AKF GROUP, LLC

AKF engineers

SUNY PURCHASE CAMPUS

ALTERNATE PHOTOVOLTAIC SYSTEMS REPORT

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I. EXECUTIVE SUMMARY

A. The objective of this report is to analyze the academic buildings on campus with respect to the feasibility and cost effectiveness for the installation of renewable solar energy systems. This study summarizes our findings of a comparison study of various applicable photovoltaic (PV) system installations. The buildings were evaluated for their orientation, roof type, size, configuration; and the need for roof replacement (the roof condition report prepared by A.M. Technologies, Inc. was taken into consideration). Fifteen (15) academic buildings and the new residence hall were selected as a first priority and included in this report (refer to the Appendix 'A' for the list of buildings).

B. In summary, we found that the installation of photovoltaic systems is not justified from a purely economical cost/benefit standpoint. However, you may wish to weigh other factors in your decision making, such as carbon emissions reduction and financing of the project; for estimated savings refer to Tables 2 and 3 of Appendix 'A'.

C. A monocrystalline type roof mounted PV panel manufactured by SUNPOWER was selected as the basis of design because it is the highest peak power producing and cost effective solar system modules available on the market at the present time. Three (3) options for mounting configuration were evaluated: Option 1 is fixed PV panels mounted flat on the roof; Option 2 is fixed PV panels mounted in brackets at 25º angle; and Option 3 is the single axis active tracking PV panels. Building integrated photovoltaic (BIPV) panels were also analyzed for certain buildings; however, they proved not to be an economical option.

The solar system components also include inverter assembly and the PV kilowatt-demand meter along with pertinent conduit and wiring. All DC power generating components including inverter should be installed in a proximity to PV panels at the roof level to minimize the line losses and associated cost. Disconnect switch and PV meter should be installed in the building electric switchgear room.

D. The total power generated by PV arrays in each building was computed and included in table 1 of Appendix 'A'. The estimated PV system contribution into the SUNY Campus electricity consumption was calculated utilizing available monthly electrical utility bills and is ranging from 7.8% to 23%, as indicated in Table 2 of Appendix 'A'. The associated initial cost of PV system installation, yearly savings, annual loan payments and per-cent savings were put together in Table 3 of Appendix 'A'.

E. It is important to point out that SUNY Purchase Campus does not qualify for any federal or state rebates presently available for the photovoltaic system installations. SUNY Purchase Campus is exempt from receiving federal tax credits for photovoltaic systems because it is a state university that doesn't pay federal taxes. Purchase College does not qualify for any New York State Energy

Research and Development Authority (NYSERDA) rebates because its utility company is New York Power Authority (NYPA), a state owned utility company. Only facilities that use private New York utility companies qualify for NYSERDA rebates.

F. There is a Power- Purchase-Agreement (PPA) program available for various facilities. According to PPA program the PV system is installed, maintained and owned by a third party, which in turn offers a discount electrical rate to the facility if that facility pays into "System's Benefits Charge" (SBC). But due to the fact that Purchase College does not pay into SBC, it does not qualify for this program.

II. INTRODUCTION

A. The Capital Facilities Planning Department of Purchase College has retained AKF Group, LLC (AKF) to conduct a study of various on-campus renewable sources of solar energy opportunities and create a report in which the most appropriate solar systems are compared, evaluated; and the appropriate recommendations are offered. This report paves the way for execution of the most suitable on-site renewable energy systems at the Purchase College campus and may ultimately serve as a prototype for other State Universities.

B. AKF and Capital Facilities Planning Group had discussed all academic, residential and support buildings on campus with respect to a possible implementation of renewable solar energy systems and created the list of buildings most fitting for incorporation of the on-site renewable energy systems. The following factors were considered during this selection:

- The roof mounted photovoltaic array systems were selected as the most appropriate and cost effective type of the renewable energy systems for the campus. The solar thermal technologies were also discussed and found to be inappropriate for this task due to their relative complexity and cost ineffectiveness; therefore it was decided not to include the evaluation of the solar thermal systems in this report.

