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Feasibility Study of Photovoltaic Systems at WPI

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Abstract

The objective of this study was to determine the feasibility of the installation and utilization of photovoltaic systems for on the Worcester Polytechnic Institute campus. The two most suitable buildings for a photovoltaic system are Morgan Hall and Daniels Hall. Each building has enough unused roof space to install a 3.6kW system. A cost benefit analysis was conducted to illustrate when the system would begin to save WPI money on electricity. This analysis was performed based on the cost of electricity for several different economic scenarios. This established how feasible the proposed system will be given a 10 year payback requirement by WPI facilities.



-View of available area on the roof of Morgan Hall



-View of available area on the roof of Daniels Hall

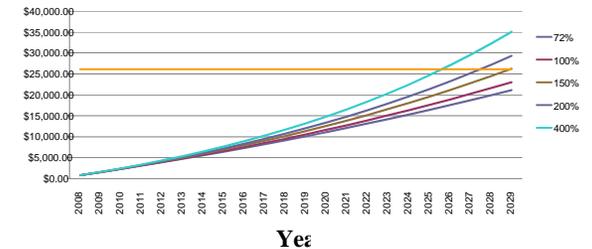
Methodology

- Determine the most optimal location for the system
 - directional orientation of building
 - condition of roof
- Establish the roof area that can be utilized
- Choose a size for the system (kW)
- Determine amount of insolation for location (kWh/m²/day)
- Determine the annual output of the system (kWh/year)
 - (system size kW)x(lowest insolation kWh/m²/day)x(365 days)
- Calculate the amount of money saved each year
 - (annual output of system)x(projected cost of electricity)
- Compile the amount saved from each year
- Calculate which year the compiled electricity savings is equal to the initial investment, this tells you the payback period

Goal/Objectives

- To determine the feasibility of installing a photovoltaic system at WPI
- Estimate the cost of the equipment and installation
- Calculate the payback period

Payback Period (Years) Adjusted for Electricity Costs

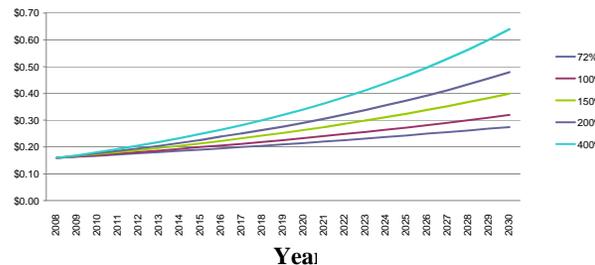


System Specifications

- 3.6kW System
- 321,875 sq ft
- Twenty 180W Evergreen ES-180-SL Panels (61.8"x35.7")
- 3600W DC to AC Inverter



Projected Cost of Grid Electricity (% Increase)



Results / Conclusions

- The calculated total cost of the proposed 3.6 kW photovoltaic systems is \$26,100. (\$34,200 Equipment and Installation Costs - \$8,100 Estimated Massachusetts Technology Collaborative Rebate)
- The calculated annual output of the proposed systems is 4,467.6 kWh/yr. (3.6 kW x 3.4 kWh/m²/day x 365 days/yr)
- The payback period for the proposed systems with respect to several projected increases in cost of grid electricity by 2030 is:
 - 72% (2.50 % Annual Inflation): >22 Years
 - 100% (3.20% Annual Inflation): >22 Years
 - 150% (4.25% Annual Inflation): 22 Years
 - 200% (5.12% Annual Inflation): 21 Years
 - 400% (6.50% Annual Inflation): 19 Years
- Both of the proposed photovoltaic systems are not feasible given the 10 year payback period requested by WPI facilities.