

Option Submittal Form

Contact Information (optional):

Keep my contact information private

Contact Name: _____	Title: _____
Affiliation: _____	
Address: _____	
Telephone: _____	E-mail Address: _____

Date Option Submitted: 12/12/2011

Option Name:

Colorado River basin-wide water conservation by reducing evaporation losses from lakes, spreading grounds, canals and reservoirs, using renewable energy generating floating solar Floatovoltaics® systems [+]

Description of Option:

Using floating solar photovoltaic panels (Floatovoltaics®), open surfaces of water bodies can be transformed into generating green energy and saving water from evaporation in addition. This option uses no land, improves water quality and maximizes return on investment.

For Colorado River basin, a basin-wide application of the option would lead to water savings which can be used in reducing longer term water shortfall. In addition, installing Floatovoltaics® would increase water security in times of drought.

Both the sale of the electricity generated from previously non-revenue generating surface area of water, and water savings from reduced evaporative losses, make this proposal most attractive.

Here, I suggest conducting a preliminary assessment and cost/benefit analysis of reducing evaporation losses from open surfaces of water bodies in the entire Colorado River basin using solar Floatovoltaics® systems. I also request developing a stake holder participation-based business model for this option.

Location: Describe location(s) where option could be implemented and other areas that the option would affect, if applicable. Attach a map, if applicable.

Colorado River basin-wide application including all of its service areas. Specific locations (large and small) to be determined after preliminary assessment. Location related constraints may include remoteness of the site, site locations with freezing cold weather, availability of feed power grid near by, and the ease of access to the site.

Quantity and Timing: Roughly quantify the range of the potential amount of water that the option could provide over the next 50 years and in what timeframe that amount could be available. If option could be implemented in phases, include quantity estimates associated with each phase. If known, specify any important seasonal (e.g., more water could be available in winter) and/or frequency (e.g., more water could likely be available during above-average hydrologic years) considerations. If known, describe any key assumptions made in order to quantify the potential amount.

Potential amount of evaporative water loss savings could be approximately 2 million acre feet per annum*. Under favorable conditions, site/location specific evaporation reduction of up to 70% can be achieved. Seasonal variability of the evaporation loss would influence the water availability. Depending upon the availability of funds and approval processes time, a significant portion of this potential can be realized in less than two decades. I request pursuing a multi-phased approach (including that of a pilot phase at multiple locations in the entire Colorado River basin) to such installations.

* Please see pp C-25 at <http://www.usbr.gov/lc/region/programs/crbstudy/Report1/TechRptC.pdf>

Additional Information

Technical Feasibility: Describe the maturity and feasibility of the concept/technology being proposed, and what research and/or technological development might first be needed.

Technical readiness level of this technology is very high. Floatovoltaics® installations are currently functioning at many smaller sites.

The Floatovoltaics® system is engineered to withstand 85 MPH winds and a minimum of 12" wind generated waves.

Please see technical details in the SPG Solar document enclosed : Engineering section pp 4 and Installation/Clients list pp 10-15.

Costs: Provide cost and funding information, if available, including capital, operations, maintenance, repair, replacement, and any other costs and sources of funds (e.g., public, private, or both public and private). Identify what is and is not included in the provided cost numbers and provide references used for cost justification. Methodologies for calculating unit costs (e.g., \$/acre-foot or \$/million gallons) vary widely; therefore, do not provide unit costs without also providing the assumed capital and annual costs for the option, and the methodology used to calculate unit costs.

Working with a vendor, determine the location specific cost after preliminary assessment. Conduct a complete cost analysis associated with power generation, feed-in tariff, water resource transport and sales.

Revenue from the renewable electricity generated by Floatovoltaics® will help offset the cost. In addition, such installations consumes no land and capitalize on a non-revenue generating areas (water surfaces) with minimum environmental impacts.

Permitting: List the permits and/or approvals required and status of any permits and/or approvals received.

Assess environmental and economic impact consistent with the local, state and federal laws and seek required permits.

Legal / Public Policy Considerations: Describe legal/public policy considerations associated with the option. Describe any agreements necessary for implementation and any potential water rights issues, if known.

Recreational boating and fishing community of interest may pursue some litigation.