- Most of the academic buildings have a true north-south orientation with respect to position and angle of the sun during morning and afternoon hours, thus offering the optimal sun rays output in conjunction with the proper layout of photovoltaic modules.

- The roof materials, age, condition and structure were analyzed in order to prioritize the list of buildings. The available roof conditions report prepared by A.M. Technologies, Inc., was reviewed and evaluated during the development of this list.

C. Based on the preliminary evaluation of the campus buildings, they were separated into three (3) categories, as follows:

- Fifteen (15) academic buildings listed in the Appendix were chosen as suitable for photovoltaic array system installations and, therefore, are included in the report.

- The residential complexes and apartment buildings were prioritized as category #2 and only newly built Residence Hall (building #84) was included in the study because it was designed to LEED standards.

- The administrative and support buildings were put into category #3 and are not included in the report.

D. The team of AKF consulting engineers has been assigned to perform detailed survey of the selected academic buildings and compile the findings into PV study tables. The team began the task with obtaining from the Facilities Management Department all applicable existing architectural and structural roof plans; and electrical set of drawings of the building single line diagrams, as well as the switchgear room layouts.

E. Each roof of the academic building of choice was surveyed and the roof plans marked-up to reflect the new and existing equipment, piping and roof drain locations along with the roof structure changes and modifications. The applicable measurements were made in order to accurately calculate the roof surface area available for PV panels and equipment installation.

F. Based upon this information, calculations were performed and complied into respective tables in Appendix 'A' to determine the following:

- Gross and net PV power output based on usable roof area layout and solar panel peak power generation.
- PV array savings and electrical consumption cost with inclusion of PV system installation.
- Carbon emission reductions from PV system installation.
- PV system return on investment based on 100% financing of installation over 25 years. Please note that 4% anticipated annual increase of the electricity cost is not considered in these calculations, thus making per cent savings more attractive.

G. Concurrently, each building's electric switchgear room was surveyed to obtain and confirm the main switchgear data and layout, location of the building electric metering assembly; and free wall space availability for the PV system disconnect switch and kWh-demand meter installations.

H. For photographs of applicable building roofs and electric rooms refer to the Appendix 'B'.

III. ANALYSIS OF PROPOSED PHOTOVOLTAIC SYSTEMS

A. Three (3) types of PV module mounting configurations were considered for this study: flat roof-mounted; 25° angle tilt roof mounted; and single-axis tracking pole mounted on the ground. They were labeled as Options 1, 2 and 3 and inserted in the Table 1 of Appendix 'A'.

B. After initial review of various types of photovoltaic panels presently available on the market, a 315watt monocrystalline type panel was selected as the basis of design because it has the highest peak power output per unit area.

C. Each PV module is constructed with 96 monocrystalline type solar cells, all-back contact configuration, 36 inch long output cable, front tempered glass, and clear anodized aluminum alloy frame. Each module weighs 53 lbs. and has the following dimensions: 61.3 "L x 41.2"W x 1.8" D. The individual module's characteristics are as follows:

• Peak Power	315 Watts
• Peak Power per Unit Area	17.9 W/sq. ft.
• Rated Voltage	54.7 Volts
• Rated Current	5.76 Amps
• Maximum System Voltage	600 Volts
• Power Temperature Coefficient	.38%/ºC
• Temperature Range	-40ºC to +85ºC
• Max Weight Load	50 lbs/sq. ft.
• Warranty	25 year limited power warranty 5 year limited product warranty
• UL Listed	Class C Fire rating

D. In addition to solar panels, the PV system installation is comprised of the following components:

- An inverter assembly is housed in a weather-proof NEMA-3R enclosure and normally should be installed on the roof near the solar panel racks, thus minimizing the voltage drop losses and associated material cost on all direct-current cabling between solar modules and inverter assemblies. The inverter includes an integrated load-break rated direct-current (DC) and alternating-current (AC) disconnect switches and is sized based on the total output of the solar panels connected to the assembly. The inverter assembly is furnished with LCD display and data communication and collection options.

