EGG HARBOR CITY
SOLAR FEASIBILITY EVALUATION
FOR MUNICIPAL BUILDING &
WATER TREATMENT PLANT

Site 1 – Municipal Building

Site 2 – Water Treatment Plant

Prepared by:
Remington and Vernick Engineers
232 King's Highway East
Haddonfield, New Jersey 08033
(856) 795-9595

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License #GE ______

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Abstract

This Solar Energy Feasibility Evaluation was conducted for a grid-tied photovoltaic system typical of on-grid commercial-size installations in Egg Harbor City, New Jersey. This report describes the method by which anticipated annual and monthly solar power produced for the municipality may be obtained. The basis of the cost analysis, including participation in the local utility New Jersey Board of Public Utilities' (NJBPU) programs, eligibility for a federal tax credit, and the projected energy costs, is described. A summary of the simple payback period and life cycle cost analysis performed is presented via a comprehensive proforma for each location. Assumptions for the study are stated.

Implementing municipal solar PV and other renewable energy is an effective way to achieve a municipality's overall Energy Management goals and provide significant benefits for a community. This includes serving as a model to residents, businesses and neighboring towns and cities in environmental stewardship, enhancing economic development, and contributing to workforce development for renewable energy business in the new economy.

In addition to the benefits above, the economics of solar PV can stand on their own providing for significant long-term cost savings and an energy strategy not subject to fuel price volatility, at a time when many communities are required to become more efficient in managing their limited operating resources. The purpose of this evaluation is to provide a resource for local government officials who have already decided on the benefits of solar PV and are looking to implement solar PV projects on municipal buildings and land. This guide provides municipalities with a general overview to make them aware of potential considerations and possible options available, as they seek to implement solar PV.

The Municipality may be able to generate 100% of its electricity for the Municipal Building from roof-mounted solar panels. Utility information was not provided for the Water Treatment Plant facility, but due to the intensive energy requirements for this type of facility – the proposed PV system would likely not be able to generate 100% of its electricity.

In addition, solar electricity is relatively affordable compared to current electricity prices. Given the long term horizon of the Municipality and the non-financial benefits, the Municipality should consider installing at least some solar panels on roofs with southern-facing exposure.

Results conclude that the proforma payback period for the Municipal Building Rooftop system is 8.7 years with an 8.8% Internal Rate of Return (IRR), the Water Treatment Plant Rooftop system is 9.3 years with an 7.9% Internal Rate of Return (IRR), and the Water Treatment Plant Ground Mount system is 15.2 years with an 4.1% Internal Rate of Return (IRR). The construction cost and payback period outlined in the proformas are inclusive of a design-build contractor, however, it does not include 3rd party inspection costs.

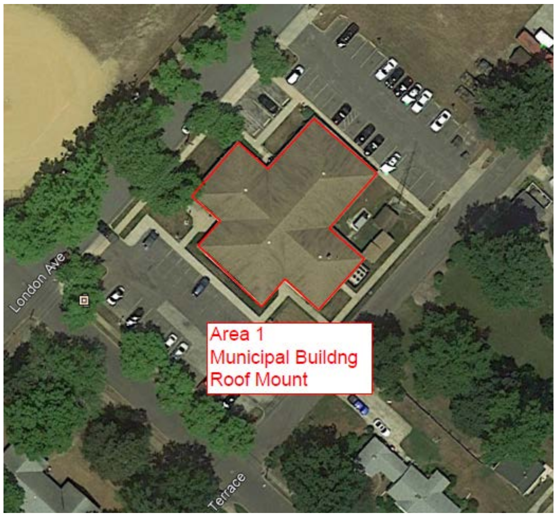
Site Survey and Considerations

A site survey is typically conducted to determine the locations on the site property best suited for solar photovoltaic (PV) arrays. Optimal PV array locations maximize the available solar energy and minimize solar obstructions to reduce shading on the PV arrays. A survey may not be absolutely necessary if there is a general understanding that the PV array location clearly has no solar obstructions (for instance, the array may be located on an unobstructed south-facing roof or in the middle of a field).

The following locations were analyzed:

Name of Facility	Address
Egg Harbor City Municipal Building	500 London Avenue, Egg Harbor City, NJ
Egg Harbor City Water Treatment Plant	701 Philadelphia Avenue, Egg Harbor City, NJ

The Municipal Building site is located on a small plot of land surrounded on 3 sides by London Avenue, 4th Terrace, and Campe Street with parking areas in both the front and rear of the structure. The Water Treatment plant fronts on Philadelphia Avenue and Diesterweg Street and also has parking areas in the front and rear of the main structure. However, the Water Treatment Plant has 2 stormwater drainage basins near the rear of property. Analysis as to the feasibility for rooftop systems at each location as well as a ground mounted system at the Water Treatment Plant shall be performed as outlined in the photographs below (the basin area to the northwest of the Water Treatment plant was omitted due to underground stormwater structures and underdrain pipes):



Solar insolation data was estimated for the sites per reference (1). This software incorporates 30-year historical weather data from the National Renewable Energy Laboratory (NREL) for specific locations in North America and estimates the amount of solar radiation received for a given site and the amount of energy produced for a given system. The calculated energy produced also accounts for estimate system efficiency losses (non-optimal configurations, shading, etc.).

Data from the reports generated by reference (1) was used as a basis for estimating the month-by-month solar power generated and the cost analyses described below. The assumption for these data is that minimal solar obstructions/shading will be present on the PV at any time of the year. The anticipated solar energy produced by the systems is summarized in Table 1, Table 2, and Table 3 below.

Table 1. Anticipated Solar Energy Produced (Area 1: Municipal Building Rooftop)

Array	# Panels	Array Size (kW)	Azimuth (deg.)	Pitch (deg.)	Annual Solar Access (%)	Annual Output kWh (PVWatts)
1	37	13.32	222	23	94	18,051
2	31	11.16	222	23	92	14,800
3	21	7.56	132	23	86	9,199
4	78	28.08	132	23	92	36,567
5	17	6.12	222	23	92	8,117
6	78	28.08	312	23	95	28,314
7	36	12.96	42	23	94	12,548
Totals	**298**	**107.28**		**Total Annual Output (kWh)**		**127,597**

Table 2. Anticipated Solar Energy Produced (Area 2: Water Treatment Facility Rooftop)

Array	# Panels	Array Size (kW)	Azimuth (deg.)	Pitch (deg.)	Annual Solar Access (%)	Annual Output kWh (PVWatts)
1	142	51.12	132	23	96	65,594
2	126	45.36	312	23	94	42,542
3	34	12.24	132	23	96	15,466
4	44	15.84	312	23	94	14,857
Totals	**346**	**124.56**		**Total Annual Output (kWh)**		**138,459**

Table 3. Anticipated Solar Energy Produced (Area 3: Water Treatment Facility Basin Ground Mount)

Array	# Panels	Array Size (kW)	Azimuth (deg.)	Pitch (deg.)	Annual Solar Access (%)	Annual Output kWh (PVWatts)
1	344	123.84	132	25	96	164,271
				Total Annual Output (kWh)		**164,271**

The reported results are based upon the 30-year historical weather data from NREL for the site location and estimated system efficiency losses.

