AMERICAN SOLAR ENERGY SOCIETY

Managing the Dark Side of Trees

Solar continues to make dramatic gains as a power source. Worldwide, the United States ranks fifth, with a total installed solar electricity capacity of more than 4.5 gigawatts. While utility-scale photovoltaics (PV) added the most megawatts in recent years, distributed rooftop and ground-mounted systems still represent the majority of PV installations.

Including federal, state and utility incentives, these installations represent billions of dollars of investment in distributed solar. Several states are committing hundreds of millions of additional dollars. While these public-private investments in distributed PV are impressive, they will not pay off without access to the fuel that powers the panels — the sun. But does our legal system value and protect such solar access?

Sadly, in almost every U.S. jurisdiction, the answer is "no." In fact, in most cities, local officials can help you control a neighbor's weeds or barking dog, but they have no authority to help you control a neighbor's actions that render your solar panels useless. In other words, a neighbor can add shading that was not there when you installed a solar array, and there is no effective legal remedy to stop them or to receive compensation for depriving the grid of the benefit of what would effectively be a remote power source.

Despite the lack of federal and state safeguards, solar advocates have options for avoiding solar access conflicts. One simple solution is for solar installers, working with arborists, to create solar access zones, or SAZs. SAZs create standardized height limitations in order to lessen the risk of future obstruction. Unlike existing solar access laws, SAZs specify in advance the appropriate height limitations and species of trees for each zone. That makes compliance easy.

Solar Easements Prove Ineffective

Ancient cultures deeply valued solar access for providing heat and light. It was only

DAN STALEY

A good example of solar-friendly tree species selection and placement for rooftop PV.

DAN STALEY

An example of how land-use considerations — in this case, short setbacks from the street — can affect solar access. These trees will impede solar access likely in less than a decade, depending on site conditions.

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By specifying height limitations for vegetation in advance, solar access zones have the potential to make compliance easy.

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after the discovery of fossil fuels and the invention of artificial lights that legal regimes began to characterize access to the sun as an expendable commodity, secondary to allowing unhindered development.

This trend began to reverse during the energy crisis of the late 1970s, as some states and towns began to recognize and protect access to sunlight as a source of energy. At that time, about half of the states attempted to solve the solar access dilemma by legislating a right to create solar easements. A solar easement is essentially a contract between neighbors that prevents shade from one property from impacting the adjacent property.

Unfortunately, except in a few instances, the solar easement mechanism has proved ineffective for protecting residential solar. First, the process of getting an easement in place can involve significant additional costs for the solar host — including not only payment to the southern neighbor for the easement, but also attorney's fees for drafting and negotiating the contract.

Second, in return for payment, the southern neighbor may take on obligations, such as trimming vegetation. With easements, this condition would "run with the land," meaning that the next owner would be responsible for this obligation. Some buyers would view such an obligation as a burden on their title, making the property less marketable.

Third, even if the solar easement does not place any additional responsibilities on the southern neighbor, the very existence of something different in the title could be perceived by potential buyers of the property as a negative. Because we have a transient culture in America, many people are more concerned about being able to sell their home in a few years than they are about getting along with neighbors. Consequently, neighbors to the south may be unwilling to even discuss granting a solar easement.

Currently there are no federal-level protections for private solar access. Only a handful of states have explicit statewide protections. New Mexico and Wyoming's laws are the strongest, but both of these states have relatively few solar installations and sparse populations, so their statutes have been rarely, if ever, applied.

With more than a quarter of the nation's cumulative solar electricity capacity, California should be a leader in the area of solar access protection. Yet California has no statewide system for addressing obstructions that are constructed after solar investments have been made. California did, however, pass one of the strongest statewide protections against solar shading from vegetation.

The California Solar Shade Control Act protected "solar collectors" such as PV panels, but not passive solar designs, from trees or shrubs that "cast a shadow greater than 10 percent of the collector absorption area" during certain times. But in 2008, 30 years after it was enacted, the California State Legislature eviscerated this act. The act was amended to make the remedy a private, instead of a public, nuisance, so now the burden is on the solar panel holder to bring a lawsuit to enforce the act's protections. The falling prices for solar panels and the rising rates for attorney's fees mean that pursuing this remedy would cost more than the panels themselves in most instances.

