



# Management Audit of the District's Almaden Campus Solar Project

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## Final Report

Peter Sakai, Temporary District Auditor

3/3/2011

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**Management Audit of the District's Almaden Campus Solar Project  
Final Report – March 3, 2011**

The Temporary District Auditor has completed his management audit of the Santa Clara Valley Water District's Almaden Campus Solar Project. The purpose of this audit is to examine the costs and benefits of this project. This examination included a review of project documents, materials submitted to the Board, financial records and interviews with key staff. This examination was recommended by the District's Audit Ad Hoc Committee as part of the Board's pilot audit program. The Temporary District Auditor was directed to complete this examination by the Board of Directors in November 2009.

The following report contains a summary of findings, followed by sections that provide an overview of the project and a summary of project costs. The report also includes 2 recommendations. The first recommendation is for the Board to codify budgetary controls it has implemented since the start of Fiscal Year 2007, but are not contained in its Governance Policies. The second recommendation calls for periodic review of the District's energy portfolio and evaluation of potential alternative energy projects. Because the factors driving cost and benefit of these projects is subject to rapid change, periodic review and consideration of projects will help to ensure that the District's management of its power costs is cost effective and environmentally responsible.

**Summary of Findings**

The 200 kilowatt (kW) Almaden Campus Solar project is annually producing approximately 332,000 kilowatt hours (kWh) of electricity, enough to provide for a 20% reduction in peak power demand at the campus and 10% of overall campus energy needs. The cost of the project, net of incentives totaled \$2,186,040, with a useful life of 30 years. The project reduces demand on the California/P&G&E power grid, provides shaded parking, reduces CO<sub>2</sub> and other emissions and serves as a symbol of the District's commitment to environmental stewardship and development of renewable energy.

In evaluating the Almaden Campus Solar project, it is important to keep in mind the conditions that existed at the time the project was considered for funding. The District Board of Directors elected to fund construction of the solar project at a time when reliability of energy supplies was increasingly uncertain, energy costs were becoming more volatile, attention to the causes and effects of global climate change were escalating, and attractive incentives were available for investments in alternative/renewable energy projects.

As originally conceived, the project showed positive cost and environmental benefits within the projected useful life of the project. However, the project ended up costing more than anticipated and the District was able to significantly reduce its energy cost by joining the Power and Water Resources Pooling Authority (PWRPA) after the project was completed. PWRPA provides electricity at about half the cost of the PG&E rate and the power provided by PWRPA originates from largely clean sources. Beginning in 2005, the District started receiving low cost and clean energy from PWRPA.

As it stands today, the savings achieved by the District by joining PWRPA effectively offset much of the potential savings and environmental benefits initially estimated for the Almaden Campus Solar Project.

It should be noted however, that the cost-benefit equation for this project could again shift in favor of the project. This could happen if PWRPA rates for electricity were to increase significantly, if new and existing laws to limit greenhouse gas emissions are fully implemented, and the market value of carbon and renewable energy credits increase beyond current levels.

### **Almaden Campus Solar Project Overview**

The Almaden Campus Solar Project is an element of a concerted effort by the District to improve energy efficiency, manage energy costs, and maximize renewable power usage to reduce greenhouse gas emissions. The District received the 2006 Energy Management Award from the California-Nevada Section of the American Water Works Association, and the Bay Area Breathe California Clean Air Leadership Award in 2007, all in recognition of the District's energy management efforts. The District also received Santa Clara County Green Business Certification in 2004, due in part to the Almaden Campus Solar Project.

The 200 kW Almaden Campus Solar Project is composed of 2 carport structures, 57 solar arrays installed on the roof of the Administration Building, 64 solar arrays mounted on top of the two carport structures, 4 power inverters, switches, power distribution panel, and combiner and re-combiner boxes. The carports provide 76 shaded parking spaces for District employees. The system also includes a data acquisition system, lobby kiosk displays and four charging ports for electric vehicles. With a designed project life of 30 years, the project had a total cost of \$3,085,651 less \$899,611 in incentives, for net cost of \$2,186,040. The carport structures are estimated by District staff to have a value of \$450,000-\$600,000 after the 30 year life of the project. The targeted amount of power the system is designed to produce is 299,288 kWh annually.