- Intermediate electrical panel(s) connected to AC side of the inverter assemblies might be required to collect all output power from the solar

panel racks and connect to the kWh peak demand meter registering the PV system power generation.

- The PV kilowatt-demand meter assembly can be either located on the roof or in the building electric room near the electric sub-meter. The fused disconnect switch sized for a total solar power output is connected to PV meter on one end and to the main distribution board serving the building loads on the other end. Depending on a distance from the roof's solar system to the main switchboard and the path for feeder routing, the PV disconnect switch could be moved closer to electric panels located in a proximity to the PV inverters. PV system meters should have the capability to transmit all data gathering information to a campus data center via wireless website link.

E. The option 1 and 2 PV panels are the rack-mounted type of the same construction with the only difference being that the option 1 panels are mounted flat on the roof and option 2 panels are mounted at 25º angle.

F. The rack-mounted solar modules are supported by a metal framework. The rack is bolted to the roof's structural members. Rack-mounting of the panels proves to be the most energy producing due to the increased air circulation (less thermal losses) and easier access to electrical cabling and connections, therefore better servicing of installation.

G. Considering that the most sunlight per square foot falls on a surface perpendicular to the angle of sun, the sun's altitude in this region and the type of roof construction is critical in selection of the optimal PV panels mounting. It was determined that the mounting of panels at the composite 25º angle would create the most solar power output. Below are the types of panel installations that were considered for this report:

- Flat roofs: Rack-mounted panels positioned at 25º angle.

- Sloped roofs: Rack-mounted modules positioned parallel to the angle of the roof's slope.

- Aluminum roofs: Solar panels stand-off mounted on special S-5 clips (S shape) to the roof's seams. PV panel's position would be parallel to the roof construction.

H. The initial cost for photovoltaic panel installations was estimated based on the industry standards. For fixed array panels at 0° tilt and fixed array panels at 25° tilt, the budget installation cost is approximately $9/Watt. This cost includes all system components, cabling, the ballast for the panels, and the labor for installation and connection of the system components.

I. Option 3 is single axis tracking PV system consisting of the PV array mounted on a pole mount which tracks the sun in its path across the sky by engaging motor(s) powered from integrated PV panel. Tracking mounts that follow only the sun's azimuth are called single axis trackers and appear to be more cost-effective. Since tracking PV systems are located on the ground, in order to be cost-effective they would require significant area. The mount is installed on 4 to 6-inch diameter pipe which set in reinforced concrete footings and has an adequate height above the ground level to allow unobstructed movement above snow, debris, etc. Tracking units may enhance the PV system performance up to 30% but can also add a significant cost due to complexity of the controls and the increased maintenance of a tracking system. Therefore, considering the campus building map and distances to the underground electrical grid, the tracking PV system is proven not to be a viable option for the most of the campus buildings. The initial installation cost of the tracking PV system is approximately $12/Watt vs. $9/Watt for fixed array system and is attributed to additional costs for the motors, controls and software to operate the tracking aspect of the panels.

IV. RECOMMENDATIONS

A. AKF is recommending that SUNY Purchase Campus use Option 2, fixed array photovoltaic panels installed at 25° angle above the horizontal plane on flat roofs and parallel to the pitched roofs. The panels installed at this angle will absorb an average of 4.5 hours of sunlight throughout the year. This average hourly sunlight use is based on the sun's position at the varying times of day and year. Since both the flat panels and the angled panels are prefabricated, there is relatively no difference in their installation cost but Option 2 generates a higher solar power output. Considering that there are no rebates available for SUNY Purchase Campus, the average break-even point for each building using Option 2 can be achieved in 43.1 years.

