, Optony has offices in Santa Clara, Washington DC, Denver, Chicago, and Beijing.

For more information, visit optonyusa.com

APPENDIX A: ILLUSTRATIVE SOLAR DESIGN PHOTOS

Fixed-Tilt Rooftop Systems

Fixed-Tilt (Cantilevered) Shade Structures

Fixed-Tilt Ground-Mounted Systems