Ongoing maintenance of the solar system is managed by the Facilities Management Unit with technical support from the Water Utility Electrical and Control Systems Unit. Annual maintenance consists of cleaning the solar panels twice each year. This maintenance is performed by District staff and is scheduled through the District's asset management system.

### **Project History**

In early 2001, the California electricity crisis resulted in rolling power blackouts and rising electricity costs throughout the State. This crisis significantly challenged the District's mission of providing comprehensive management of water resources in terms of power supply reliability and cost management. In July 2001, the Board stated its interest in the possibility of solar projects at the District. The Almaden Campus Solar Project was one of several potential solar energy projects presented by District staff to the Board in December 2001. In addition to reducing reliance on the PG&E and California power grid, and increasing electrical service reliability, the project was intended to serve as a visible example to the community of the District's environmental stewardship by reducing greenhouse gases, leadership in pursuing renewable energy sources, and initiative to manage electrical power costs.

On May 14, 2002, the Board directed staff to pursue a 234 kilowatt (kW) Almaden Campus Solar Project after a presentation on the projects by District staff. The presentation included a description of the following reasons and benefits for the Almaden Campus Solar Project:

- Provides cost management of power bills.
- Increases electrical power reliability at the Almaden headquarters.
- Availability of potential California Energy Commission/Pacific Gas and Electric (PG&E) incentives totaling \$1,053,000 (\$4,500 per kW x 234) to reduce project costs.
- Reduces electrical power load from the local and statewide California power grid.
- Provides for environmental savings and air quality improvements for Silicon Valley residents by the reduction of over 1,400 tons of harmful greenhouse gases over a 30 year period.
- Enhanced roof insulation and extended roof life for the Administration Building.
- The carport solar installation in the west parking lot would provide a positive neighborhood environmental stewardship public relations statement.

At the time of project was presented to the Board, District staff estimated the payback period for this project at 10 – 20 years.

By October 2003, the District started construction of the project and it was essentially complete on April 15, 2004. By the time the project was formally closed out in 2008, the cost of the project totaled \$3,085,651, excluding interest paid on loans from the Water Utility Enterprise and Watershed funds. District staff applied for and received \$899,611 in incentives for this project for a net project cost of \$2,186,040.

The following is a chronology of actions taken by the Board and District staff on project funding:

- On July 16, 2002, the Board of Directors funded the project at \$2,150,000 with the anticipation of receiving incentives of \$1,053,000 (for a net project cost of \$1,097,000) and authorized the CEO to execute all consulting agreements necessary to fast-track and complete the project by December 31, 2002, to maintain eligibility for financial incentives for the project. To finance the project, funds were loaned (and subsequently repaid) from the Water Utility Enterprise Central Valley Project Reserve to the District's General Fund.
- In September 2002, District staff reported that that the completion date for the Almaden Campus Solar Project could go beyond December 31, 2002, and still be eligible for same level of incentives under a different incentive program. The Board was also informed that District staff set a new project completion schedule for July 2003, and District staff advised the Board on selection of Mogavero Notestine Associates as the design consultant for the project.
- On April 15, 2003, the Board approved plans and specifications for the project and also approved advertisement of bids for construction. In the agenda memo for approval of the plans and specifications, District staff made a number of disclosures to the Board regarding the design of the project:
  - The size of the project was reduced to 200 kWh, due to the design decision not to install solar panels on the HVAC rooftop canopy due to maintenance concerns and to avoid