Overall Energy Costs

Utility bills were analyzed for a 24-month period starting from October 2016 and ending September 2018. The tabulated approximate annual electricity usage is tabulated below in Table 2 below.

Table 2. Annual Electricity Usage

Month-Year	Approx. Usage (kWh)	Month-Year	Approx. Usage (kWh)
Oct-16	11,100	Oct-17	9,700
Nov-16	8,000	Nov-17	10,300
Dec-16	10,000	Dec-17	10,100
Jan-17	11,100	Jan-18	10,800
Feb-17	9,000	Feb-18	9,200
Mar-17	9,600	Mar-18	9,500
Apr-17	9,100	Apr-18	10,000
May-17	10,600	May-18	10,300
Jun-17	10,200	Jun-18	10,800
Jul-17	11,600	Jul-18	11,500
Aug-17	12,300	Aug-18	12,800
Sep-17	11,900	Sep-18	12,960
Annual Total	**124,500**	**Annual Total**	**127,960**

The Cost of Electricity was also analyzed, shown in Table 3 below:

From Atlantic City Electric Sep-18 Bill	Cost	$/kWh
Delivery	$ 793.94	$ 0.0613
Supply	$ 1,086.02	$ 0.0838
Total	$ 1,879.96	$ 0.1451

Actual Cost/kWh (Monthly Customer Charge not included)	Cost	$/kWh
Total	$ 1,707.18	**$ 0.1317**

For the purposes of our financial analysis we shall use the $0.1317/kWh rate as later highlighted in the Assumptions section below.

Solar Finance Options with Project Ownership

Owner-funded solar projects are projects that are purchased, owned, maintained and operated by the local government entity. This can be achieved with funds from general obligation bonds, special tax exempt bonds or funded through tax-exempt debt or lease structures, typically at below market interest rates.

Capital Purchase

With ownership, municipalities own the rights to use or sell all energy production and renewable energy certificates (SRECs). Ownership of a solar PV system requires regular inspections, performance monitoring and maintenance, which could be handled by the municipality or instead provided through contract with a service provider. Additionally, as the system owner, the electric utility may require documentation of insurance and maintenance records as a condition of interconnection to their grid system. Performance risk, such as underperformance, system downtime, and maintenance risk resides with the municipality.

Public entities who own solar PV systems are not eligible to receive significant federal incentives provided through the tax code, and many projects might not be financially feasible without other significant incentives or grants.

Benefits

Because the system is owned, the owner receives all of the benefits of solar PV, including reliable electricity production, stable and predictable electricity cost, and ownership of the rights to the environmental attributes evidenced through renewable energy certificates (SRECs). SRECs can be used to meet carbon emissions goals, or be sold to another party or utility that may use them for RPS or emissions compliance.

Challenges

Though prices for solar PV systems have decreased dramatically over recent years, and over the long term solar PV offers great benefits, the upfront costs associated with installing solar PV are significant, especially for larger scale solar projects. Federal tax incentives and depreciation for solar PV may offset up to 50% or more of project costs, but municipalities are not able to realize these benefits and likely will need significant rebates, grants or other incentives to help make their projects financially viable

This method shall be the basis as to compare all sites and all other financing methods.

Municipal Lease (Tax-Exempt Lease-Purchase)

A municipal lease is available to some local governments (but not all) and carries a lower payment rate over that of other lease structures. This is because the lessor is not taxed at the federal level for the interest portion of the lease payment. This savings is reflected through lower lease payments. The lease term is typically structured through a series of one year terms that are renewed until there is little or no residual value left for the asset, then ownership of the solar assets are typically transferred to the lessee. Alternatively, ownership may be transferred to the municipality at the beginning of the lease term, with the lessor maintaining contractual security on the equipment.

Benefits

Lower lease payments and project ownership flexibility are the main advantages of this finance option. In addition, with non-appropriation and other specific language in the contract, lease obligations usually are not considered long-term debt, and are not considered a capital expense.

Challenges

A municipal lease is issued by state, county or local government authorities or districts within, which cannot realize federal tax incentives and thus cannot pass these savings along through lower lease payments. Thus, the benefit of low tax-exempt interest payments may not be as attractive as the benefit of lower lease payments from private sources of capital, which are able to monetize tax credits. As with other ownership finance options, significant grants, rebates, or other incentives are likely required to make the solar project economically viable.

Tax-Exempt Bonds

A municipality may finance renewable energy projects with tax-exempt bonds, which allow for low interest debt and ownership of the solar PV system. The municipality may, subject to various rules, use bond proceeds to contract services for the design, construction, operation and maintenance of the solar PV system with a private contractor.

Benefits

Low cost of capital with flexibility for longer terms at fixed interest rates are the primary benefits for this type of financing over traditional commercial debt, which typically has shorter terms and variable interest rates that are generally a few percentage points higher.

Challenges

With ownership, a municipality would not receive any indirect benefits of renewable energy tax incentives or depreciation. As with other ownership structures, significant grants, rebates, or other incentives may likely be required to make the solar project financially attractive. Increasing debt obligations may be a sensitive issue in many communities; other alternatives, which could be classified as an operating expense, might be preferable.

Solar Finance Options with Third Party Ownership

As an alternative to financing solar projects through direct ownership models, non-ownership financing options may be more attractive to many local governments. With private third party ownership, tax incentives and tax depreciation for solar projects can be realized by the for-profit project owner, and savings then passed to municipalities through lower lease payments or through lower prices for energy.

Project scale is an important factor for third party investors, as fixed costs such as legal contracts, due diligence and other factors must be outweighed by the project's financial returns. As a general rule, the larger and more attractive the project, the more financing options become available, and the more negotiating leverage for the municipality. A project may consist of one site, a series of sites owned by a municipality, or even sites in more than one municipality.

The popularity of third party solar financing has grown tremendously over recent years. More and more communities are recognizing the potential to avoid large upfront costs and avoid performance and operating risks, while achieving significant energy savings as a result of shared benefit from tax credits. Third party finance structures include operating leases, sale/leaseback structures, partnership/flip agreements, power purchase agreements (PPAs), and hybrid financing structures.

One further note, capturing tax benefits by third party financiers for use in municipal solar projects requires strict adherence to IRS regulations, as well as any state or other jurisdictional requirements. In structuring third party agreements between taxable and non-taxable entities, it is essential that contracts meet these very specific requirements and limitations, which are beyond the scope of this study. Because of this, it is recommended that contracts be carefully examined by an experienced attorney who understands the tax laws specific to renewable energy project finance, and understands the regulatory requirements for tax-exempt municipalities. Third party owners may be a developer, an investor, or a special purpose entity such as an LLC comprised of stakeholders that may include the developer, the investor and others.

