

Trees and Solar Power – Environmental Conflict or Can the Two Co-Exist?

I attended a recent seminar in San Diego entitled Trees and Solar Power: Natural Partners, sponsored by the California Urban Forest Council (CAUFC). The goals of the seminar included:

- Clarify various professional's role between trees and rooftop solar
- Inform attendees of the multiple factors in arboriculture/urban forestry and rooftop solar
- Review the importance of urban forests in cities and the increase in rooftop solar energy production.
- Create a dialog between solar and tree professionals, share information and create ideas on how to address issues and opportunities with trees and solar.

Solar Laws Already Exist?

Even with decades experience as a landscape contractor, certified arborist, professional horticulturist and land development infrastructure project manager, I was not aware of the current solar and arboriculture laws. For example, the State of California and many other states enacted solar legislation decades ago. Due to the oil crisis in the 1970's and 1980's, there was increased interest in promoting alternative energy sources. Many states adopted laws to encourage renewable energy technologies, solar being one of them. The laws offered financial incentives, such as tax credits and rebates as well as provisions to protect a landowner's right to sunlight.

In the past decade, as our energy infrastructure reliance on fossil fuels continues, so to does the ever-increasing cost for fossil fuel generated electricity. In San Diego where I live, SDG&E (San Diego Gas and Electric) has the highest electrical rates in the country. San Diego is also blessed with a mild sunny climate, a perfect location for solar energy production. As the cost of electricity rises, we are seeing renewed interest in green alternative energy sources, with rooftop solar being one of many popular residential alternatives in Southern California.

California has been a leader in promoting solar energy production; where over 65% of installed photovoltaic capacity is currently located. In 1978, California enacted the Solar Shade Control Act, in part to protect consumer rights to install and operate solar energy systems on a home or business and to protect consumer rights to access sunlight. In 2008, the law was amended due to a very public controversy between two Santa Clara County residents being criminally prosecuted and convicted under the Act for allowing their redwood trees to cast

shade on a neighbors solar panels. Learn more information about the Act here: http://www.costar.com/uploadedFiles/JOSRE/JournalPdfs/16.361_382.pdf

When the law was originally passed and took effect in 1979, it prohibited property owners from planting trees or those who already had existing trees, from casting a shadow over more than 10% of a solar collector on a neighboring property at any one time between 10 a.m. to 2 p.m. If a neighbor installed a rooftop solar system and your pre-existing trees cast a shadow over the solar collectors, you were in violation of the Solar Shade Control Act and could be prosecuted and fined for the violation! This is exactly what happened in a 2007 Sunnyvale/Santa Clara high profile case.

The case involved a homeowner who had a stand of coast redwoods in their backyard. A neighbor later installed solar collectors on several areas of their roof, including a shaded area on a lower roof section. The district attorney and judge in the case ignored the pre-existing element of the tree statute and settled on a call to subordinate the pre-existing trees in favor of the new solar collector's placed in their current and future shaded area. This shockingly short-sided ruling resulted in the entire removal or topping of the pre-existing redwood trees. The national attention from this case created serious polarization on both sides of the issue. Read an article in the Los Angeles Times concerning the neighborhood conflict at <http://articles.latimes.com/2008/nov/15/business/fi-solarspat15>.

Common Sense Prevails

The fallout from the court ruling had major local and national implications for everyone. From the viewpoint of municipal agencies responsible for maintaining public trees, the potential consequences of the decision would create an immediate long-term budget crisis by requiring substantially increased contract tree pruning and trimming. If a solar collector were improperly or poorly sited, adjacent existing trees would have to be pruned, topped or removed.

A claim by any property owner of shading from a public or private tree would require the district attorney and public resources to support the homeowner claim to require mature and growing city-owned and privately owned trees to be topped or cleared. Additionally, a community-zoning ordinance prohibiting removal or topping a tree would not be exempt from the case law and consequences. The infrastructure benefit of tree value would be diminished. Studies showing a \$2 dollar payback for every \$1 invested in trees for stormwater management, air quality, cooling and real estate value would be lost as public, parkland and private trees would be cleared to prevent shading on newly installed solar collectors. Millions of dollars would be lost due to premature destruction of mature tree benefits. Communities, municipalities and private landowners would suffer devastating loss of landscape aesthetics, shading and many other benefits derived from trees.