- costs associated with upgrading the canopy structure. District staff disclosed that this reduction in size reduces the incentive to \$898,650 (\$4,500 per kWh x 200).
- The estimated cost of the carports increased due to the design decision to increase the number of solar panels to the carports and increase efforts to match the architectural design of the carports to the Headquarters Building.
  - Receipt of incentives is now tied to completing the project by October 27, 2003.
  - In May 23, 2003, District staff informed the Board that only 1 bid was received for construction of the project and an extension of up to 6 months for the completion date of the project to maintain eligibility for incentives was an option.
  - On June 17, 2003, the Board rejected the single bid for construction. This was recommended by staff because the bid amount was substantially higher than the engineer's estimate and because of an error by the bidder. District staff revised the plans and specifications based on review of the single bid, and identified additional costs for kiosk installation, interconnection fees and permits. District staff also requested a 6 month extension for receipt of project incentives and changed the project completion date from October 27, 2003 to April 27, 2003. As a result of these changes, the estimated cost for the project increased by \$300,000, from \$2,150,000 to \$2,450,000. The Board approved the revised plans and specifications for advertisement of bids.
  - On August 5, 2003, the Board awarded the construction contract to I.C.E. Builders of Sacramento, CA. The amount of the contract was \$1,212,800. Staff noted that based on the successful bid and additional costs previously identified, the estimated cost of the project will be \$250,000 over the initial estimate of \$2,150,000. In July 2003, an internal budget adjustment was made by the CEO, to shift an additional \$250,000 to the Almaden Campus Solar Project from the Almaden Campus Gas Generator Project that was previously funded by the Board. This increased the amount allocated to the project to \$2,400,000.
  - On March 2, 2004, the Board approved a construction contract change order that added \$270,000, for a total construction contract cost of \$1,482,000, and a project cost of \$2,670,000. Funding for this change order was provided by funds previously allocated to the Almaden and Winfield Campus Project. The increase was due to discovery of unstable soils and the existence of buried foundations and septic tanks from old buildings at the site where the carports were to be constructed. The change order provided for removal of buried objects, construction of spread footing foundations, and relocation of a storm drain made necessary by the construction of the new footing foundations. According to District staff, specific geotechnical work for this project was not conducted during the project planning and cost estimating phase because project staff relied upon a prior geotechnical report for construction of the Almaden Campus which did not reveal the specific site conditions found in the parking lot area where the carports are located.
  - On March 30, 2004, an internal budget adjustment was approved by the CEO that increased the budget for the project by \$380,000. This adjustment transferred \$380,000 from the Almaden and Winfield Campus Project. This increased the level of funding for the solar project to \$3,050,000. Although this adjustment did not require Board approval because it was a transfer

within the capital budget, it is unclear as to whether the Board was informed specifically of this budget adjustment.

- On July 19, 2005, the Board approved the Notice of Completion of Contract and Acceptance of Work for the construction of the project by I.C.E. Builders. District staff reported that the project was substantially complete on March 25, 2004, but the contractor was slow in closing out the project. District staff also reported that a staff approved change order was executed, reducing the contract by \$27,962, which included a \$7,552 credit for As-Built Drawings.
- In June 2006, an internal budget adjustment was made that added \$50,000, from the Almaden Gas Generator project, to the Almaden Campus Solar Project. The purpose of this adjustment was to fund District labor costs to complete as-built drawings for the project. This increased the total allocated to the project to \$3,100,000. As with the \$380,000 adjustment from March 30, 2004, this adjustment did not require Board approval because it was a transfer within the capital budget. It is unclear as to whether the Board was informed specifically of this budget adjustment.
- By the end of Fiscal Year 2008, when unspent funds of \$14,349 was disencumbered. Total project costs were \$3,085,651.

Beginning in Fiscal Year 07, the Board limited the CEO's authority to make budget transfers between capital projects within the same fund. Board Resolution 06-42, contains language that requires action by the District Board of Directors for all budget adjustments between capital projects within a fund that exceed \$100,000 per project within the fiscal year. This provision has been carried forward into Budget Resolutions for subsequent years. It was noted in this audit that this limitation on CEO authority is not reflected in the Board's Executive Limitation Policies on Financial Conditions and Activities (EL-5).

### **Recommendation**

The Board of Directors should consider adding a provision to EL-5 to limit the CEO's authority to make budget transfers between capital project within a fund to \$100,000 or less per project within the fiscal year. This would establish consistency between the Board's annual budget resolutions and the authority delegated by the Board in its Governance Policies.