Operating Lease

An operating lease allows a municipality to receive solar energy without ownership. A solar developer designs, builds and owns the solar equipment, then leases the use of this equipment to the public entity. This is similar to a rental agreement. The public entity receives use of the solar equipment to produce electricity and receive SRECs (if applicable) for the term of the lease, typically 7 years or longer, limited to under 75% of system life and up to 80% of the solar project's value, among other IRS requirements. At the end of the lease term, the public entity does not receive ownership, but may purchase the solar PV equipment at fair market value. There are several tax rules that must be followed to qualify a solar lease as an operating lease. It is recommended that any lease contract be carefully reviewed by a qualified accountant and/or tax attorney.

Benefits

With an operating lease, there are no upfront costs and payments are evenly distributed throughout the lease term. Because a private third party owns the solar PV equipment and meets IRS ownership requirements including at-risk rules, the lessor receives the federal tax incentive and depreciation and will monetize them. This benefit in turn will be shared with the municipality through lower lease payments.

Challenges

The operating lease term must be limited to 75% of the solar PV system's estimated life and 80% of the solar project's value. Payments must be evenly spread over the term. At the end of the lease, ownership cannot be transferred unless sold at fair market value, which could be a substantial price. While equipment risk resides with the developer as lessor, all energy production risk resides with the municipality.

Power Purchase Agreement (PPA)

Power purchase agreements (PPAs) have become widely accepted in many states as a means for public and non-profit entities to finance solar projects. With this finance structure, a private developer and financial investor with tax equity create a special purpose entity such as an LLC that designs, builds, owns and operates the solar project. The developer may also be the financier. A municipality provides the site(s) for the solar project under a long-term easement or lease to this entity, and then agrees to purchase the solar energy under long-term contract at an agreed upon rate that is typically less than the utility rate. The typical PPA term may be from 10 to 20 years or custom to the project, but will likely be at least 7 years, the period required for investors to safely monetize tax credits and depreciation. The power purchase rate may contain escalators that increase rates over time based on projections for utility price increases.

Benefits

Solar PPAs allow public entities to implement solar projects with little or no upfront cost. Third party owners assume system performance and maintenance risk, and municipalities may ensure certain levels of performance (energy supply) through contractual arrangements.

Also with a PPA, municipalities receive fixed, predictable pricing for electricity over a long period and may realize significant savings in energy expense over that time. The overall price is typically lower than ownership models, as third party owners are able to monetize and share the tax benefits through lower energy prices. Projected energy prices are just that, and decisions on long-term purchases do carry some risk, however there is also a non-monetary value in having predictable energy costs that can be safely budgeted, and not subject to unexpected price volatility.

In general, investors are concerned that off-takers make good on their long-term purchase agreements, and municipalities are attractive to investors as energy purchasers (off-takers). Municipalities have established credit ratings and will not potentially move somewhere else during the 20-year term, unlike some commercial off-takers.

Challenges

Project scale is important, as the larger the project, the more attractive it becomes to investors. Smaller projects, such as a single small rooftop, may be financeable with a PPA, but with high fixed costs for the third party owner, terms and pricing would not likely be as favorable to the municipality. Third party owners will have rights to the SRECs and most often will sell them to another party. Therefore, the municipality cannot claim the “green” attributes of the clean solar energy.

Cost of capital from the tax equity investor and private commercial debt is higher and partially offsets the benefit of tax credits received in the solar project. Even with this high cost of capital, overall savings will most often be significantly better than with ownership financing models.

Sale / Leaseback

A sale/leaseback structure is a well-established structure allowing municipalities to design and build a solar PV project, then sell the project to a third party investor, who then leases back the solar PV assets to the municipality under an operating lease structure. Lease payments are treated similar to rental payments, as an operating expense. This allows the investor to monetize tax incentives and depreciation, and receive a cash flow return at an attractive overall interest rate. Benefits of the tax incentives and depreciation are shared with the municipality through lower lease payments. This same structure has been used between investors and developers, with developers then selling the power to municipalities. As applied in this case, the municipality would be assuming the role of the developer.

Benefits

In by-passing the developer and managing the engineering procurement and construction (EPC) process itself, a municipality, with help from an experienced independent consultant, might save money on construction finance costs, equipment purchases, developer fees and other related costs. The advantages of an operating lease structure also apply.

Challenges

Developing a solar PV project of any scale requires very specialized knowledge. An experienced consultant should be retained to help guide a municipality through this process, assisting with design, project management, procurement, and construction oversight and commissioning functions. Specialized solar developers may have ongoing relationships with equipment suppliers and may be able to purchase equipment at a significantly lower cost than a one-time purchaser. Construction risk, which is significant, will be taken by the municipality. IRS regulations on ownership requirements for tax incentives limit the amount of time in which a solar PV system’s ownership can be transferred after the construction process is completed. If a lease finance closing between the municipality and investor is delayed or canceled, this could severely impact the project economics and the municipality would bear this risk. Finally, as with the operating lease model, there is significant regulatory risk at this time regarding treatment of lease payments.

Leasing Property for Solar

Though not as financially beneficial as some third party ownership models, a municipality may decide to forgo energy savings and other value streams and simply lease land or rooftops to a solar developer, who would then sell the energy to another party, such as a utility. Though a lower value use of sites suitable for solar energy, depending on a municipality's goals, this option does provide some financial benefit with limited complexity, while also promoting solar development. Other than lease payments, no project benefits would be received by the municipality and an RFP would be issued with identified sites that have been determined feasible for solar development. Considerations should include lease and options payments, lease escalators, insurance, system removal and decommissioning at the end of the lease, among other issues.

Reference 2 (P.L. 2008, c. 83) amended provisions of the Local Public Contracts Law, the Public School Contracts Law, and the County College Contracts Law. The amendments grant those contracting units improved procedures to contract for installation of renewable energy programs owned by third parties (renewable); permitting contracts for up to 15 years.

The laws also require that whenever either of the projects are executed through a lease, the lease agreement must contain a clause making them subject to the availability and appropriation annually of sufficient funds as may be required to meet the extended obligation, or contain an annual cancellation clause.

Municipalities should also be aware that when it comes to contracting for solar panels under power purchase agreements, there are a myriad of different circumstances, minimum standards, and pricing options that must be considered, as well the use of federal tax credits. As outlines above, Federal tax credits cannot be used by a government agency, but a private company granted a concession to install solar on a government facility, can use them to lower the cost of the installation below the cost that could be obtained if the government pays for the improvement by itself.

Other issues include the fact that the installation of solar panels by the government directly or through a vendor is considered a "public works activity" under state law, and thus requires prevailing wages and other public works related requirements to be followed for their installation. In many cases, the economics of installations may limit their use to facilities that can generate a minimum amount of energy.