Water saved stays in the reservoir with no impact on water rights. Instead, in the time of drought/scarcity, a fraction of the allotted water rights can be improved.

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Implementations have been successful on smaller reservoirs. Some risk assessment will be necessary in extending their use to very larger reservoirs and to reservoirs in very freezing cold weather locations. In addition, availability of capital, return on investment, acceptance of the cost of the evaporation water so saved to the beneficiaries, and revenues from the renewable energy generated, will play some role in determining the site specific viability of the option.

Reliability: Describe the anticipated reliability of the option and any known risks to supply or demand, such as: drought risk, water contamination risk, risk of infrastructure failure, etc.

Warm weather installation reliability appears very high. System longevity is estimated at more than 20 years. Freezing cold weather installation reliability appears yet to be established.

Please see engineering details at <http://www.spgsolar.com/products/floatovoltaics/> and in the technical document from SPG Solar enclosed with this submittal.

Water Quality: Identify key water quality implications (salinity and other constituents) associated with the option in all of the locations the option may affect.

Reduces algal growth underneath installation. No adverse impact on water quality envisioned.

Energy Needs: Describe, and quantify if known, the energy needs associated with the option. Include any energy required to obtain, treat, and deliver the water to the defined location at the defined quality.

Energy Required	Source(s) of Energy
This option generates its own green (renewable) energy	Solar radiation

Hydroelectric Energy Generation: Describe, and quantify if known, any anticipated increases or decreases in hydroelectric energy generation as a result of the option.

Location of Generation	Impact to Generation
This option generates its own green energy from solar radiation	None envisioned

Recreation: Describe any anticipated positive or negative effects on recreation.

Locations	Anticipate Benefits or Impacts
Site/location specific, to be determined after preliminary assessment	Some probable restrictions on access and use for recreational facilities

Environment: Describe any anticipated positive or negative effects on ecosystems within or outside of the Colorado River Basin.

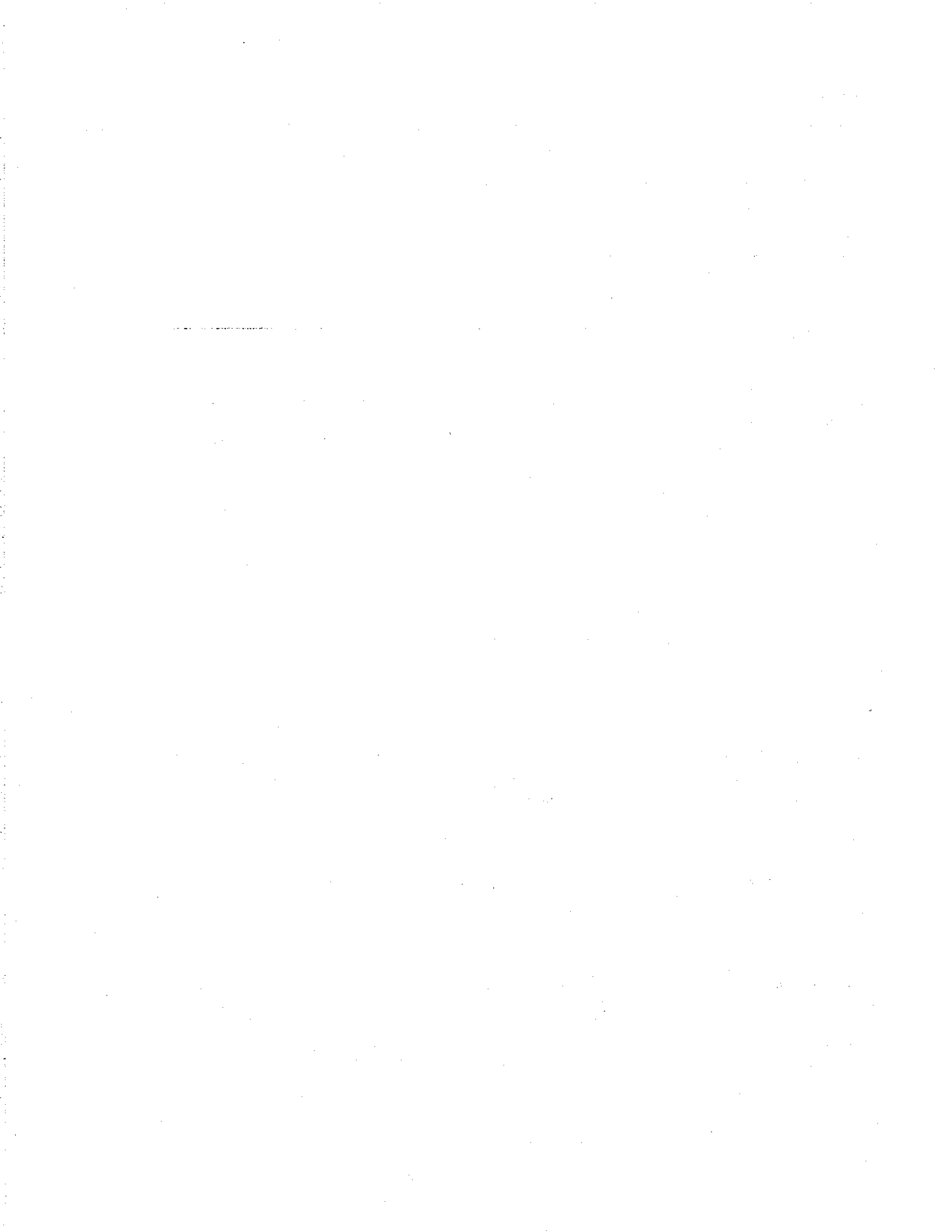
Locations	Anticipated Benefits or Impacts
Site/location specific, to be determined after preliminary assessment	Generation of solar energy over water than that over desert land and, glint
Area covered under the solar floatovoltaics panels at the site	Reduced algal growth, and impact on limnetic ecology

