Mt. San Antonio College Solar Self-Generation Alternatives

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Background

Solar self-generation provides the college with long term access to the least expensive power available within the constraints of current technology. After the first cost investment in site development is made, solar power costs are limited to the cost of panels distributed over 25 years plus the annual operating and maintenance costs of the facility. Savings of at least $500,000 per year after operating costs can be expected from a 2.2 MW system for as long as the college uses the site for self-generated power. As panel costs decrease and power costs increase, the annual savings will increase. In time, Mt. SAC could generate all of the power necessary to operate the college from the west parcel site.

The decision to construct a 2.2 MW solar power facility was based on evaluation of several critical factors. These factors were applied to several site options in early 2013, and presented to the Board of Trustees at the November 2013 regular meeting. Subsequently several other solar site options have been considered. While some of the underlying conditions that affect site selection factors have changed since 2013, the same factors are relevant in considering site options in 2017. An objective review of Mt. San Antonio Colleges current options to develop self generated solar power requires a review of updated site selection factors and current consideration of past site selection decisions.

Critical Factors in Evaluating Self-Generation at Mt. SAC

1. **Quantity of Power Generated** – Mt SAC requires 6 MW of power capacity at peak consumption, and just less than 2 MW at minimal daytime consumption rates. Sizing a solar system requires analysis of how power will be used through daily, weekly, semester, and annual cycles. The 2.2 MW system size was selected to maximize the efficient use of self-generated power, without wasting generation capacity. The system size is consistent with the power demands of the college now. Future systems may be needed to maintain the optimal balance. Installing smaller systems distributed around the campus could provide similar power capacity, but would require higher installation and operating costs**. A 2 to 2.5 MW single site system is recommended.**
2. **Operational Issues** - Solar systems can be designed to connect to the college main power grid, or to provide for localized power. The highest efficiency systems connect to the campus power grid at higher voltages. Smaller distributed systems are more costly to construct and maintain, and may not be as efficient as larger single site systems. **A single site solution is recommended.**
3. **Environmental Considerations** – All solar self-generation projects require environmental review according to the California Environmental Quality Act (CEQA). Environmental costs vary depending on the extent of mitigation required to develop the project with little or no resulting environmental impacts. Open space projects require the most extensive mitigation.

Carport systems require a standalone environmental review. Rooftop systems may be addressed as component of the project specific environmental review necessary for the underlying structure. The college has already committed to jointly mitigating environmental impacts related to the athletics complex and the west parcel development in the open space area south of Temple Avenue. The mitigation area includes Mt. Sac Hill, the area around temporary student Lot M, and along the Snow Creek area extending south from the existing wildlife sanctuary. A restrictive covenant exists to ensure that the open area is converted to protected habitat. Developing other open space on campus utilizing the committed mitigation area would preclude future development of the west parcel or require committing to expensive off-site mitigation. **Avoiding significant changes to the college's environmental mitigation plan is recommended.**

4. **Site Development Costs** – All solar self-generation projects require site development. Rooftop systems require structural analysis, while open space projects require compliance with grading and fire access review comments. Carport systems may require both. Minimizing site development costs is a critical component affecting the decision to develop an individual site. Identifying sites on campus that can accept poor quality soil displaced by other projects is the most effective method of limiting site development costs. Relocating soil on campus saves approximately $20 per cubic yard of hauling and export costs. The current estimate of export quantities for the athletics complex project is 170,000 cubic yards, plus an additional 100,000 cubic yards to construct the Lot R parking structure. The west parcel site is the only area on campus that can accept extensive fill without considerable additional study, design, and environmental evaluation. **The west parcel site is recommended with the lowest site cost when considering savings on other projects.**

5. **Photovoltaic System Costs** – The cost of photovoltaic (PV) systems depends on the quality of the panels specified, the type and complexity of the incorporated electrical systems, and the structural system necessary to support the panels. Tracking systems are more costly, but provide higher generation capacity per land area, and allow for panel glare to be fully mitigated. It is unclear of tracking panels are cost effective or even generally available in conjunction with carport structures. **Utilizing ground mounted structures to support solar panels is recommended to minimize structural costs and to support the use of tracking systems.**