Disclaimer

The authors of this study are neither accountants nor lawyers, and though we discuss in a general manner various diligence, feasibility and technical topics, as well as potential financing structures and general considerations in agreements with service providers, we do not offer legal advice of any kind. Prior to making any decisions, whether they be financial, legal, technical or otherwise, we strongly recommend consultation with a professional attorney and with a qualified accountant for advice and guidance related to your specific project or application.

Assumptions

For this analysis, the following assumptions were used:

1. **Module Type:** Due to the limited area available and space constraints, in order to maximize the system output, we shall assume using a high-efficiency LG 360 Watt monocrystalline PV module.
2. **Electricity Rates:** Per the U.S. Energy Information Administration (Reference 3) electricity rates have increased by a total of 45.13% from 2001 to 2018, an average of approximately 2.51% annually. Electricity rates can be expected to continue to increase and we shall assume the historic escalation rate. Established previously in the "Overall Energy Costs" section, a utility price of $0.1317 per kilowatt-hour shall be used.
3. **PV Degradation:** The yearly PV cell performance degradation is 0.5% per year. Reference (4) describes "the loss of Energy Life production of a PV cell as a function of annual degradation rates. Reports have placed this rate between 0.2% and 0.7% per annum." Based on these rates, cell performance degradation of 0.5% per year was selected for this study as a moderate factor used to determine the amount of energy produced per year, thus the energy cost savings for the corresponding year.
4. **PV System Cost:** Appendix A (2019 Solar Prices: average cost per watt by state) shows NJ at just below the $3.05 National Average price per watt. We shall conservatively assume a cost per watt price of $3.00 in our analysis for the rooftop solar PV systems and
5. **Variable SREC Pricing**: Solar Renewable Energy Certificates (SRECs) are another important source of project revenue in many states. Based on renewable portfolio standards (RPS) adopted in these states, SRECs represent the green attributes of clean solar energy. In addition to the value of energy produced by solar, there is also the value of the green attributes, often measured in dollars per megawatt-hour ($/MWH). Energy producers in certain states are required under RPS to include a certain percentage of renewable energy as part of the total portfolio mix of energy they produce. There are penalties associated with not meeting these requirements, and because of this, energy producers are willing to purchase SRECs from other sources to meet their requirements. Once sold however, you can no longer claim the environmental benefits of your solar PV array, as this would now belong to the purchaser of the credit. Per Reference (5), Solar Facilities in New Jersey have a 10-year "qualification life", meaning that they are eligible to generate SRECs for 10 years after they are connected to the grid. Appendix B outlines the last 3+ years of SREC trading in NJ. We shall assume a conservative $150/SREC for 10 years.

The Proforma in Appendix C summarizes the outcome of the payback and financial feasibility analysis for roof-mounted PV systems at each site and also a ground mounted system located on the Water Treatment Plant site.

Financial Feasibility, Conclusions and Recommendations

The sites considered in this report are all feasible areas in which to implement solar PV systems. Using accessible land and roof areas that are unavailable for other purposes allows for the re-use of these areas that would not otherwise contribute to productivity for the City. Installing a solar generation plant and the associated facilities on stormwater basins can provide an economically viable option for sites where local economic ordinances prohibit traditional reuse of these sites for any other uses.

Relative to constructing on the available rooftops, constructing above stormwater basins increases both construction costs and design costs, may cause permitting and design issues, as well as prohibiting remedial or maintenance options if the stormwater basin ceases to continue to work efficiently. However, roof condition must be evaluated prior to installation of the solar PV systems as these systems are constructed to be in operation for a minimum 25 to 30 years. If the roof is determined to be nearing the end of its lifecycle, installation of a new roof prior to installation of the solar system is highly recommended.

Both sites are already interconnected into the Atlantic City Electric grid with all other critical infrastructure in place for PV systems of this size.

For this feasibility study, system calculations and sizes were based on available roof and site square footage; however, actual system installation should be based on the availability of funds or on the amount of power that can be sold after the Water Treatment Plant utility bills are analyzed. Installing a small demonstration system and adding capacity as funding becomes available might be a good option. When the system goes out to bid, a design-build contract should be issued that requests the best performance (kWh/yr) at the best price and which allows vendors to optimize system configuration. A third-party ownership PPA or lease model provide the most feasible way for a system to be financed on these sites if a capital purchase option cannot be budgeted for.

In the coming years, increasing electrical rates and increased necessity for clean power will continue to improve the feasibility of implementing solar PV systems at these sites.

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   Web Source: https://www.pv-magazine.com/2011/04/19/solar-on-storm-water-detention-basins_10002682/

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APPENDIX A

2019 SOLAR PRICES:

AVERAGE COST PER WATT BY STATE

Source: https://news.energysage.com/how-much-does-the-average-solar-panel-installation-cost-in-the-u-s/

APPENDIX B

NJ SREC TRADING STATISTICS

ENERGY YEAR 2016, 2017, 2018 & 2019

NJ SREC Trading Statistics Energy Year 2016 (June 1, 2015 - May 31, 2016)

CUMULATIVE SOLAR WEIGHTED AVERAGE PRICE (EY 2016)

SRECs traded in EY2016			Monthly			Cumulative	
Month	**Year**	**Active KW (DC)**	**Number of SRECs Issued**	**Number of SRECs Traded**	**Weighted Average Price per SREC**	**Number of SRECs Traded**	**Weighted Average Price per SREC**
Nov	2016	1,796,591	4,003	17,949	$219.09	4,210,550	$229.84
Oct	2016	1,755,752	7,033	570,848	$225.67	4,192,601	$229.88
Sep	2016	1,716,647	13,525	367,824	$242.44	3,621,753	$230.55
Aug	2016	1,706,073	21,251	95,380	$234.10	3,253,929	$229.20
Jul	2016	1,657,760	22,309	840,505	$226.71	3,158,549	$229.05
Jun	2016	1,638,833	209,720	300,044	$246.09	2,318,044	$229.90
May	2016	1,597,264	197,408	147,068	$244.32	2,018,000	$227.50
Apr	2016	1,576,144	170,165	166,728	$225.57	1,870,932	$226.17
Mar	2016	1,561,510	110,798	198,996	$256.30	1,704,204	$226.23
Feb	2016	1,540,514	100,043	132,984	$255.02	1,505,208	$222.26
Jan	2016	1,514,335	78,422	308,212	$243.95	1,372,224	$219.08
Dec	2015	1,501,765	106,866	306,713	$231.46	1,064,012	$211.88
Nov	2015	1,475,927	141,713	145,921	$218.47	757,299	$203.95
Oct	2015	1,464,799	158,205	310,438	$209.63	611,378	$200.49
Sep	2015	1,448,147	202,528	208,071	$190.08	300,940	$191.06
Aug	2015	1,436,724	185,530	92,869	$193.25	92,869	$193.25
Jul	2015	1,430,312	153,510	4,523	$164.40		
Total			1,883,029		4,215,073		

EY 2016 SACP = $323/mwh

Source: http://www.njcleanenergy.com/renewable-energy/project-activity-reports/srec-pricing/srec-pricing