### **Summary of Project Costs**

As previously described, the project cost more to design and construct than originally estimated. The total project cost net of incentives was \$2,186,040; the original design estimate of net project cost was \$1,097,000 a difference of \$1,089,040. The increased cost of completing the project was primarily due to:

- Additional work that needed to be performed for design and construction of the carpports because of permitting requirements and unanticipated site conditions.
- Costs associated with accelerating construction to maintain eligibility for incentives,
- Staff preparation of as-built drawings and installation of informational kiosks.

- Incentives received were less than initial estimates because of changes in project plan that downsized the project from 234kW to 200kW.

The following is a breakdown of project costs:

Construction Contract	\$1,454,838
Solar Panels, Inverters, Switches	\$849,926
District Labor	\$404,297
Design Consultant	\$158,751
Miscellaneous Charges (staff benefits, allocated costs)	\$144,033
Interconnection, Data Acquisition System, Kiosk Display	\$23,827
Advertisement, Reprographics, FedEx, Other Services	\$14,144
City of San Jose Planning and Permits	\$13,382
Control Systems	\$12,084
Soil Testing	\$9,209
Landscaping	\$1,160
<b>Total Project Costs</b>	<b>\$3,085,651</b>
<b>Less Incentives (\$4,500 per project size kW)</b>	<b>-\$899,611</b>
<b>Net Project Cost</b>	<b>\$2,186,040</b>

In addition to using a competitive bidding process for selection of the construction contractor (I.C.E. Builders) as noted in the Project History above, District staff used competitive processes for selection of the design consultant (Mogavero Notestine Associates), and for the procurement of major systems hardware (solar panels, inverters and associated hardware).

### Project Performance and Benefits

This examination verified that since the project was completed, over 2 million kilowatt hours (kWh) of electricity was produced by the Almaden Campus Solar Project system as of September 2010. The yearly average of 332,000 kWh of power produced, exceeds the annual targeted level of 299,288 kWh. According to District staff, the project is responsible for a 20% reduction in peak power demand and provides 10% of overall demand for electricity at the Almaden Campus compared to pre-project conditions.

In 2001 - 2004, when the Almaden Solar Project was in the planning and construction stages and initial Board discussions on project funding took place, District staff estimated the ongoing savings in utility costs as \$50,000-\$70,000 per year based on PG&E rates and a project payback period within the estimated 25-30 year useful life of the project. It should be noted however, that a significant change occurred in 2005, after the solar project was completed. The District, as a member of PWRPA, began purchasing power, generated largely from renewable sources, at a rate that is about 50% less than rates charged by PG&E. The District's participation in PWRPA provided immediate environmental benefits as well as actual cost savings that far exceeded the anticipated cost and environmental benefits of the solar project. Consequently, measuring the actual payback period and environmental benefits of the solar project using current information relative to current cost of PWRPA provided electricity will result in a

much longer payback period and significantly less environmental benefits for the project than originally estimated.

If existing and proposed laws to cap carbon emissions are fully implemented and the market value of carbon and renewable energy credits increase and/or if PWRPA power rates increase beyond current levels, the cost-benefit of this project could become more favorable. Current values for carbon credits are \$13-\$30 per metric ton of CO<sub>2</sub> and the current value of renewable energy credits are \$10-\$50 per megawatt hour (1000 kWh)

For comparative and educational purposes, the annual average estimated value of the power produced by this system, using a Pacific Gas and Electric rate of \$.15 per kWh is just under \$50,000 per year. This is reasonably close to the estimates of \$50,000-\$70,000 savings made by District staff during the planning study phase of the project. The renewable, self generated power produced by the project is equivalent to an annual 174,000 – 441,000 lb reduction of CO<sub>2</sub> when compared to power available from electric utilities. The 174,000 – 441,000 lb range is based on different kWh to CO<sub>2</sub> conversion factors in use. Currently PG&E uses a factor of .524 lbs of CO<sub>2</sub> per kWh, while the California average is .724 lbs per kWh and the U.S. average is set at 1.329 lbs per kWh. The District's informational kiosks use a factor of 1.241 lbs per kWh in computing CO<sub>2</sub> emissions. It was noted during this examination that during the planning phase of the project, the conversion factors in use at that time were significantly higher than the factors in use today.