B. Option 1 is not as advantageous as Option 2 because the panels, which would lay flat on the roof surface, only absorb an average of 4 hours vs. 4.5 hours of sunlight throughout the year. The difference between Option 1 and 2 occurs because the ideal position for PV panels is perpendicular to the sun. Since New York is in the northern hemisphere, the panels should be angled toward south for the most solar power output. For the roofs that are pitched and facing south the hours of solar absorption will be the same as Option 2 because the panels will be at the same angle. With no rebates available, the average break-even point for each building using Option 1 would be between 46.2 and 48.5 years.

C. Option 3 was not chosen due to the cost and the fact that the panels would have to be placed on the ground. While SUNY Purchase campus has the ground space available for this PV system installation, its connection to the campus underground electrical power distribution grid could be more costly than other option installations. Also, the single axis tracking PV system is more expensive than the other two options because of the addition of motors, framing, control equipment and control software. This system has to consider many factors, including sun position, time of day and year, weather, etc., to accurately track the sun. While it would be ideal for the panels to always be perpendicular to the sun throughout the day, this system only receives an average of 1 extra hour of solar power. Additionally, Option 1 and Option 2 PV system installations would occur concurrently with the planned roof replacements on several academic buildings. For these reasons the tracking system is not recommended for this project. The average break-even point for each building using Option 3 would be 46.2 years.

D. The savings that each option will produce for the Priority 1 buildings is shown in Table 2 & 3 of Appendix "A".

E. Since SUNY Purchase Campus is a state university and not eligible for any rebates and incentive programs, the budget costs for installation of any PV system will be expensive. We recommend that this project be completed in phases with planning of installing smaller size PV systems on selected roofs over an extended period of time. For example, instead of covering the entire roof of some of the large buildings, a smaller amount of PV panels can be installed on the more ideal

and less obstructed portions of the roofs. These smaller installments of PV panels can also be used as a marketing tool showing that SUNY Purchase Campus is taking a leading role in developing on-site renewable energies.

F. The available information on carbon emission generated by NYPA was utilized in our Table 2 to bring to your attention that PV array system can bring a significant reduction of carbon emission and play an important role in improving our region's environment.

G. Should SUNY Purchase College decide to implement the PV system installation on any of the buildings by financing the project, we included in Table 3 the computations of the loan annual payments including associated savings from PV system installation and per cent savings from loan amortization.

END OF REPORT

V. APPENDIX

A. PV System Calculation Tables

B. Photographs

SUNY PURCHASE CAMPUS PV STUDY

Table 1: PV System Power Output Calculation

Option 1: Fixed Array @ 0°
Option 2: Fixed Array @ 25°
Option 3: Single Axis Tracker @ 25° (Must be ground mounted)

Panel Manufacturer	Panel Dimensions (ft)	Panel Size (sq.ft.)	Panel Peak Power (W)	Panel Rated Voltage (V)	Panel Open Circuit Voltage (V)	Panel Short Circuit Current (A)	Panel Rated Current (A)
SUNPOWER	L:5 x W:3.5	18	315	54.7	64.6	6.14	5.76