NJ SREC Trading Statistics Energy Year 2017 (June 1, 2016 - June 30, 2017)

CUMULATIVE SOLAR WEIGHTED AVERAGE PRICE (EY 2017)

SRECs traded in EY2017			Monthly			Cumulative	
Month	Year	Active KW (DC)	Number of SRECs	Number of SRECs	Weighted Average Price per SREC	Number of SRECs	Weighted Average Price per SREC
June	2017	2,067,297	275,411	556,122	$224.51	2,771,883	$226.81
May	2017	2,027,029	223,852	243,318	$219.81	2,215,761	$227.39
April	2017	1,984,230	183,655	164,420	$219.61	1,972,443	$228.32
March	2017	1,934,984	155,235	178,308	$230.68	1,808,023	$229.11
Feb	2017	1,887,999	88,700	243,795	$232.43	1,629,715	$228.94
Jan	2017	1,832,829	120,714	276,221	$235.86	1,385,920	$228.33
Dec	2016	1,814,580	138,593	235,386	$223.04	1,109,699	$226.45
Nov	2016	1,796,591	168,065	149,519	$221.19	874,313	$227.37
Oct	2016	1,755,752	173,526	333,874	$228.22	724,794	$228.65
Sep	2016	1,716,647	231,538	279,447	$231.72	390,920	$229.01
Aug	2016	1,706,073	222,895	111,473	$222.21	111,473	$222.21
Jul	2016	1,657,760	213,267	3,693	$201.38		
Total			**2,195,451**	**2,775,576**			

Source: http://www.njcleanenergy.com/renewable-energy/project-activity-reports/srec-pricing/srec-pricing

NJ SREC Trading Statistics Energy Year 2018

CUMULATIVE SOLAR WEIGHTED AVERAGE PRICE (EY 2018)

SRECs traded in EY2018			Monthly			Cumulative	
Month	**Year**	**Active KW (DC)**	**Number of SRECs**	**Number of SRECs**	**Weighted Average Price per SREC**	**Number of SRECs**	**Weighted Average Price per SREC**
June	2018	2,384,490	291,489	431,891	$218.02	2,993,853	$212.70
May	2018	2,338,812	264,498	251,302	$222.22	2,561,962	$211.81
April	2018	2,316,411	206,048	280,879	$214.58	2,310,660	$210.67
Mar	2018	2,294,936	138,935	225,392	$212.38	2,029,781	$210.13
Feb	2018	2,271,948	133,875	317,475	$216.62	1,804,389	$209.85
Jan	2018	2,240,542	129,218	213,002	$208.90	1,486,914	$208.41
Dec	2017	2,210,749	145,958	387,819	$210.67	1,273,912	$208.32
Nov	2017	2,192,811	186,190	209,190	$206.85	886,093	$207.30
Oct	2017	2,166,175	232,070	297,311	$202.38	676,903	$207.44
Sept	2017	2,151,770	252,191	221,166	$208.96	379,592	$211.40
Aug	2017	2,129,547	250,503	158,426	$214.82	158,426	$214.82
Jul	2017	2,084,635	242,761	6	$165.83		
Total			**2,473,736**	**2,993,859**			

Source: http://www.njcleanenergy.com/renewable-energy/project-activity-reports/srec-pricing/srec-pricing

NJ SREC Trading Statistics Energy Year 2019

CUMULATIVE SOLAR WEIGHTED AVERAGE PRICE (EY 2019)

SRECs traded in EY2019			Monthly			Cumulative	
Month	Year	Active KW (DC)	Number of SRECs	Number of SRECs	Weighted Average Price per SREC	Number of SRECs	Weighted Average Price per SREC
March	2019	2,626,871	174,431	264,334	$212.32	2,028,933	$205.06
February	2019	2,599,029	141,828	277,448	$212.33	1,764,599	$203.97
January	2019	2,578,945	134,615	190,578	$202.15	1,487,151	$202.42
December	2018	2,531,636	145,082	327,690	$203.05	1,296,573	$202.46
November	2018	2,511,508	194,642	228,990	$191.57	968,883	$202.26
October	2018	2,479,957	186,430	363,085	$208.16	739,893	$205.56
September	2018	2,466,212	284,520	232,967	$205.59	376,808	$203.06
August	2018	2,429,052	298,557	143,841	$198.96	143,841	$198.96
July	2018	2,406,555	278,106	17,998	$225.96		
Total			**1,838,211**	**2,046,931**			

Source: http://www.njcleanenergy.com/renewable-energy/project-activity-reports/srec-pricing/srec-pricing

APPENDIX C

EGG HARBOR CITY

MUNICIPAL BUILDING AND WATER TREATMENT PLANT

PROFORMA AND PRODUCTION ESTIMATES

RVE 1901 REMINGTON & VERNICK ENGINEERS

Egg Harbor City Municipal Building
Roof Mount
Pro Forma and Production Estimates

Project Scope	
System Size [kW]	107.28
System Output [kWh]	127,597
System Cost as $/Watt	$ 3.00
Current Electrical Price [per kWh]	$ 0.1317
SREC [Non-weighted avg]	150
Core Inflation [30yr CPIU+ Elec.Rate Inflation]	2.51%
Federal Tax Rate	0%

System Cost	$ 321,840	IRR	8.8%
Value of Federal ITC	$ -	Payback	8.7 Years
Net System Cost	$ 321,840		

*after tax

SREC Values [averages]	
2019 to 2029	$ 150.00

INCOME STATEMENT		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Current Electricity Cost per [per kwh]		0.132	0.135	0.138	0.142	0.145	0.149	0.153	0.157	0.161	0.165
System Efficiency Degradation		0.50%	1.00%	1.50%	2.00%	2.49%	2.99%	3.50%	3.99%	4.51%	5.01%
Degradation Effect on Production		127597	126959	126321	125683	125051	124415	123779	123130	122504	121842
Value of Power Produced (Avoidance Costs)		$ 16,805	$ 17,140	$ 17,482	$ 17,830	$ 18,186	$ 18,548	$ 18,916	$ 19,289	$ 19,673	$ 20,058
SREC (See above SREC Section)		$ 19,140	$ 19,044	$ 18,948	$ 18,852	$ 18,758	$ 18,662	$ 18,567	$ 18,469	$ 18,376	$ 18,276
Net Operating Income (Solar System)		**$35,944**	**$36,184**	**$36,430**	**$36,683**	**$36,944**	**$37,210**	**$37,483**	**$37,759**	**$38,048**	**$38,334**
Federal ITC		$ -									
Total Tax Impact of Solar Investment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
After Tax Annual Cash Flow	**$ (321,840)**	**$ 35,944**	**$ 36,184**	**$ 36,430**	**$ 36,683**	**$ 36,944**	**$ 37,210**	**$ 37,483**	**$ 37,759**	**$ 38,048**	**$ 38,334**
After Tax Cumulative Cash Flow		**$ (285,896)**	**$ (249,712)**	**$ (213,282)**	**$ (176,599)**	**$ (139,655)**	**$ (102,445)**	**$ (64,962)**	**$ (27,204)**	**$ 10,845**	**$ 49,179**