Fortunately, in 2008 a bi-partisan law (SB 1399) was generated by state Senator Simitian (D) and co-sponsored by Senator McClintock (R) and signed by then Governor Schwarzenegger that clarified the motives of the original bill and amended the Solar Shade Act in the following manner:

- Trees and shrubs planted **prior** to the installation of a solar collector were protected and could not be topped or removed if a solar collector was later installed.
- Eliminated criminal prosecution as a penalty for violation of the law.
- Provided a mechanism for written notification between neighbors.
- Made it easier for local municipalities to adopt and enforce their own local ordinances.
- Clarified provisions of the law that were vague and confusing.
- Refined the law so that only the amount of solar generation required to power the property could be installed on a property.

The common sense bill restored the proper balance between trees and solar, providing clear exemption from the Solar Shade Act for pre-existing trees. No longer can a neighbor move in next to your home, install a rooftop solar system and under the threat of criminal prosecution, force you to top or remove your pre-existing trees.

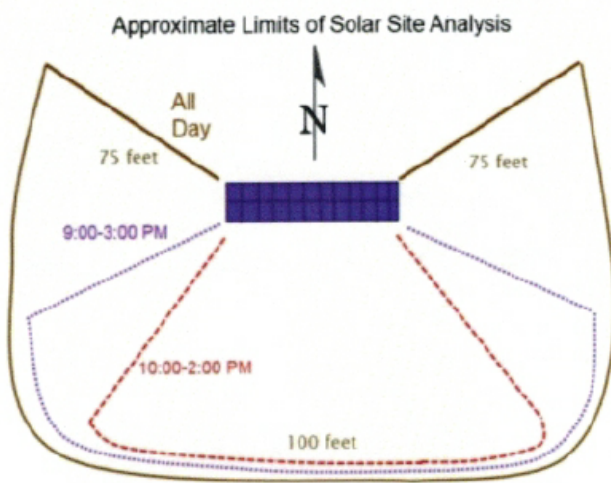
Improper placement of a solar collector adjacent to pre-existing trees can lead to this kind of senseless activity <http://www.youtube.com/watch?v=vFQ9gF-rHOM>

Solar Planning and Tree Shading

As rooftop solar systems continue to increase in popularity, solar companies are popping up throughout the state and country. Like most companies selling a product and or service, there is an expectation the company is reputable and will stand behind the product. However, not all solar companies are alike and permitting requirements from most municipalities are extremely general and easily obtainable. Many agencies only require a typical permit application without a site plan of your property, and more importantly, surrounding neighbor properties.

Based on the Solar Shade Act of 2008, a site plan reflecting the pre-existing conditions at the time a solar system is installed should be a mandatory permit and legal requirement. As lawsuits increase due to conflicts between trees shading solar collectors, a site plan showing trees in place pre-existing a solar installation will become an important legal instrument.

Solar generation refers to “peak power”, which is the value that specifies the output power achieved by a solar module under full solar radiation. Peak power is also referred to as “nominal power” by most manufacturers and is based on measurements under optimum conditions. The specific optimum conditions for generating photovoltaic energy occurs between 9 a.m. and 3 p.m. During this



Practical limits for most urban sites are much shorter.

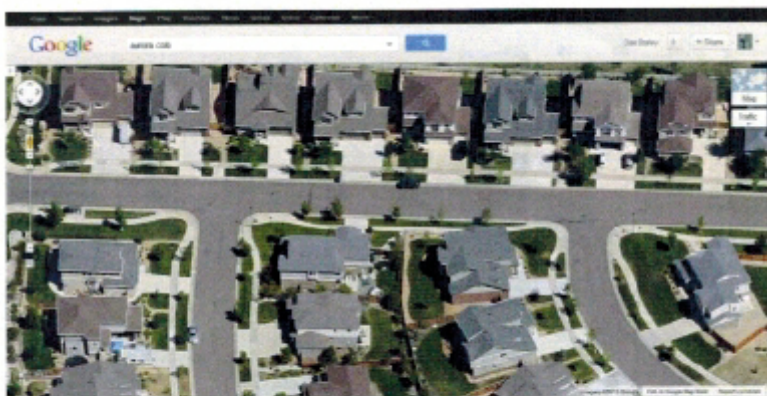
time of day, it is imperative solar collectors receive unimpeded solar radiation to generate peak power.

While seasonal sunlight angle and orientation varies, optimum rooftop orientation for solar collectors is the southeast portions of a given rooftop. This location provides the greatest amount of time for solar radiation to strike the solar collector as the sun travels east to west, thereby providing the greatest peak power generation. Knowing this orientation is optimum; solar collector location should include an

analysis of obstacles that provide shading on the location during the most useful hours of 9 a.m. to 3 p.m.

We derive many benefits from large trees, from their beauty and aesthetics to the shade and passive cooling affect they have on our homes and businesses. The same is true for deciduous trees in the winter when they drop their leaves, permitting solar radiation to warm our homes. In a residential setting, large existing trees will invariably cast shading onto a structure. It is incumbent upon a solar company to analyze shading from the Client and neighboring trees for correct solar panel design and installation.

