SOLAR POWER SHINES

ALAMEDA COUNTY IS REDUCING CO_2 EMISSIONS BY 1,000+ TONS PER YEAR

By Susan DiVico

One of the nation's earliest proving grounds for the U.S.'s fastest growing renewable energy technology.

PowerGuard® Solar Electric System on the roof of the Santa Rita Jail

No other county in the U.S. better exemplifies the thoughtful and ambitious deployment of solar power than Alameda County.

Alameda County has been at the forefront when it comes to using solar power—and demonstrates continued leadership in this arena. At the county level, Alameda is the nation's largest deployer of solar power, with a total of 3.0 MW of solar photovoltaics (PV) commissioned at nine County-owned facilities.

Alameda County was keen to deploy smart energy strategies—integrating solar generation and energy efficiency measures into county-owned and operated facilities. For years, the County has been a leader in smart energy investments; this is a direct result of the vision and leadership of the County's Board of Supervisors and General Services Agency to reduce the County's annual overall energy usage and costs.

A number of cost-effective energy efficiency programs were launched in 1993, when the County's General Services Agency hired its Energy Program Manager, Matt Muniz, P.E. One of Muniz's first projects was to retrofit over 12,000 fluorescent light

"Over the past several years, Alameda County has reduced electricity use by more than 30 percent. . . We are confident that solar energy is a very smart addition to our overall energy strategy."

– County Supervisor, Scott Haggerty in 2001.

fixtures with energy efficient T-8 lamps and electronic ballasts and install innovative lighting controls throughout the County's Santa Rita County Jail in Dublin, CA. Later Mr. Muniz's energy team replaced over 550 inefficient fractional horsepower exhaust fan motors with premium efficiency motors at a payback of less than one year. Both of these projects are part of Pacific Gas & Electric's (PG&E) "PowerSaving Partners" demand-side management program. As a PowerSaving Partner, the County has received over $3.2 million in direct incentive payments and ultimately reduced electricity costs at its Santa Rita Jail by one-third.

Charged with the task of achieving even greater energy savings at other Alameda County facilities, Mr. Muniz and his energy program colleagues implemented a number of other energy efficiency measures that presently total over $4 million in annual cost avoidance savings. These measures included lighting retrofits in 95% of County owned-buildings, the installation of state-of-the-art building automation systems in 25 facilities, replacement of most chillers with energy efficient and CFC-friendly equipment, and installation of Variable Frequency Drives to the HVAC systems in County facilities.

In early 2000, the City of Oakland was evaluating 'green' electricity purchase options and met with executives of PowerLight Corporation, a subsidiary of SunPower Corporation. PowerLight's protective insulating solar electric rooftop technology gave them a new demand reduction challenge: How could he and his colleagues continue to reduce energy costs at the Santa Rita Jail by generating electricity from an onsite solar power plant?

"I thought that we had completed all the cost-effective energy saving measures that were possible at the jail," said Matt Muniz, P.E., Alameda County's Energy Program Manager. "But with over a half-million square feet of unused flat roof space at the jail and the recent drop in prices for solar cells I immediately concluded that solar electricity was the perfect solution for further demand reduction."

How could Alameda County achieve its vision of becoming a leader in solar energy? Could the economics of large-scale solar PV pencil out? How would such a large capital purchase be financed?

The answers to these questions began with the abundant solar electric incentive programs available in California—the predecessors to today's statewide California Solar Initiative program—that made the solar electric system affordable in its own right. However, an even more affordable idea was devised: to combine on-site solar electric generation with reductions in the jail's overall energy use by implementing energy efficiency and sophisticated energy management measures. PowerLight Corporation contracted with its strategic partner, CMS Viron Energy Services (which was acquired in 2003 by Chevron Energy Solutions), to

Modified Central Plant Cooling Tower Installation.

showcase the synergy between the latest advancements in solar PV and state-of-the-art energy efficiency technology.