6. **Power Distribution Costs** – Each solar self-generation site requires connection to a load that can be instantaneously balanced with the output of the system. This can be done at each of many sites, or at a single point of connection to the main campus power grid. Using few, higher capacity points of connection are more efficient and cost effective, and require fewer maintenance hours. Conduit pathways connecting power sources to the main power grid are more costly within the main campus and where they are required to cross areas congested with other utility systems. **A large site south of Temple Avenue is recommended to minimize power distribution costs.**

7. **Sunk Costs** –The College has already committed over $3.3 million to the west parcel solar site. Up to 10% of these costs are recoverable, or could be reallocated to cover environmental mitigation related to the development of other open space sites on campus. **Proceeding with the west parcel site is recommended to minimize the marginal added cost to develop solar self-generation.**

Site Options Considered

1. **No Project** – The decision to develop self-generated solar power stems from the Colleges ability to use land resources to minimize college operating costs in a sustainable manner. Options to buy solar power generated elsewhere do exist, but are more costly as they fail to make use of the colleges land resources. **The no-project option is not recommended.**

2. **Rooftop Solar** – Rooftop solar can provide self-generating capacity, but at a much higher cost due to structural considerations. The quantity of solar power that can be generated on rooftops is much less than from a single large field and the costs to connect many small sources of power are high. Operating many smaller power sources is complex and expensive. **Rooftop solar is not recommended as a primary self-generation option.**

3. **Carport Solar** – Solar power self-generation from structures that cover surface parking is a popular option for school districts. It has the secondary benefit of providing shade to student's vehicles. The concerns of the system type include reduced visibility of the parking area limiting crime deterrence, significantly higher pavement maintenance costs, higher structural and design costs as compared to ground mounted systems, and difficulty eliminating glare associated with the solar panels. Mt. SAC has many large parking areas, most of which have been considered for solar, but for all parking lots north of Temple Avenue, the option has been eliminated because the parking areas surrounding the main campus represent future building sites for academic and service buildings and parking structures. **Carport solar is not recommended as a primary self generation option north of Temple Avenue.**

4. **Campus Open Space** – Two open space sites on the east side of campus were considered as alternatives to the west parcel. The combined area of the two sites would provide about 70% of the solar capacity of the west parcel site, but would require environmental mitigation, earthwork and soil export, and duplicate conduit pathways to bring power to the main campus. **Developing self generation on these sites would not meet financial constraints of profitable self-generation and is not recommended.**

5. **The West Parcel** -- The west parcel site was recommended in 2013 because it met the project financial goals, provided significant cost savings on other projects, minimized the impact on the environment, and represented the only feasible development option for the college's property west of Grand Avenue. Other development options for the site were considered, including commercial and residential. Both options were eliminated because they require the export and disposal of 450,000 - 500,000 cubic yards of generally poor quality earth, as well as environmental mitigation costs that would significantly exceed the mitigation measures required to develop the site for solar self-generation. The use of the site for academic purposes was eliminated because of the remote location and complexity of pedestrian circulation to the main campus.

   The Board made a firm commitment to the west parcel site for self-generation in the fall of 2015 by approving contracts for design and construction, approving a restrictive covenant to restore and protect disturbed habitat, and by exempting the structural design of the solar panel system from DSA review. Approximately $3.3 million dollars have been committed, the majority of which has been expended and is not recoverable. **The west parcel remains the superior alternative for the college to develop meaningful self-generation capacity.** Only one other option is available at this time that could meet the colleges need.

