# **AAR ${AR}: Install an Array of Solar Panels**

**Recommended Action**

Install an array of solar panels on the roof.

**Summary of Estimated Savings and Implementation Costs**

|  |  |
| --- | --- |
| Annual Cost Savings | ${ACS} |
| Implementation Cost | ${MIC} |
| Payback Period | ${PB} |
| Annual Electricity Savings | ${ES}kWh |
| ARC Number | 2.9112.2 |

**Current Practice and Observations**

As a rule of thumb for most solar installations, there is approximately 1 kW of solar capacity per 100 ft2. The company has ${RS} ft2 of roof space on the new building, and roughly ${ASR}% of which can be dedicated to solar panels. Taking this to be one of our assumptions, this facility stands to gain ${CAP} kW (from ${AS} ft2 total) of installed solar generation.

Most solar installations in Pennsylvania produce on average of 1,200 kWh/yr for every 1 kW of capacity, giving an initial estimate of approximately ${AES} kWh/yr in energy savings. A more accurate analysis was done for your specific location using NREL’s PVWatts calculator that estimated ${ES} kWh/yr of energy savings[[1]](#footnote-1). Also, it was estimated that at systems above 10 kW of capacity, the price per watt stays around ${PPW}, which gives a system cost of approximately ${IC}. In addition, there are state and federal incentives that drastically lower the overall price. These were also used in the calculations.[[2]](#footnote-2)

The mounting height of the panels could be crucial to avoid any possible shadows. Angling the panels south, southeast at a 20 degree tilt may eliminate this issue completely, as well as increase the production of the panels.

**Anticipated Savings and Incentives**

The best cost estimate for your capacity of a solar panel system is ${PPW}/W, considering the size of the solar installation. Typically, installations starting at 1 kW are priced at $6.00/W and decrease as the capacity of the solar installation increases. Given an ${CAP} kW system, the implementation cost, IC, is as follows:

IC = ${PPW}/W × 1,000 W/kW × ${CAP} kW

= ${IC}.

The PVWatts Calculator takes into account many variables in calculating your system’s annual energy savings, ES, and annual cost savings, ACS­El. These are factors such as your DC rating of ${CAP} kW, south facing fixed tilt panels, your cost of electricity, and inputting your facilities exact coordinates, which results in:

ES = ${ES} kWh/yr

ACSEl = ${ACSel}/yr.

A breakdown of estimated monthly solar energy generation is shown in the table below:

|  |  |  |
| --- | --- | --- |
| **Month** | **Solar Radiation**  **kWh/m2/day** | **AC Energy**  **kWh** |
| January |  |  |
| February |  |  |
| March |  |  |
| April |  |  |
| May |  |  |
| June |  |  |
| July |  |  |
| August |  |  |
| September |  |  |
| October |  |  |
| November |  |  |
| December |  |  |
| **Annual** |  |  |

**Table 1: Breakdown of estimated monthly solar energy generation**

Many incentives exist which stand to drastically reduce the overall and yearly cost of solar panel systems. Two of the most common incentives were calculated and used in the findings for this report. The first is the Federal Investment Tax Credit (ITC), which covers ${ITCR}% of the total project capital costs. The second is the Solar Renewable Energy Credit (SREC) Auction Market, in which a company produces a credit for every 1,000 kWh of energy produced annually. These credits can be sold to one's local interconnection (PJM) but obviously cannot be collected until the end of the first year.

The calculated capital cost after Federal Investment Tax Credit (ITC) deduction, ICTotal, is calculated as follows:

ITC = ${IC} × ${ITCR}%

= ${ITC}

ICTotal = ${IC} - ${ITC}

= ${MIC}.

Calculating PA SRECs, as of ${CM}, with ${credits} credits (from ${ES} kWh), the average market value, AMV, and annual cost savings, ACSSR, are given as:

AMV = ${AMV}

ACSSR = ${AMV} × ${credits}

= ${ACSsr}/yr.

The total annual cost savings, ACS, is as follows:

ACS = ACSEl + ACSSR

= ${ACSel}/yr + ${ACSsr}/yr

= ${ACS} /yr.

As a note, the annual cost savings from SREC auctions does not start until the end of the first year of installation, which was taken into account when calculating the payback period. Therefore, this recommendation results in an annual energy savings of ${ES} kWh and a total annual cost savings of ${ACS} after the first year.

Contractors who install these systems also offer third party systems, which allow constant monitoring of a system’s performance, down to every panel’s daily output.

**Implementation Costs**

The implementation cost for this project is the capital cost approximation based upon ${PPW}/W at a system of ${CAP} kW and Federal ITC ${ITCR}% reduction. Therefore, the total implementation cost for this AR is approximately ${MIC}.

**The annual electricity savings for this AR will be ${ES} kWh. The estimated annual cost savings with incentives is ${ACS} after the first year and, with ${MIC} in implementation costs, the payback period will be about ${PB}.**

**Implementation Cost Reference:**

The below link is for an implementation cost reference. We do not endorse/recommend this brand or product. Furthermore, this product may or may not be suitable for the application. The client should contact a vendor(s) to conduct a detailed study of the process, in order to determine the best product for the recommended application.

<https://www.nrel.gov/docs/fy21osti/77324.pdf>

**Note:** In August 2022, Congress passed an extension of the ITC, raising it to 30% for the installation of which was between 2022-2032.

1. <https://pvwatts.nrel.gov/> [↑](#footnote-ref-1)
2. <https://www.srectrade.com/markets/rps/srec/pennsylvania> [↑](#footnote-ref-2)