Bldg Name	Bldg #	Roof Type	Roof Material	Option	Useable area (sq.ft.)	# of Panels	Panel Layout Reduction**	Gross Output (kW)	Net Output (kW)***	Hours of Use/Year	Total Output (kWh/yr)****
Physical Education*	42	Flat	Gravel	1	35,647	1980	0.73	455	316	4	461,984
				2						4.5	519,732
				3						5.6	646,777
New Residence Hall*	84	Pitched	Shingles	1	13,972	776	0.66	161	112	4	163,713
				2						4.5	184,177
				3						5.6	229,198
Humanities	41	Flat	Gravel	1	29,558	1642	0.66	341	237	4	346,338
				2						4.5	389,630
				3						5.6	484,873
Campus Center South*	43	Flat/Pitched	Gravel/Metal	1	6,139	341	0.66	71	49	4	71,932
				2						4.5	80,924
				3						5.6	100,705
Butler Bldg	60	Pitched	Metal	1	17,715	984	0.66	205	142	4	207,571
				2						4.5	233,517
				3						5.6	290,599
Campus Center North*	22	Flat/Pitched	EPDM rubber	1	11,435	635	0.66	132	92	4	133,986
				2						4.5	150,735
				3						5.6	187,581
Dance	56	Flat	EPDM rubber	1	43,077	2393	0.73	550	382	4	558,276
				2						4.5	628,061
				3						5.6	781,587
Social Science	55	Flat	Gravel	1	13,587	755	0.73	174	121	4	176,087
				2						4.5	198,098
				3						5.6	246,522
Bookstore/Post Office	49a	Flat	EPDM rubber	1	9,523	529	0.73	122	85	4	123,418
				2						4.5	138,845
				3						5.6	172,785
Library*	49	Flat/Pitched	EPDM rubber/Metal	1	14,421	801	0.66	167	116	4	168,974
				2						4.5	190,096
				3						5.6	236,564
Natural Science*	52	Flat/Pitched	EPDM rubber/Concrete	1	8,578	477	0.66	99	69	4	100,510
				2						4.5	113,074
				3						5.6	140,714
Neuberger Museum of Art*	40	Flat/Pitched	EPDM rubber/Concrete	1	9,391	522	0.66	108	75	4	110,036
				2						4.5	123,791
				3						5.6	154,051
Visual Arts*	58	Flat/Pitched	EPDM rubber/Metal	1	23,368	1298	0.66	270	188	4	273,808
				2						4.5	308,034
				3						5.6	383,331
Music*	57	Flat	EPDM rubber	1	28,396	1578	0.66	328	228	4	332,722
				2						4.5	374,313
				3						5.6	465,811
Performing Arts Center*	50	Flat	EPDM rubber	1	64,461	3581	0.73	823	572	4	835,412
				2						4.5	939,838
				3						5.6	1,169,577

* Multiple Bldgs
** Reduction for roof shape: Square (0.73) & Rectangle (0.66)
*** Reductions for PV Temp losses (0.88), Derate Factor (0.84) & Inverter Efficiency (0.94)
**** 365 days used for kWh output calculation

SUNY PURCHASE CAMPUS PV STUDY

Table 2: PV System Contribution to Campus Electricity Consumption

Option 1: Fixed Array @ 0°
Option 2: Fixed Array @ 25°
Option 3: Single Axis Tracker @ 25° (Must be ground mounted)