6. **Temporary Student lot M** – Student lot M was constructed in 2015 after the construction of the Lot A parking structure was halted. The 500,000 square foot lot provides almost 1,000 parking spaces, and is fully utilized for both the fall and spring semesters. The site could be developed to provide 2.2 MW of solar power to the main campus. The following obstacles would need to be overcome:

   a. **Environmental Impacts** – No CEQA evaluation has been made for Lot M as a self-generation site. A new CEQA effort would require 6 – 12 months and would conflict with other planned CEQA compliance work related to the ongoing Facilities Master plan and Traffic and Parking studies. The site is located in an area of campus that is clearly visible to surrounding neighborhoods. A preliminary glare analysis suggests that tracking type panels would be required to mitigate glare to the same extent as planned at the west parcel suite. The Lot M site would result in greater aesthetic and view impacts to surrounding home sites when compared to the west parcel site.

   b. **Loss of Other land Uses** – The long term use of the Lot M site is currently under evaluation in the 2018 facilities master plan. Preliminary indications suggest that the site will be used for athletics and fire technology training, with the possible construction of a small nature center adjacent to the expanded wildlife sanctuary. Developing Lot M for self-generation would limit the long-term use of this site for academic purposes.

   c. **Other project Savings** - No additional soil can be imported to the site therefore selection of the Lot M site does not result in savings on other projects.

   d. **Site Development** - The asphalt surface of lot M was constructed to provide a 10 year service life, consistent with its temporary designation. To support 2.2 MW of solar panels, the lot should be reconstructed to meet a 50 life span at a cost of approximately $2.5 Million. Work to replace the temporary surface at Lot M could be done over a summer or winter holiday with varying weather risks. The Lot must be open for fall and spring semesters for approximately 8 more years.

   e. **Photovoltaic System Costs** - The cost of a PV system at lot M would be 50% to 100% greater than the system planned for the west parcel. All other things remaining equal, the design-build cost of a ground mounted system is approximately $2.5 Million per MW. A carport system will range from $3.5 Million to $4 Million per MW depending on soils and other conditions. Such a system would not typically incorporate tracking panels for glare mitigation. Tracking systems on carports have not been constructed on California school sites for several years, since the State Architect structural requirements for such systems were substantially upgraded. It is not clear if glare can be adequately mitigated at the Lot M site without tracking technology.

   f. **Cash Requirements** - The availability of incentive funds would be impacted by the time necessary to develop a Lot M Alternative. The $700,000 self generation incentive would be lost, as would the opportunity for a $ 3 million zero interest loan. Proposition 39 funds of $2.5 Million may be available in the future, but would be subject to future State and local budget considerations.

   Lot M should be considered a second option for the development of a primary solar self-generation system.

Financial Comparison West Parcel and Lot M

Project Scope	West Parcel Only	Lot M only	Develop Both Sites
Site Development	$ 4,800,000	$ 2,600,000	$ 7,600,000
Environmental Mitigation	$ 2,100,000	$ 1,900,000	$ 2,600,000
Other Project Savings	($ 2,600,000)	$ 0	$ (2,600,000)
Sunk Costs	$ 3,000,000	$ 3,000,000	$ 3,000,000,0
Conduit Costs	$ 600,000	$ 600,000	$ 600,000
Solar System Costs	$ 4,600,000	$ 7,200,000	$7,200,000
Solar Tracker Added Cost	$ 0	$ 2,000,000	$ 2,000,000
Available Incentives	($ 3,200,000)	$ 0	$ 0
Interest Costs	$ 0	$ 700,000	$ 700,000
Total	**$ 9,300,000**	**$ 18,000,000**	**$ 21,100,000**

Recommended Options

1. **Maintain commitment to the west parcel.** The west parcel remains the recommended option for solar development. The project site best addresses the project goals and development constraints. Funds are available for the project, and pending certification of the current CEQA compliance work, the project will begin the fall of 2017 and complete in late 2018 or early 2019. Further legal costs will be required to complete the project.
2. **Develop the Lot M site for solar self generation AND develop the west parcel site.** The west parcel site could be developed as planned, but for academic uses, including fire training (excluding a burn tower) and athletics. This option would preserve all of the planned land uses, and meet most of the other project goals, but would be the most costly at approximately $21 million, not including the academic facilities currently envisioned for student Lot M.
3. **Develop only the Lot M site and abandon the west parcel development.** This option would be more costly than developing the west parcel site, and would reduce the land available for use by the college by approximately 11 acres.
4. **Abandon solar self-generation.** The least desirable option would abandon solar self-generation and the accompanying general fund savings. While the west parcel could be developed in the future, it is unclear how feasible such land development would be in the future.