Socioeconomics: Describe anticipated positive or negative socioeconomic (social and economic factors) effects.

Positive: Job creation with benefits of generating green (renewable) energy and water conservation
 Negative: Minimum if any. Locations specific restricted access and use of recreational facilities.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Floatovoltaics® option provides multiple benefits. It reduces water surface evaporation (generating additional in-place water for the use as a results) and produces green (renewable) energy from solar radiation with minimum environmental impact.
 Please see technical details on the technology in the SPG Solar document (PDF) enclosed with this submittal.



Floatovoltaics®

Solar Power System

Overview and SPG Solar Statement of Qualifications



Submitted by SPG Solar, Inc.
CA License # 759086



System Design



38kW Demonstration Installation of 2010 Floatovoltaics®



200kW Installation at Far Niente

Why Floatovoltaics®?

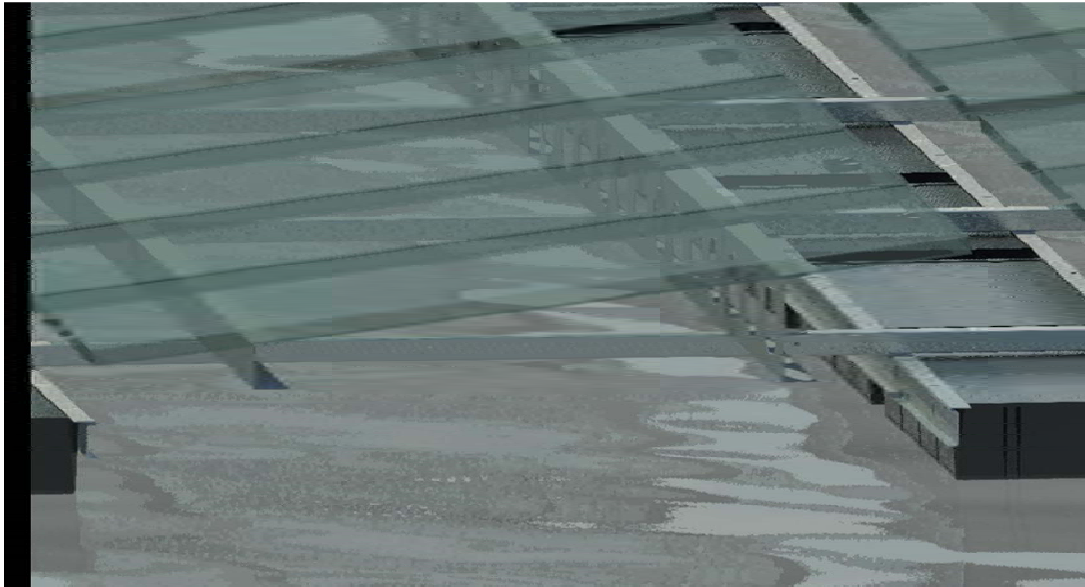
SPG Solar's Floatovoltaics® is at the hub of the energy-water nexus. When SPG Solar installs a Floatovoltaics® system, our customers not only receive a state of the art solar PV system, but also receive a wealth of additional benefits:

Consumes No Land and Capitalize on a Non-Revenue Generating Area

Land is a valuable resource that should be used optimally for farm or industrial production. SPG Solar Floatovoltaics® enables customers with no available land or roof space to enjoy the benefits of solar while capitalizing on typically non-revenue generating area—water.

Improve Water Quality

SPG Solar Floatovoltaics® not only saves productive land, but also conserves valuable fresh water for generations to come. As water bodies are exposed to the sun, photosynthesis promotes the growth of organic matter including algae. The algae is typically not desirable, can clog pumping and filtration systems and requires costly chemical treatment to control the problem. Installing SPG Solar Floatovoltaics® will shade the water and reduce photosynthesis. This in turn will reduce the formation of algae and reduce your chemical and operational costs.



Cooler Water = Cooler PV Panels = More Power Production

Solar PV panels perform better in cooler conditions. By installing SPG Solar Floatovoltaics® over water, not only is the water cooled by the 100% shade but the panels will be naturally cooled resulting in improved power production performance. The cooler environment also reduces stress on the system, which reduces maintenance and increases the PV system's lifespan.

Evaporation Reduction by up to 70%

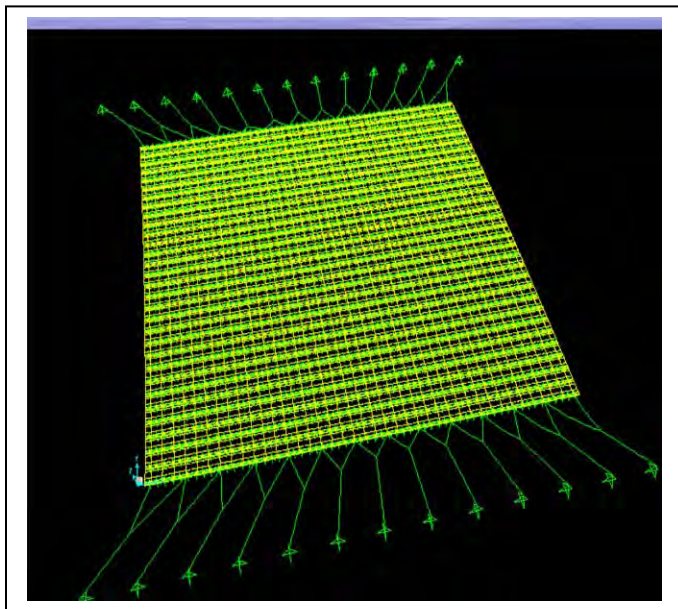
A substantial amount of water is lost to the atmosphere each year. A typical pond in California can lose as much as two million gallons (six acre-ft) per acre per year to evaporation— water that could be utilized for productive uses including crop production and industrial processes. Not only can SPG Solar Floatovoltaics® help water stressed regions, but it is simply good business.

In normal conditions water may not be an issue, but during drought years water scarcity is a real concern. In recent years, many farmers in California's Central Valley were only able to receive 60% of their allotted water rights because of water scarcity. By Installing Floatovoltaics® you can increase your water security and help out our country's farmers.

Engineering

The Floatovoltaics® system is engineered for durability and longevity. The system is specifically designed to keep all metallic components above water leaving only 100% recyclable, closed cell foam filled HDPE plastic floats in contact with the water. HDPE is resistant to corrosive environments and will not break down in any water used by Floatovoltaics. The floats have been approved by the U.S. Corp of Engineers for use in the country's protected waterways. The plastic resin is also approved by the NSF for use in drinking water reservoirs.