Yearly Investment Rates of Return:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
		11% returned YR1								Payback	
		Fed/State Grants & Taxes								$ 332,685	
	$ (321,840)	$ 35,944	$ 36,184	$ 36,430	$ 36,683	$ 36,944	$ 37,210	$ 37,483	$ 37,759	$ 38,048	$ 38,334
$321,840 (Return % Based on Total Cost)	-100%	11%	11%	11%	11%	11%	12%	12%	12%	12%	12%
Total Net Net Cost Yr 1		$ (285,896)									

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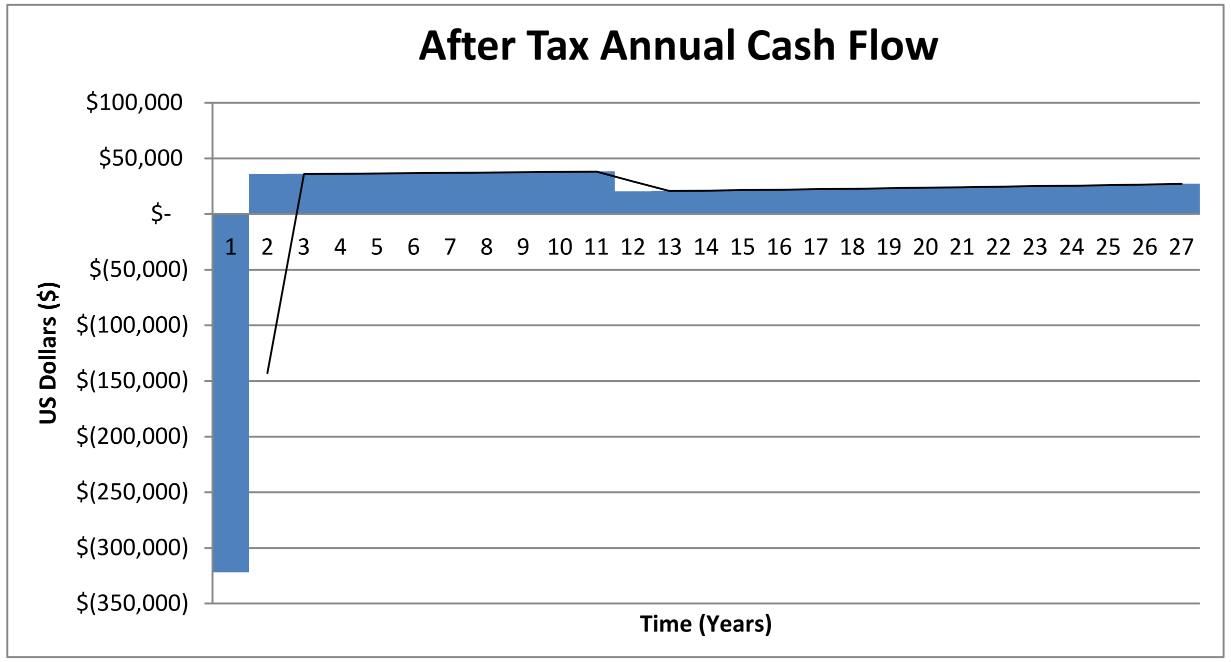

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
0.169	0.173	0.177	0.182	0.186	0.191	0.196	0.201	0.206	0.211	0.216	0.222	0.227	0.233	0.239	0.245
5.51%	6.00%	6.48%	7.00%	7.49%	8.02%	8.50%	9.01%	9.55%	10.02%	10.53%	11.05%	11.60%	12.07%	12.55%	13.05%
121209	120570	119938	119325	118663	118038	117369	116755	116105	115415	114806	114166	113495	112790	112197	111581
$ 20,454	$ 20,857	$ 21,268	$ 21,691	$ 22,112	$ 22,548	$ 22,983	$ 23,436	$ 23,891	$ 24,345	$ 24,824	$ 25,305	$ 25,788	$ 26,271	$ 26,789	$ 27,311
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$20,454	**$20,857**	**$21,268**	**$21,691**	**$22,112**	**$22,548**	**$22,983**	**$23,436**	**$23,891**	**$24,345**	**$24,824**	**$25,305**	**$25,788**	**$26,271**	**$26,789**	**$27,311**
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 20,454	**$ 20,857**	**$ 21,268**	**$ 21,691**	**$ 22,112**	**$ 22,548**	**$ 22,983**	**$ 23,436**	**$ 23,891**	**$ 24,345**	**$ 24,824**	**$ 25,305**	**$ 25,788**	**$ 26,271**	**$ 26,789**	**$ 27,311**
$ 69,633	**$ 90,490**	**$ 111,758**	**$ 133,449**	**$ 155,561**	**$ 178,109**	**$ 201,092**	**$ 224,528**	**$ 248,418**	**$ 272,763**	**$ 297,587**	**$ 322,893**	**$ 348,681**	**$ 374,952**	**$ 401,741**	**$ 429,052**

Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26
$ 20,454	$ 20,857	$ 21,268	$ 21,691	$ 22,112	$ 22,548	$ 22,983	$ 23,436	$ 23,891	$ 24,345	$ 24,824	$ 25,305	$ 25,788	$ 26,271	$ 26,789	$ 27,311
6%	6%	7%	7%	7%	7%	7%	7%	7%	8%	8%	8%	8%	8%	8%	8%

Egg Harbor City Water Treatment Plant
Roof Mount
Pro Forma and Production Estimates

REMINGTON & VERNICK ENGINEERS

Project Scope	
System Size [kW]	124.56
System Output [kWh]	138,459
System Cost as $/Watt	$ 3.00
Current Electrical Price [per kWh]	$ 0.1317
SREC [Non-weighted avg]	150
Core Inflation [30yr CPIU+ Elec.Rate Inflation]	2.51%
Federal Tax Rate	0%

System Cost	$ 373,680	IRR	7.9%	*after tax
Value of Federal ITC	$ -	Payback	9.3 Years	
Net System Cost	$ 373,680			