Month	Option	Electric Consumption (kWh)*	PV Contribution (kWh)	% Electric Consumption Reduction with PV Panels (kWh)	Electric Consumption Cost*	PV Savings	Estimated Electric Consumption Cost with PV Panels
Nov-07	1	3,120,000	200,454.26	6.4%	$257,828.30	$25,457.69	$232,370.61
	2		242,215.56	7.8%		$30,761.38	$227,066.92
	3		283,976.87	9.1%		$36,065.06	$221,763.24
Dec-07	1	2,496,000	146,721.38	5.9%	$262,487.41	$18,633.62	$243,853.79
	2		207,136.07	8.3%		$26,306.28	$236,181.13
	3		241,658.75	9.7%		$30,690.66	$231,796.75
Jan-08	1	2,582,400	207,136.07	8.0%	$215,510.88	$26,306.28	$189,204.60
	2		250,289.42	9.7%		$31,786.76	$183,724.12
	3		293,442.76	11.4%		$37,267.23	$178,243.65
Feb-08	1	2,524,800	249,454.19	9.9%	$242,631.00	$31,680.68	$210,950.32
	2		288,431.41	11.4%		$36,630.79	$206,000.21
	3		350,794.95	13.9%		$44,550.96	$198,080.04
Mar-08	1	2,534,400	371,118.79	14.6%	$275,988.22	$47,132.09	$228,856.13
	2		397,010.80	15.7%		$50,420.37	$225,567.85
	3		491,948.16	19.4%		$62,477.42	$213,510.80
Apr-08	1	2,755,200	459,374.34	16.7%	$276,430.75	$58,340.54	$218,090.21
	2		442,669.82	16.1%		$56,219.07	$220,211.68
	3		559,601.47	20.3%		$71,069.39	$205,361.36
May-08	1	2,179,200	560,993.52	25.7%	$306,207.48	$71,246.18	$234,961.30
	2		500,578.83	23.0%		$63,573.51	$242,633.97
	3		621,408.20	28.5%		$78,918.84	$227,288.64
Jun-08	1	2,812,800	567,953.73	20.2%	$217,445.85	$72,130.12	$145,315.73
	2		501,135.65	17.8%		$63,644.23	$153,801.62
	3		626,419.56	22.3%		$79,555.28	$137,890.57
Jul-08	1	3,552,000	578,254.86	16.3%	$296,651.16	$73,438.37	$223,212.79
	2		517,840.17	14.6%		$65,765.70	$230,885.46
	3		647,300.21	18.2%		$82,207.13	$214,444.03
Aug-08	1	2,812,800	517,840.17	18.4%	$407,282.55	$65,765.70	$341,516.85
	2		491,948.16	17.5%		$62,477.42	$344,805.13
	3		612,777.53	21.8%		$77,822.75	$329,459.80
Sep-08	1	2,966,400	417,613.04	14.1%	$334,820.39	$53,036.86	$281,783.53
	2		417,613.04	14.1%		$53,036.86	$281,783.53
	3		517,840.17	17.5%		$65,765.70	$269,054.69
Oct-08	1	2,582,400	310,704.10	12.0%	$327,807.15	$39,459.42	$288,347.73
	2		353,857.45	13.7%		$44,939.90	$282,867.25
	3		440,164.14	17.0%		$55,900.85	$271,906.30

NOTE:

1. This column represents the total campus electric usage for the months of November 2007 through October 2008.
2. The PV contribution is only for Priority 1 buildings.

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Table 3: PV System Return on Investment

Option 1: Fixed Array @ 0°
Option 2: Fixed Array @ 25°
Option 3: Single Axis Tracker @ 25° (Must be ground mounted)