The Floatovoltaics system is engineered to withstand 85 MPH winds and a minimum of 12" wind generated waves. The structural steel frame is galvalume and hot-dip galvanized coated and designed specifically to minimize wear in fresh water environments—from wastewater treatment facilities and irrigation ponds to cooling ponds and natural waterways. A proprietary mooring system distributes the loads to minimize point loading and wear. The Floatovoltaics system was developed with the assistance of marine civil engineers, structural engineers, marine corrosion experts, NEC code consultants and environmental engineers.



Benefits

Floatovoltaics® is designed to be installed over existing water surfaces, from irrigation ponds to lakes to large reservoirs. By installing an SPG Solar Floatovoltaics® solar PV system, you can save up to 70% of the water under the array that would have otherwise evaporated. You can also improve water quality by

reducing the water temperature by several degrees and increase energy production by cooling the PV panels. With Floatovoltaics you will:

- Avoid using valuable land
- Capitalize on a previously non-revenue generating area; water.
- Lower solar panel temperatures and increase power production
- Reduce water evaporation by up to 70%
- Improve water quality by reducing water temperature
- Save money on your utility bill
- Become a good steward to the environment



Water Conservation

While the world is debating energy scarcity, water is a precious resource that is often neglected. Of all the water in the world, less than half a percent is unfrozen, fresh water that is accessible to people. Water supplies throughout much of the western U.S. are stretched and large volumes of fresh water are lost to evaporation each year further stressing our resources. Floatovoltaics helps:

- *Evaporative losses in open water bodies:* In some parts of California, surface water bodies can lose as much as six vertical feet per year to evaporation. This amounts to almost two million gallons (six acre-ft) per acre. SPG Solar Floatovoltaics® PV systems save 70% of the water under the array. A 1MW Floatovoltaics system will cover three acre and can save up to 3 million gallons of water per year.
- *Twenty percent of all energy in California is used to pump water.* By increasing water supplies, less water needs to be pumped around the state further saving energy. Additionally, 4.5 gallons of water are required to produce every kWh of electricity. By creating your own electricity, you save about 3 million gallons of water per year.
- SPG Solar Floatovoltaics® PV system provides a unique opportunity for you to be a leader in both energy and water stewardship.

Patents Pending





Company Qualifications & References

Company Overview

Founded in 2001, SPG Solar is a proven leader in the design and installation of photovoltaic power systems.

We have delivered customized solar technology solutions for over 1,500 grid-connected PV systems throughout the United States.

Services

SPG Solar's senior staff provides professional design-build services with decades of experience in electrical engineering, construction and project development. We deliver innovative and dependable solar systems with the highest quality of workmanship from the initial customer consultation to the final system commissioning and post installation analysis. Our integrated turnkey services include professional on-site assessment and feasibility study, custom design, engineering, installation and ongoing system monitoring. Each installation comes backed with an energy output guarantee to ensure that every client's system will be performing long into the future.

Strategic Relationships

In a rapidly growing industry, SPG Solar has quickly risen to become one of the leaders in the field, and routinely is chosen by both competitive and negotiated selection processes. Privately held, SPG Solar maintains strategic partnerships with key manufacturers including Sharp Electronics, SunTech, Kyocera Solar, Trina, Canadian Solar, Yingli, PV Powered/Advanced Energy, SMA Inverters and others. In addition, SPG Solar has supply/manufacturing agreements in place with domestic steel carport suppliers, and foreign steel fabricators for racking and tracking system components.

Technical and Financial Expertise

Our innovative systems, technical expertise, and commitment to client satisfaction make us the first choice in solar integrators for a broad customer base. We have installed over 47 MW of solar for a range of clients including pharmaceutical companies, wineries, agricultural facilities, government agencies, educational facilities and Fortune 500 Companies. For each of our clients, we offer cost-effective solar solutions and the benefits of clean, renewable energy at competitive prices. In addition, SPG Solar has many financing partners and we provide custom financial solutions including Power Purchase Agreements (PPA), lease options or cash purchases.

Environmental Commitment

SPG Solar not only provides our clients with clean, renewable energy, but our company runs on solar power too. In addition, to a solar PV system on the roof of the headquarters in Novato, CA, our company uses a fleet of hybrid vehicles, encourages office wide recycling, and incentivizes employee carpooling. Our construction team is reducing the environmental impact of ground mount solar facilities by using vibropile and screwpile devices to eliminate concrete footings.