SREC Values [averages]	
2019 to 2029	$ 150.00

INCOME STATEMENT		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Current Electricity Cost per [per kwh]		0.132	0.135	0.138	0.142	0.145	0.149	0.153	0.157	0.161	0.165
System Efficiency Degradation		0.50%	1.00%	1.50%	2.00%	2.49%	2.99%	3.50%	3.99%	4.51%	5.01%
Degradation Effect on Production		138459	137767	137074	136382	135697	135006	134316	133611	132933	132214
Value of Power Produced (Avoidance Costs)		$ 18,235	$ 18,599	$ 18,970	$ 19,348	$ 19,734	$ 20,127	$ 20,526	$ 20,931	$ 21,347	$ 21,765
SREC (See above SREC Section)		$ 20,769	$ 20,665	$ 20,561	$ 20,457	$ 20,355	$ 20,251	$ 20,147	$ 20,042	$ 19,940	$ 19,832
Net Operating Income (Solar System)		**$39,004**	**$39,264**	**$39,531**	**$39,806**	**$40,089**	**$40,378**	**$40,674**	**$40,973**	**$41,287**	**$41,597**
Federal ITC		$ -									
Total Tax Impact of Solar Investment		**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
After Tax Annual Cash Flow	**$ (373,680)**	**$ 39,004**	**$ 39,264**	**$ 39,531**	**$ 39,806**	**$ 40,089**	**$ 40,378**	**$ 40,674**	**$ 40,973**	**$ 41,287**	**$ 41,597**
After Tax Cumulative Cash Flow		**$ (334,676)**	**$ (295,412)**	**$ (255,880)**	**$ (216,075)**	**$ (175,986)**	**$ (135,608)**	**$ (94,935)**	**$ (53,962)**	**$ (12,675)**	**$ 28,922**

Yearly Investment Rates of Return:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
		10% returned YR1									**Payback**
		Fed/State Grants & Taxes									$ 402,602
	$ (373,680)	$ 39,004	$ 39,264	$ 39,531	$ 39,806	$ 40,089	$ 40,378	$ 40,674	$ 40,973	$ 41,287	$ 41,597
$373,680 (Return % Based on Total Cost)	-100%	10%	11%	11%	11%	11%	11%	11%	11%	11%	11%
Total Net Net Cost Yr 1		$ (334,676)									

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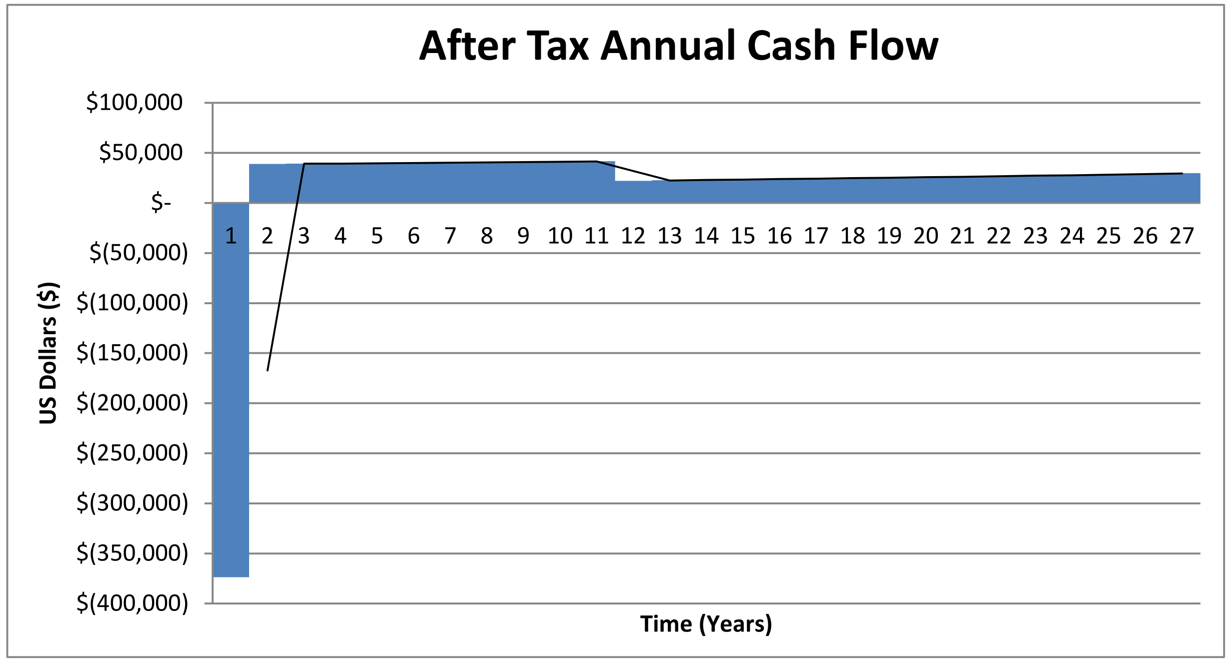

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
0.169	0.173	0.177	0.182	0.186	0.191	0.196	0.201	0.206	0.211	0.216	0.222	0.227	0.233	0.239	0.245
5.51%	6.00%	6.48%	7.00%	7.49%	8.02%	8.50%	9.01%	9.55%	10.02%	10.53%	11.05%	11.60%	12.07%	12.55%	13.05%
131527	130834	130148	129483	128765	128086	127360	126694	125988	125240	124579	123885	123156	122391	121748	121080
$ 22,195	$ 22,633	$ 23,079	$ 23,537	$ 23,994	$ 24,467	$ 24,939	$ 25,431	$ 25,924	$ 26,417	$ 26,937	$ 27,460	$ 27,983	$ 28,508	$ 29,070	$ 29,636
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$22,195	**$22,633**	**$23,079**	**$23,537**	**$23,994**	**$24,467**	**$24,939**	**$25,431**	**$25,924**	**$26,417**	**$26,937**	**$27,460**	**$27,983**	**$28,508**	**$29,070**	**$29,636**
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 22,195	**$ 22,633**	**$ 23,079**	**$ 23,537**	**$ 23,994**	**$ 24,467**	**$ 24,939**	**$ 25,431**	**$ 25,924**	**$ 26,417**	**$ 26,937**	**$ 27,460**	**$ 27,983**	**$ 28,508**	**$ 29,070**	**$ 29,636**
$ 51,118	**$ 73,751**	**$ 96,830**	**$ 120,367**	**$ 144,361**	**$ 168,828**	**$ 193,767**	**$ 219,199**	**$ 245,123**	**$ 271,540**	**$ 298,478**	**$ 325,937**	**$ 353,921**	**$ 382,428**	**$ 411,498**	**$ 441,133**

Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26
$ 22,195	$ 22,633	$ 23,079	$ 23,537	$ 23,994	$ 24,467	$ 24,939	$ 25,431	$ 25,924	$ 26,417	$ 26,937	$ 27,460	$ 27,983	$ 28,508	$ 29,070	$ 29,636
6%	6%	6%	6%	6%	7%	7%	7%	7%	7%	7%	7%	7%	8%	8%	8%

REMINGTON & VERNICK ENGINEERS

Egg Harbor City Water Treatment Plant Ground Mount

Pro Forma and Production Estimates

Project Scope	
System Size [kW]	123.84
System Output [kWh]	164,271
System Cost as $/Watt	$ 5.00
Current Electrical Price [per kWh]	$ 0.1317
SREC [Non-weighted avg]	150
Core Inflation [30yr CPIU+ Elec.Rate Inflation]	2.51%
Federal Tax Rate	0%

System Cost	$ 619,200	IRR	4.1%
Value of Federal ITC	$ -	Payback	15.2 Years
Net System Cost	$ 619,200		

