

Solar Power Options for Mt. San Antonio College

November 2013

Background

Since 2003, Mt. San Antonio College has been a leader among all California Community Colleges in the areas of sustainability, energy conservation, and reducing greenhouse gas emissions. Since then, over 50 distinct energy savings projects have been completed on campus; including the chilled water central plant, the cogeneration facility, the campus wide energy management system, various lighting upgrade projects, and several LEED certified new construction projects. Together, these projects have resulted in a net ongoing general fund savings of over \$1 million per year. When adjusted for inflation and campus growth, this figure approaches \$1.4 million per year. To help pay for these projects, public utility commission and other incentives totaling over \$3 million have been received.

Each of these projects has been evaluated using specific criteria such as simple payback, return on investment, maintenance savings, operating costs, life cycle cost analysis, first cost, and opportunity cost comparisons. The projects have generally been completed in logical order, with the highest return projects funded first. During the last decade, staff has periodically evaluated opportunities for solar power generation on campus, using the same rigorous criteria as all other energy conservation projects. During this time, local solar power generation has evolved from a high cost, high-risk venture to a potential project that compares well with other successful energy conservation projects. Staff now believes that it is time invest in solar power generation at Mt. San Antonio College.

In developing this analysis, the following three sites on campus have been considered: a 2 million watt ground mounted system, located on the parcel of land to the west of Grand Avenue, a 330,000 watt system mounted on the top deck of the planned parking structure, and a 1.5 million watt carport type system located in student lot F. While these three scenarios do not represent all possible options for implementing solar power generation on campus, they are representative of the various available options.

Analysis

First Cost

Two engineering firms were engaged to assist in the study of on campus solar power generation options. Each firm presented a separate order of magnitude cost opinion for the three scenarios, and produced estimates of the value of the power that would be generated. Very conservative estimates of the energy savings are used in this analysis, considering our already very low cost of energy for comparison purposes. Staff has added additional information regarding site conditions and specific infrastructure elements to complete the cost estimates. The first cost for each of the three systems, without utility incentives or other grants, is as follows.

Cost Basis	2 MW Ground	1.5 MW Car Port	0.33 MW Structure
Total Cost Per Watt	\$4.20	\$5.85	\$8.09
Escalated Cost	\$4.20	\$6.91	\$8.33

Site Specific Conditions

Each of the three projects would present unique challenges. The large project on the west parcel requires significant environmental mitigation efforts, expected to cost over \$2 million. While the mitigation efforts will result in over 11 acres of buildable land that can be used in perpetuity by the College, the mitigation costs should be considered when comparing the first cost of each project. The carport scenario would require larger concrete footings and extensive earthwork to meet the specific requirements of the Division of the State Architect, estimated to cost nearly \$500,000. Similarly, the parking structure scenario would require structural enhancements costing an estimated \$450,000 to support the additional loads on the top deck. When these costs are considered, the cost per watt increases as shown below.

Cost Basis	2 MW Ground	1.5 MW Car Port	0.33 MW Structure
Total Cost Per Watt	\$5.70	\$6.72	\$10.09

Financial Summary

For our purposes, each of the three scenarios was evaluated in terms of return on investment (ROI), net cost after incentives, simple payback, and actual energy savings. The return on investment is calculated as the net present value (NPV) of the future cash flows generated by the solar power facility, divided by the total first cost of the project after incentives, expressed as a percentage. Since we expect the cost of energy to increase at a greater rate than the standard inflation rate, we use a discount rate of 3% and an energy inflation rate of 4.5%. The service life of the solar facilities is expected to be 25 years.

Cost Basis	2 MW Ground	1.5 MW Solar	0.33 MW Structure
Total Cost	\$8,400,000	\$10,080,000	\$3,329,700
Utility Incentives	(\$1,100,000)	(\$800,000)	(\$363,000)
Prop. 39 Funds	(\$1,050,000)	\$0	(\$1,050,000)
Net Cost	\$6,250,000	\$9,280,000	\$1,916,700
Initial Service Year	2016	2021	2018
First Year Savings	\$455,061	\$418,533	\$79,657
NPV Savings	\$13,209,275	\$12,148,972	\$2,312,262
ROI	211%	131%	120%
Simple Payback	11 Years	15.5 years	16.5 years

Opportunity Cost

Implementing any of the three scenarios above would result in some secondary effects or opportunity costs. While these effects are difficult to quantify financially, where possible

the financial opportunity costs were taken into account in the above financial summary. For the parking structure scenario, the additional structural costs were considered in the project cost estimates. The impact on the neighboring homes was not. Adding solar to the top deck would increase the height of the structure and may result in complaints. A corresponding reduction in height of the structure would be cost prohibitive or would reduce the number of spaces available for students and staff. For this reason it is not recommended.

The carport scenario presents a viable option for solar power generation, but due to the scarcity of parking on campus, especially considering the upcoming construction activities, solar facility construction in any of the student lots would not be able to begin until 2019, with solar power generation beginning in 2021. The delay effectively reduces available incentives, as the Proposition 39 monies are not available after 2016–17 fiscal year. This effect, along with the increasing cost of construction reduces the carport option to the second choice. Should the College determine that additional solar generation could be effectively utilized in 2021, this scenario should be reconsidered.

While the west parcel scenario is clearly the most attractive option from a financial standpoint, other uses for the land should be considered. In 2008, before the economic downturn began, options for utilizing the land for a housing development were evaluated. Working with a prominent local homebuilder, it was determined that the site could produce positive cash flows to the college of up to \$78,000 per year for 30 years. Not only is the \$78,000 less than the energy savings that will be realized by utilizing the land for solar power generation, the proposal also required the College to remove over 300,000 cubic yards of earth from the site. Exporting such a large quantity of earth would effectively eliminate the positive cash flows from the housing option. The use of the site for solar generation also provides an opportunity for the College to transfer soil from other construction projects on campus. Finally, using the land to develop housing would be permanent. Utilizing the land for solar generation allows the district to reconsider its use after several years, once the solar power facility has paid for itself, and at that time a new use could be considered.

The west parcel option not only produces an ideal site for solar, creating ongoing savings of nearly \$500,000 per year beginning in 2016, but it also saves approximately \$1.5 million in soil export costs on other projects. For these reasons, the west parcel is the recommended site, for a 2 MW solar generating facility.

Recommendation

It is recommended that the Board approve the use of the west parcel site for solar generation. No expenditures are approved in this item. Contracts for construction will be presented for approval through the normal process.