Community Involvement

SPG Solar invests in the communities where we work. In Marin County California, SPG Solar donated all of the design, build services to build a roof top system at Camp Tamarancho Boy Scout Camp. The remote camp will benefit year after year from the renewable electricity generated by the system.



Notable SPG Solar Clients

Far Niente- Oakville, CA

Far Niente is one of Napa Valley's most highly regarded wineries, characterized by luxury and elegance. This elite vineyard bottles only one Chardonnay and one Cabernet Sauvignon from its estate vineyards each year and has consistently maintained an award-winning house style for over 20 years. Motivated by the desire to preserve its most valuable resource, the environment, Far Niente turned to solar energy to power its vineyard and winery operations, as well as those of its sister winery, Nickel & Nickel.

In an effort to preserve as much vineyard property as possible, SPG Solar in partnership with Thompson Technology Inc developed and deployed the world's first large-scale floating solar PV array – the patented Floatovoltaic™ system. By implementing this cutting-edge technology, the company was able to design a 477 kWp system, using 1,000 Sharp solar panels. SPG Solar “floated” the array on top of Far Niente's irrigation pond. SPG Solar's novel approach to installing photovoltaic panels not only saved the winery precious vineyard land, but the Floatovoltaic system has significantly reduced algae growth and evaporation in the retention pond.



The balance of the system was designed as an adjustable-tilt ground mount array using 1,300 Sharp solar panels, allowing maximum sun exposure throughout the year. Far Niente's floating solar system has been featured in high profile publications (online and print) such as: CNN, SF Chronicle, Wines and Vines, and LuxLife magazine.

Location: Oakville, CA

Completion Date: February 2008

Mount Type: Floatovoltaic and Adjustable Tilt
Ground mount

Equipment:

1 SatCon AE-500-60-PV-A (480V)

2296 Sharp ND-208U1

System Size:

477.57 kW DCp

399.81 kW AC

Gundlach Bundschu Winery

System Completion: 2008
Location: Sonoma, CA
System Size: 92 kW DC
Mount Type: Floatovoltaics
Equipment: Satcon inverter, Kyocera solar panels



Northern California Power Agency (NCPA)

Duration of Installation: 5 months (per phase)
System Completion: December 2008 (phase 1) and December 2009 (phase 2)
Location: Lake County, CA
System Size: 2,332.93 kW DC
Mount Type: Ground Mount – Sunseeker Single Axis Tracker
Equipment: Xantrex & Advanced Energy inverters, Mitsubishi and Sharp solar panels



The NCPA Geysers Geothermal Plant uses wastewater from Lake County and injects it into the geothermal reservoir to create energy. The reservoir converts the wastewater into steam, which is used by geothermal power plants to produce electricity. SPG Solar partnered with NCPA to reduce the amount of electricity that their Geothermal Plant consumed from the grid by building a 2 MW solar system. The design and engineering team at SPG Solar developed a 2 phase plan to build two 1 MW Sunseeker single axis solar tracking systems that create clean, renewable energy to power the wastewater pumps.

Kern County Water Agency- Bakersfield, CA

The Kern County Water Agency constructed a large-scale solar project to utilize renewable energy sources at its recently expanded Henry C. Garnett Water Purification Plant in Bakersfield, CA. As a portion of its water management and Treated Water Capacity Expansion Project plans, KCWA determined that accommodating the increasing demands for treated water by partially powering the Plant by sunlight was the right choice to not only reduce energy costs, but also by benefiting the environment by reducing greenhouse gas emissions.

The innovative Single Axis Tracking System follows the sun, which will generate more energy than a conventional solar tracking system installed at a fixed angle.



The expansion of the Henry C. Garnett Water Purification Plant has increased the electrical load at the facility's site. To offset this load, in addition to the new solar project, an electrical substation is being installed to convert primary electrical service to transmission level service which boasts a lower energy rate. In addition to the new and enhanced pumping and transmission facilities were constructed to produce and deliver the water contracted by the project participants which include various water service companies and districts throughout the state of California.