### **Recommendation**

Advances in technology, availability of incentives, the cost of regulatory actions to limit the discharge of greenhouse gases, the value of carbon and renewable energy credits/offsets, the level of CO<sub>2</sub> emissions resulting from the mix of electricity received by the District and the cost of electricity to the District are all subject to rapid change. The District should periodically examine its energy portfolio and evaluate potential alternative energy projects. The Board should give primary consideration to those projects that reduce energy cost over the useful life of the project, increase energy supply reliability and reduce greenhouse gases or meet regulatory requirements.

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# **ATTACHMENT 1**

## **DISTRICT RESPONSE**

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**TO:** Beau Goldie

**FROM:** Frank Maitski

**SUBJECT:** Review of Draft Management Audit Report of the Almaden Campus Solar Project **DATE:** November 9, 2010

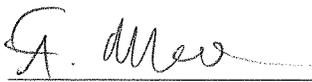
I have reviewed the draft report of the “Management Audit of the District’s Almaden Campus Solar Project.” The report does not provide any recommendations that require specific response from staff.

I believe the audit is comprehensive and accurately reflects the operational and fiscal aspects of the project. I would like to offer one refinement regarding the cost savings associated with Power and Water Resources Pooling Authority (PWRPA) power versus PG&E. The draft report states “PWRPA provides electricity at about half the cost of the PG&E rate.” Depending on market and hydrologic conditions in any given year, the PWRPA rate ranges from one third to one half less than the PG&E rate. This does not change the general conclusion that the cost savings of the solar panel were reduced when the District began acquiring power from PWRPA.

I would also like to highlight two main items discussed in the draft report:

- The solar panels are performing as anticipated in the original feasibility report.
- All cost increases were discussed, or approved by the Board, as the project was being delivered, with the exception of internal budget adjustments.

Please contact me at x2284 if there are further questions.

  
\_\_\_\_\_  
Deputy Operating Officer  
Water Utility Technical Support



## MEMORANDUM

**TO:** Beau Goldie

**FROM:** Frank Maitski

**SUBJECT:** Review of Management Audit Report of the  
Almaden Campus Solar Project

**DATE:** April 12, 2011

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### **Recommendation 1**

To adopt a new provision to its Executive Limitation Policies on Financial Conditions and Activities (EL-5). The purpose of the new provision is to establish consistency with the language contained in the Board's Annual Budget Resolution (starting in Fiscal Year 2006-2007), that limit the CEO's authority to make budget adjustments to the capital projects within the same fund to \$100,000 or less per project within the fiscal year.

#### **Response: Agree with Recommendation**

This recommendation will be addressed in the FY2012 Policy Review Work Study Session.

### **Recommendation 2**

To periodically review the District's energy portfolio and consideration of potential alternative energy projects to ensure that the District's management of its power costs is cost effective and environmentally responsible.

#### **Response: Agree with Recommendation**

As new technology becomes available periodical reviews of the District's energy portfolio would be warranted. Reviews to be scheduled over the next 3 to 7 years.

### **Additional Management Comments**

I believe the audit is comprehensive and accurately reflects the operations and fiscal aspects of the project. I would like to offer one refinement regarding the cost savings associated with Power and Water Resources Pooling Authority (PWRPA) power versus PG&E. The draft report stated "PWRPA provides electricity at about half the cost of the PG&E rate". Depending on the market and hydrologic conditions in any given year, the PWRPA rate ranges from one third to one half less than PG&E rate. This does not change the general conclusion that the cost savings of the solar panel were reduced when the District began acquiring power from PWRPA.

I would also like to highlight two main items discussed in the report.

- The solar panels are performing as anticipated in the original feasibility report.
- All cost increases were discussed, or approved by the Board, as the project was being delivered, with the exception of internal budget adjustments.

Please contact me at X2284 if there are any further questions.

Jim approved for F. Maitski via email 4/12/11

Frank Maitski

Deputy Operating Officer

Water Utility Technical Support