*after tax

SREC Values [averages]	
2019 to 2029	$ 150.00

INCOME STATEMENT		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Current Electricity Cost per [per kwh]		0.132	0.135	0.138	0.142	0.145	0.149	0.153	0.157	0.161	0.165
System Efficiency Degradation		0.50%	1.00%	1.50%	2.00%	2.49%	2.99%	3.50%	3.99%	4.51%	5.01%
Degradation Effect on Production		164271	163450	162628	161807	160994	160174	159355	158520	157714	156862
Value of Power Produced (Avoidance Costs)		$ 21,634	$ 22,067	$ 22,507	$ 22,955	$ 23,413	$ 23,879	$ 24,353	$ 24,833	$ 25,327	$ 25,823
SREC (See above SREC Section)		$ 24,641	$ 24,517	$ 24,394	$ 24,271	$ 24,149	$ 24,026	$ 23,903	$ 23,778	$ 23,657	$ 23,529
Net Operating Income (Solar System)		**$46,275**	**$46,584**	**$46,901**	**$47,226**	**$47,562**	**$47,905**	**$48,256**	**$48,611**	**$48,984**	**$49,352**
Federal ITC		$ -									
Total Tax Impact of Solar Investment		**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
After Tax Annual Cash Flow	**$ (619,200)**	**$ 46,275**	**$ 46,584**	**$ 46,901**	**$ 47,226**	**$ 47,562**	**$ 47,905**	**$ 48,256**	**$ 48,611**	**$ 48,984**	**$ 49,352**
After Tax Cumulative Cash Flow		**$ (572,925)**	**$ (526,341)**	**$ (479,440)**	**$ (432,213)**	**$ (384,651)**	**$ (336,746)**	**$ (288,490)**	**$ (239,879)**	**$ (190,895)**	**$ (141,543)**

Yearly Investment Rates of Return:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
		7% returned YR1									
		Fed/State Grants & Taxes									
	$ (619,200)	$ 46,275	$ 46,584	$ 46,901	$ 47,226	$ 47,562	$ 47,905	$ 48,256	$ 48,611	$ 48,984	$ 49,352
$619,200 (Return % Based on Total Cost)	-100%	7%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Total Net Net Cost Yr 1		$ (572,925)									

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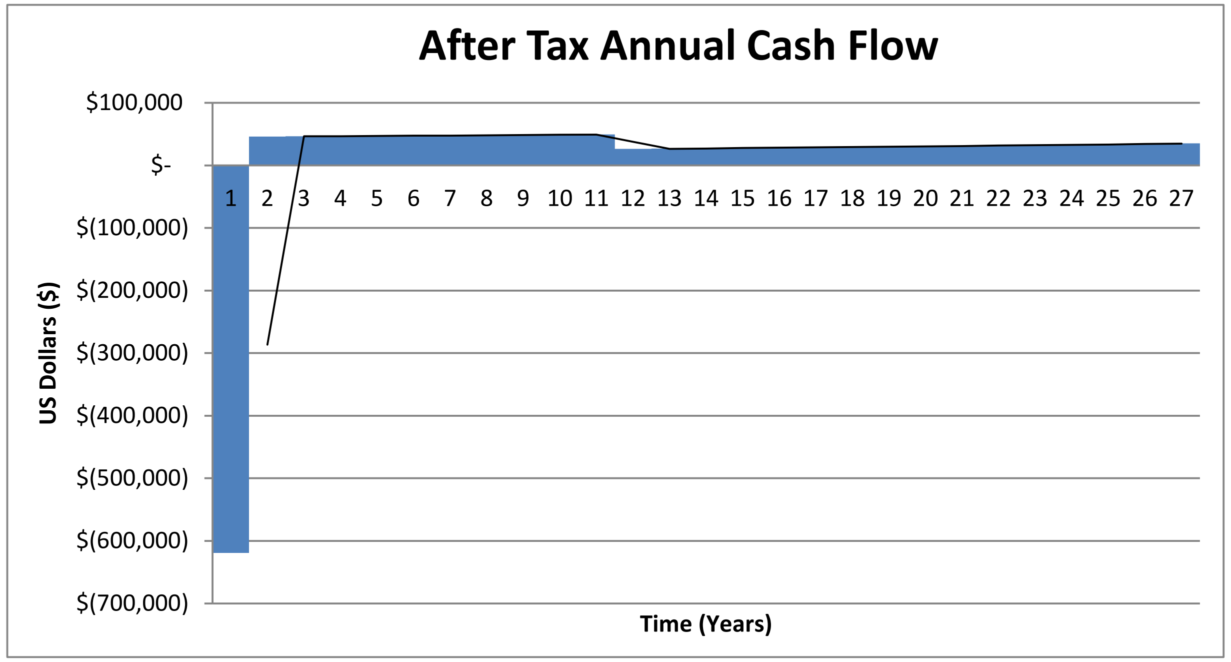

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
0.169	0.173	0.177	0.182	0.186	0.191	0.196	0.201	0.206	0.211	0.216	0.222	0.227	0.233	0.239	0.245
5.51%	6.00%	6.48%	7.00%	7.49%	8.02%	8.50%	9.01%	9.55%	10.02%	10.53%	11.05%	11.60%	12.07%	12.55%	13.05%
156047	155225	154410	153621	152770	151964	151103	150313	149475	148588	147803	146980	146116	145208	144445	143652
$ 26,333	$ 26,852	$ 27,381	$ 27,925	$ 28,468	$ 29,028	$ 29,588	$ 30,172	$ 30,757	$ 31,342	$ 31,959	$ 32,579	$ 33,200	$ 33,822	$ 34,489	$ 35,160
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$26,333	**$26,852**	**$27,381**	**$27,925**	**$28,468**	**$29,028**	**$29,588**	**$30,172**	**$30,757**	**$31,342**	**$31,959**	**$32,579**	**$33,200**	**$33,822**	**$34,489**	**$35,160**
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 26,333	**$ 26,852**	**$ 27,381**	**$ 27,925**	**$ 28,468**	**$ 29,028**	**$ 29,588**	**$ 30,172**	**$ 30,757**	**$ 31,342**	**$ 31,959**	**$ 32,579**	**$ 33,200**	**$ 33,822**	**$ 34,489**	**$ 35,160**
$ (115,210)	**$ (88,358)**	**$ (60,976)**	**$ (33,051)**	**$ (4,584)**	**$ 24,445**	**$ 54,033**	**$ 84,205**	**$ 114,962**	**$ 146,304**	**$ 178,264**	**$ 210,842**	**$ 244,042**	**$ 277,864**	**$ 312,353**	**$ 347,514**

Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26
					Payback										
					$ 312,935										
$ 26,333	$ 26,852	$ 27,381	$ 27,925	$ 28,468	$ 29,028	$ 29,588	$ 30,172	$ 30,757	$ 31,342	$ 31,959	$ 32,579	$ 33,200	$ 33,822	$ 34,489	$ 35,160
4%	4%	4%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	6%	6%