Bldg Name	Bldg #	Option	Useable area (sq.ft.)	Total Output (kWh/yr)**	Yearly Savings***	Initial Cost****	1 Year Return on Investment	25 Year Savings	25 Year Return on Investment	Break Even Point (yr)
Physical Education*	42	1	35,647	461,984	$58,672	$2,847,844	2.06%	$2,443,445	85.8%	48.5
		2		519,732	$66,006	$2,847,844	2.32%	$2,748,876	96.5%	43.1
		3		646,777	$82,141	$3,797,126	2.16%	$3,420,823	90.1%	46.2
New Residence Hall*	84	1	13,972	184,177	$23,390	$1,009,190	2.32%	$974,119	96.5%	43.1
		2		184,177	$23,390	$1,009,190	2.32%	$974,119	96.5%	43.1
		3		229,198	$29,108	$1,345,586	2.16%	$1,212,236	90.1%	46.2
Humanities	41	1	29,558	346,338	$43,985	$2,134,958	2.06%	$1,831,790	85.8%	48.5
		2		389,630	$49,483	$2,134,958	2.32%	$2,060,764	96.5%	43.1
		3		484,873	$61,579	$2,846,611	2.16%	$2,564,506	90.1%	46.2
Campus Center South*	43	1	6,139	75,529	$9,592	$443,417	2.16%	$399,473	90.1%	46.2
		2		80,924	$10,277	$443,417	2.32%	$428,007	96.5%	43.1
		3		100,705	$12,790	$591,222	2.16%	$532,631	90.1%	46.2
Butler Bldg	60	1	17,715	233,517	$29,657	$1,279,545	2.32%	$1,235,078	96.5%	43.1
		2		233,517	$29,657	$1,279,545	2.32%	$1,235,078	96.5%	43.1
		3		290,599	$36,906	$1,706,060	2.16%	$1,536,986	90.1%	46.2
Campus Center North*	22	1	11,435	140,686	$17,867	$825,944	2.16%	$744,091	90.1%	46.2
		2		150,735	$19,143	$825,944	2.32%	$797,241	96.5%	43.1
		3		187,581	$23,823	$1,101,258	2.16%	$992,122	90.1%	46.2
Dance	56	1	43,077	558,276	$70,901	$3,441,428	2.06%	$2,952,739	85.8%	48.5
		2		628,061	$79,764	$3,441,428	2.32%	$3,321,832	96.5%	43.1
		3		781,587	$99,261	$4,588,571	2.16%	$4,133,835	90.1%	46.2
Social Science	55	1	13,587	176,087	$22,363	$1,085,467	2.06%	$931,329	85.8%	48.5
		2		198,098	$25,158	$1,085,467	2.32%	$1,047,745	96.5%	43.1
		3		246,522	$31,308	$1,447,290	2.16%	$1,303,861	90.1%	46.2
Bookstore/Post Office	49a	1	9,523	123,418	$15,674	$760,794	2.06%	$652,760	85.8%	48.5
		2		138,845	$17,633	$760,794	2.32%	$734,355	96.5%	43.1
		3		172,785	$21,944	$1,014,392	2.16%	$913,864	90.1%	46.2
Library*	49	1	14,421	177,423	$22,533	$1,041,621	2.16%	$938,394	90.1%	46.2
		2		190,096	$24,142	$1,041,621	2.32%	$1,005,423	96.5%	43.1
		3		236,564	$30,044	$1,388,828	2.16%	$1,251,192	90.1%	46.2
Natural Science*	52	1	8,578	105,536	$13,403	$619,584	2.16%	$558,182	90.1%	46.2
		2		113,074	$14,360	$619,584	2.32%	$598,052	96.5%	43.1
		3		140,714	$17,871	$826,112	2.16%	$744,243	90.1%	46.2
Neuberger Museum of Art*	40	1	9,391	110,036	$13,975	$678,307	2.06%	$581,986	85.8%	48.5
		2		123,791	$15,721	$678,307	2.32%	$654,734	96.5%	43.1
		3		154,051	$19,564	$904,409	2.16%	$814,780	90.1%	46.2
Visual Arts*	58	1	23,368	287,498	$36,512	$1,687,858	2.16%	$1,520,588	90.1%	46.2
		2		308,034	$39,120	$1,687,858	2.32%	$1,629,201	96.5%	43.1
		3		383,331	$48,683	$2,250,477	2.16%	$2,027,451	90.1%	46.2
Music*	57	1	28,396	332,722	$42,256	$2,051,027	2.06%	$1,759,778	85.8%	48.5
		2		374,313	$47,538	$2,051,027	2.32%	$1,979,750	96.5%	43.1
		3		465,811	$59,158	$2,734,703	2.16%	$2,463,689	90.1%	46.2
Performing Arts Center*	50	1	64,461	835,412	$106,097	$5,149,799	2.06%	$4,418,518	85.8%	48.5
		2		939,838	$119,359	$5,149,799	2.32%	$4,970,833	96.5%	43.1
		3		1,169,577	$148,536	$6,866,399	2.16%	$6,185,926	90.1%	46.2
TOTAL (AVERAGE)	**N/A**	**1**	**329,268**	**4,148,638**	**$526,877**	**$25,056,782**	**(2.21%)**	**$21,942,272**	**(92.1%)**	**(45.3)**
		2		**4,572,863**	**$580,754**	**$25,056,782**		**$24,186,010**		
		3		**5,690,674**	**$722,716**	**$33,409,043**		**$30,098,146**		

* Multiple Bldgs
** 365 days used for kWh output calculation
*** Estimated NYPA cost of electricity: $0.127/kWh
**** Initial Cost of PV Panel Installation: Option 1 - $8, Option 2 - $8.50, Option 3 - $10


1
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