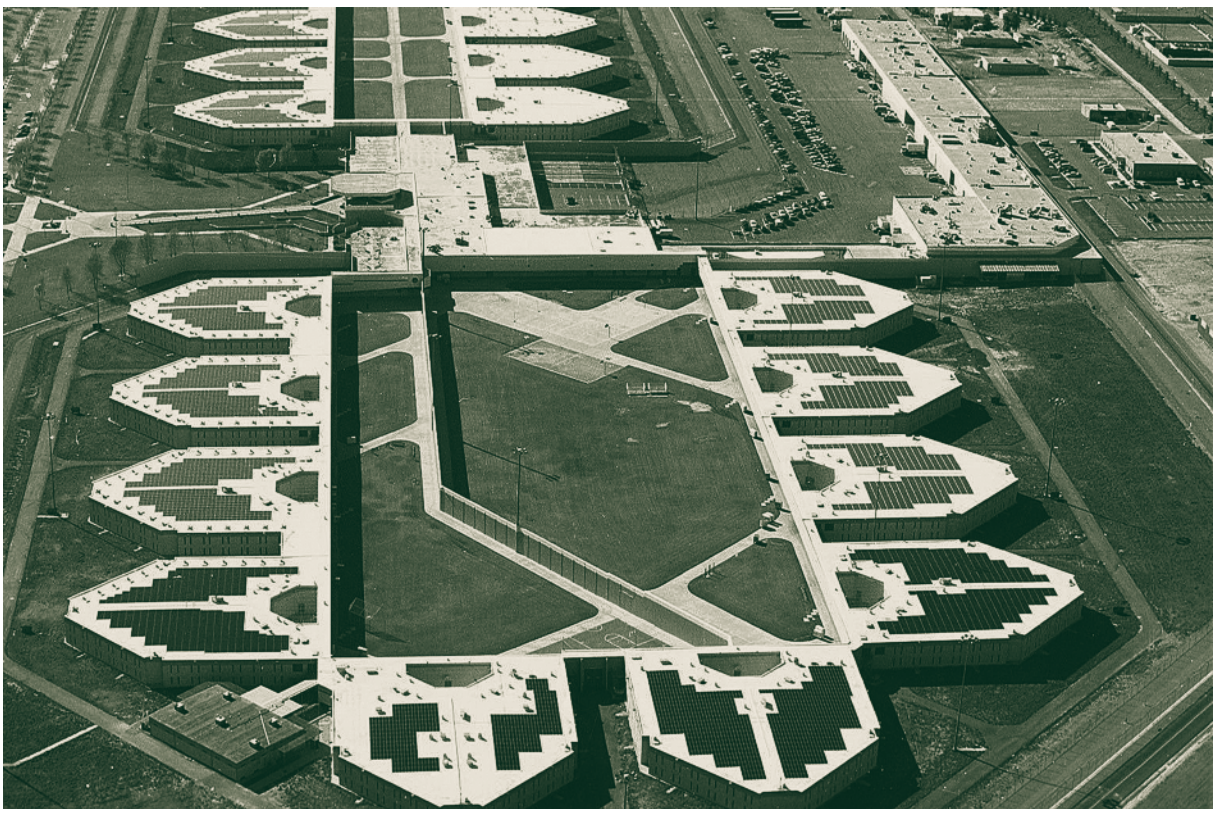
Alameda County, PowerLight, and Viron then crafted an integrated solar electric generation and energy efficiency plan with the goal of exceeding the County's 10% internal rate of return threshold for energy projects. It would soon serve as a model for other local governments and large commercial customers concerned about rising electricity rates, reliability, and the nation's increasing reliance upon polluting sources to supply electricity.

The Santa Rita Jail offers proof that solar and energy efficiency are a synergistic blend of technological innovations well suited to respond to today's stressed power grid in California. By linking the largest rooftop solar PV system in the U.S. explicitly with energy efficiency upgrades and state-of-the-art energy management software, Alameda County is able to reduce its peak power consumption, without any expenditure from its general fund. Some of the innovations that make the Santa Rita Jail project noteworthy include:

- **Solar Power Installation Provides Multiple Benefits:** PowerGuard® tiles incorporate state-of-the-art solar cells backed with insulating polystyrene foam, turning the sun's free energy into usable power while increasing building thermal insulation and extending roof life. A key innovation of these roof tiles is that they can be installed on flat rooftops without penetrating the roof membrane.