Location: Bakersfield, CA

Completion Date: December 2008

Mount Type: SunSeeker Single Axis Tracker

Equipment:

3 Xantrex GT250-480(480V)

1 Xantrex GT100-480 (480V)

6,720 Solar World California SW 175

System Size:

1,165.500 kW DCp

1,001.24 kW AC

Sonoma County Water Agency- Santa Rosa, CA

Running their Airport/Larkfield/Wikiup Sanitation Zone Wastewater Plant alone was consuming 147,000 kWh/month on average – at a cost of \$14,350 a month. SCWA wanted to find a way to control those costs, now and in the future. At the same time they wanted to do it in a way that fit their philosophy of ecological protection and the environmental services they have provided since 1974.

SPG Solar designed and engineered a world's first-of-its-kind solar solution – a plan to build a photovoltaic system directly on the face of the earthen dam on the southern perimeter of a large recycled water pond. The design was a winner aesthetically, but still had to pass a very careful review by California's Division of Safety Dams (DSOD). To ensure the solar system would not impact the integrity of the dam, SPG designed a unique above ground, concrete 'grade-beam' foundation. This eliminated the need to drill traditional footings into the dam embankment. It also created passive ventilation to cool the panels.



The finished 596 kW DCp solar PV system was also the first in California to be interconnected at high voltage (12 KV). It consists of 3,312 solar modules in three arrays, tilted to face South, Southwest and Southeast to maximize the collection of sunlight year round.

Location: Santa Rosa, CA

Completion Date: March 2007

Mount Type: Ground Mount on Dam

Equipment:

1 SatCon AE-500-60-PV-A (480V)

3312 Sharp ND-180U1

System Size:

596.160 kW DCp

500.28 kW AC



Sewerage Commission Oroville Region (SCOR)- Oroville, CA

This regional wastewater treatment plant operates around the clock, providing sanitation services to more than 15,000 families and businesses. In 2001, the Sewerage Commission-Oroville Region (SC-OR) suffered, along with the rest of California, power outages and energy price increases up to 41%, often reflected in higher bills for ratepayers. So SC-OR looked for a way to stabilize the uncertain energy supply and reduce its electricity costs without raising rates.

To meet these criteria, SPG Solar had to meet two challenges. The team of solar experts designed and installed a solar photovoltaic (PV) system that would provide enough power during peak demand hours to run the wastewater plant and power monitoring systems that must run 24/7.



The SCOR treatment plant treats approximately 1.2 billion gallons of wastewater annually. The power generated from the solar array will provide enough electricity to treat 80% of the wastewater. The plant's pioneering solar array will save the district hundreds of thousands of dollars each year in electrical costs and help avoid large rate hikes in the future.

Location: Oroville, CA

Completion Date: October 2002

Mount Type: Ground mount, fixed tilt

Equipment:

6 Xantrex PV-100208

5184 BP SX-120

System Size:

622.08 kW DCp

514.53 kW AC



Vallecitos Water District - Kingsburg, CA

The Vallecitos Water District (VWD) provides water, wastewater, and reclamation services to a 45 square mile region of North San Diego County, serving a population of over 80,000 people. The 8-acre facility in San Marcos, CA includes administrative offices, operations facilities, a maintenance yard for the District's vehicles, and several parking lots for both employee and public parking.

The VWD wanted an energy solution that would help the District control its energy costs, conserve power, and minimize pollution. A solar photovoltaic (PV) system would provide renewable energy that is clean and reliable, producing zero air, ground or water emissions. A solar PV system enables VWD to offset expensive peak electricity and sell excess energy back to the grid with the California Net Energy Metering Program (NEM).



SPG Solar, Inc. proposed a 405 kilowatt (kW DCp) solar PV system that would drastically reduce VWD's annual electric bill. SPG Solar designed and built a dual-purpose carport and solar PV system over the facility's existing 160-space fleet and employee parking lot. The solar carport system is comprised of 9 structures of 1,974 Sharp 208 watt solar PV panels, a SatCon-135 inverter, and a SatCon-225 inverter.

Location: San Marcos, CA

Completion Date: September 2006

Mount Type: Solar Carport

Equipment:

1 SatCon-135 & 1 SatCon-225 inverter

1,974 Sharp 208 watt panels

System Size:

405.6 kW DCp

339.16 kW AC