In most modern day developments, street trees are usually planted no more than 30' from the front of a residential structure, and often much closer. A tree that grows to 30' tall at maturity can be planted no closer than 30' feet from a one story house without creating shading issues for solar collectors. Trees located less than 30' from a house would have to be even smaller without creating rooftop shade.



Typical subdivision roof orientation. Not all roofs are suitable for rooftop solar collection. In addition, this landscaping was placed without regard to future solar collection. **This is why only about 25% of residential roofs in the U.S. are suited for solar collection.**

height of the structure. For example, a tree 30' from a three story condominium can reach upwards of 60' tall without creating rooftop shade issues.

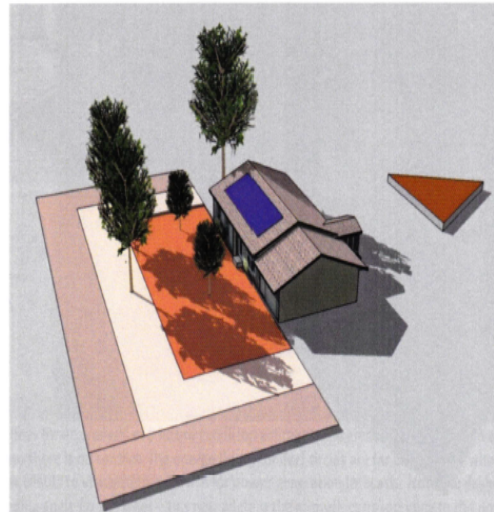
Although solar photovoltaic systems are being heavily promoted as the answer for

homeowners to reduce or eliminate their local energy utility bills, the urban environment creates many obstacles for rooftop solar systems. The reality is not all urban or suburban homes and businesses are candidates for rooftop solar systems. Whether due to shading from signs, adjacent buildings, trees or other forms of infrastructure, the reality is only 25% of all residential homes are suitable for rooftop solar systems.

If you are making a decision on whether a rooftop solar system is the correct energy alternative for your home or office, ensure you are making the right choice by having a solar company provide a site analysis inclusive of neighboring trees, structures and infrastructure that could shade solar collector panels on the rooftop.

Consult with a Certified Arborist

If a solar company identifies trees as a potential shading conflict with a rooftop solar installation, a certified arborist and or professional horticulturist should be added to the design team. Solar companies are knowledgeable about solar systems, not about trees and shrubs. In instances of potential tree conflicts with solar, the solar company or the Client should consult with a certified arborist or professional horticulturist who can identify the tree, assess the tree age and discuss the full growth characteristics of the tree. Depending on the tree species, growth form, and distance from the structure, there may be several alternatives available to mitigate tree shading without complete tree removal or butchering the tree through indiscriminate topping.



Geometric, parcel-based Solar Access Zone. Will this work in new construction or established sites? Each site is different. This rendering shows shadows for September/March 21 at 1500 local time.

Remember, rooftop solar is a means to reduce your energy bill. Tree shading and cooling is a passive form of green energy saving. If you cut down trees that shade your home or office to eliminate shading for a future solar system, you are increasing the amount of energy required to heat and cool the structure, thereby negating a percentage of the savings by going with a solar system, not to mention the loss of aesthetics and other related tree benefits.

Why not have the best of both worlds? Use a knowledgeable, reputable solar company that understands the importance of maintaining existing trees while managing shading aspects for peak solar radiation performance. Have a

certified arborist or professional horticulturist consult with the solar company to ensure retention of the desired landscape aesthetics combined with the energy savings benefits of rooftop solar.



Future conflict in Richmond, CA. The short setback ensures these medium-statured trees will likely grow into the Solar Access Zone. Professional arborists can assess this site and estimate growth rates to determine approximately when collection will be impeded. Will this be a potential future court case if the panels were there first, or will the narrow tree lawn low or impede growth?

Mr. Jeremy Rappoport, President of Rappoport Development Consulting Services LLC is a respected industry professional. Mr. Rappoport is a certified arborist, certified tree risk assessor, professional horticulturist, C-27 California licensed landscape contractor and former Director of Land Development, Director of Operations, Offsite Grading and Landscape Superintendent for public and private master planned communities and homebuilders. More information about RDCS LLC and Mr. Rappoport is available at <http://landscapeexpertwitness.com>

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All images in this article are taken from: Tree and Rooftop Solar Power Workshop Supplemental Handout, San Diego, CA. October 17, 2013, Sponsored by the California Urban Forests Council