- **Applying a "Cool Roof" Membrane with High Solar Reflectivity:** By applying a "Cool Roof" reflective coating on the jail's existing roof, the roof area not covered by solar tiles now reflects 65% of the solar energy. This effectively reduces the roof's temperature during the hot summer months by 50 degrees Fahrenheit. Peak electrical demand reductions result from the reduced air conditioning requirement in the occupied spaces below.

- **Replacing Inefficient Equipment Generates Large Electricity Savings:** Large electricity savings are garnered by replacing an old inefficient chiller with a new 850-ton high efficiency chiller that does not use CFCs that contribute to the degradation of the ozone layer. New variable speed drives attached to the new chiller, chilled water pumps, and cooling towers will respond directly to the



The 1.2 MW solar PV installation consists of tiles mounted on top of medium and minimum-security housing units of the Santa Rita Jail in Dublin, California.

The environmental benefits of Alameda County's deployment of solar power and other energy efficiency improvements are considerable. Over the course of three decades, the solar-generated electricity will reduce carbon dioxide emissions by 45,000 tons. . . savings equivalent to planting over 270 acres of trees or avoiding driving 71 million miles.

precise real-time cooling requirements needed to deliver chilled water instead of operating at 100% speed all of the time.

- **Smart Energy Management Optimizes Overall System:** Implementation of Utility Vision TM, a computerized energy management system developed by CMS Viron automatically reduces peak power consumption during dips in solar power generation. These dips may be caused by normal weather conditions such as cloud cover. For example, if clouds block the sun for five minutes on a summer afternoon, Utility Vision automatically reduces power consumption proportionately so that no additional purchases of expensive peak priced electricity are necessary.

Following the installation of the solar system at the Santa Rita Jail Alameda County was so pleased that it decided to add an additional 1.8 MW of clean solar power into its energy mix. Several more solar arrays were installed at the following County venues between 2003 and 2007—the Office of Emergency Services, the Environmental Health Services, the Winton Avenue Government Building, the Wiley W. Manuel Courthouse, Hayward Public Works, Fremont Hall of Justice, and the new Juvenile Justice Center.

Alameda County's deployment of solar power has played an enormous role in bringing down utility costs. By integrating solar power generation with energy efficiency measures, Alameda County has demonstrated enormous leadership in defining both clean and cost-efficient energy solutions. The County's cumulative 3.0 MW of solar power systems generate 4 million kilowatt-hours of electricity annually, much of it produced during peak demand times, when the utility grid is the most strained and electricity is most expensive.

Overall, Alameda County's solar energy investments are enabling the County to meet eight percent of its electrical needs at its facilities with clean, renewable solar power. Its grid-connected solar systems help reduce the County's electrical demand; consequently, it saves over $500,000 annually in avoided electricity purchases. These savings add to the $3.5 million annual savings associated with its energy efficiency measures.

The environmental benefits of Alameda County's deployment of solar power and other energy efficiency improvements are considerable. Over the next 30 years, the environment will be spared from thousands of tons of air emissions such as nitrogen oxides, sulfur dioxide and carbon dioxide. These emissions are to blame for our urban smog, a primary cause of asthma and other respiratory diseases and contribute to global warming. And over that same 30 years, the solar-generated electricity will reduce carbon dioxide emissions by 45,000 tons. These environmental savings are the equivalent to planting over 270 acres of trees or avoiding driving 71 million miles on California's roadways.

Energy performance data is posted on the internet so that Alameda County, governmental agencies, solar customers and other interested parties can review and analyze the performance of Alameda County's solar installations and the energy efficiency measures.

Alameda County has shown that large-scale solar systems can indeed be cost effective investments and even more cost effective if the system is integrated with the facility's energy management infrastructure.

The solutions offered by effective deployment of solar power reflect the future of the energy industry and point the way toward stable power costs and pollution-free, local energy choices. As volatility in energy pricing continues, increasingly the public and private sector will follow Alameda County's visionary lead. FW

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