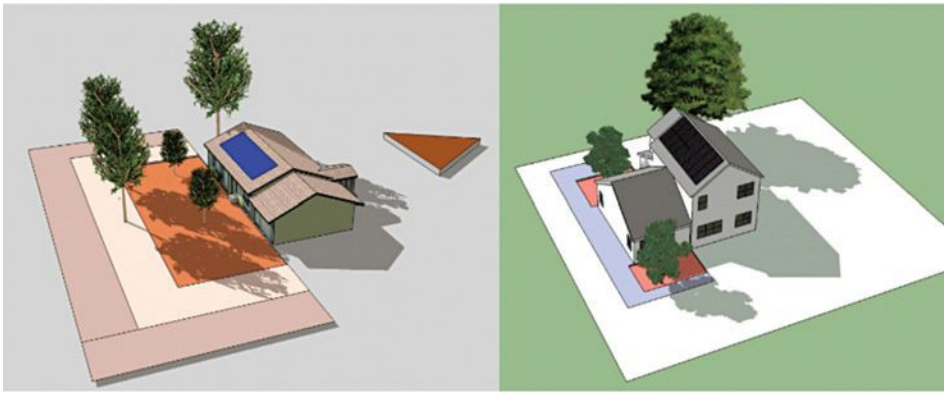
Without federal or state safeguards, the most effective security for solar panel hosts is available in only a handful of cities that have solar access protections in their municipal codes. Two of the strongest such ordinances are in Boulder, Colo., and Ashland, Ore. Both of these cities prohibit constructed obstructions in a portion of the sun's path during certain times of the day and year. Both Boulder and Ashland, however, have separate "solar access permit" requirements to protect solar installations from trees or other vegetation. These alternative requirements have proven not to be very effective as, in some instances, the cities have either refused to grant the permits or refused to enforce them.

LANCE WRIGHT

Does our legal system value and protect such solar access? Sadly, in almost every U.S. jurisdiction, the answer is "no."

FIGURE 1. **Solar Access Zone 1**

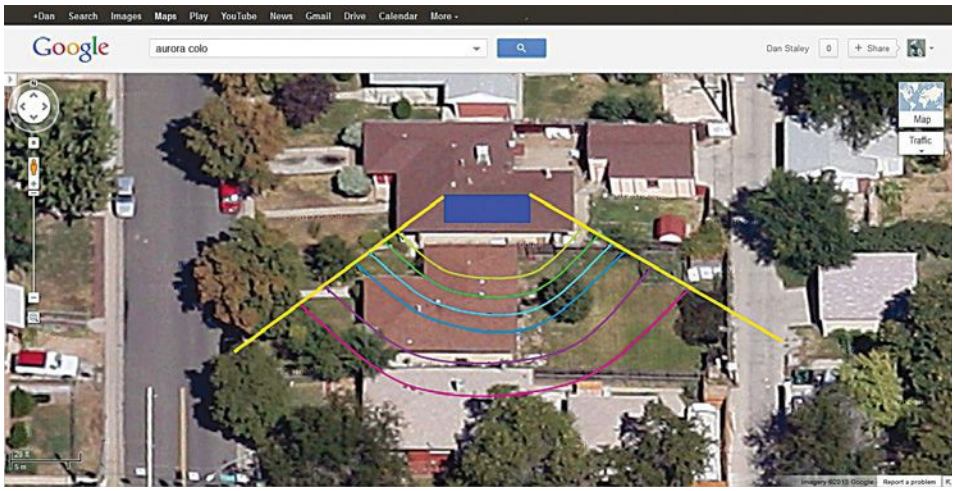
FIGURE 2. **Solar Access Zone 2**



DAN STALEY

Sept. 22 at 3 p.m.

Solar access zones define areas that suggest limits or formally restrict maximum tree heights to lessen the risk of future obstruction of solar collectors



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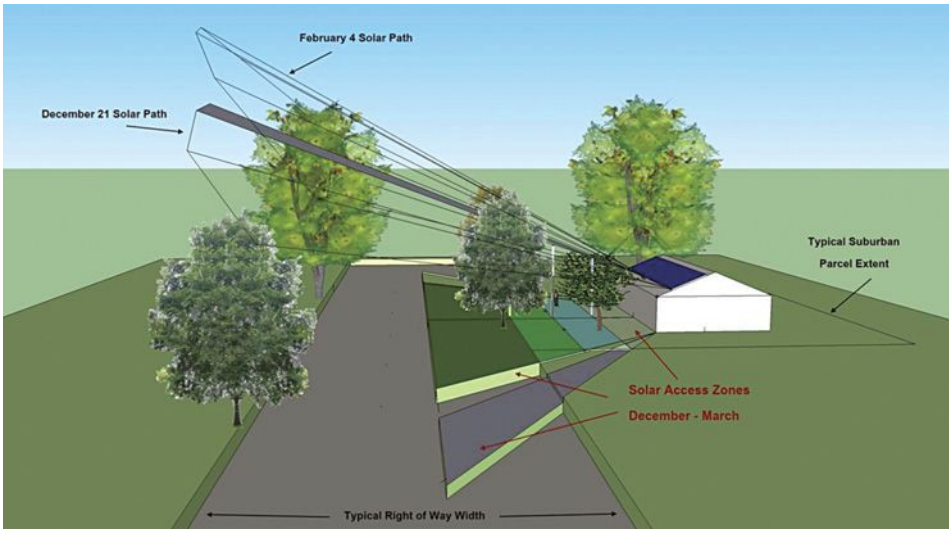
A basic analysis by an arborist can identify possible future conflicts for a proposed PV installation.



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Side view of solar path with the solar access zone reflected on the ground for vegetative restrictions.

Instead, Install with Tree Growth in Mind

There are several possible solutions to avoid future conflicts between trees and solar power, and they don't necessarily depend on government action to be implemented.

In the context of new construction or new tree plantings, potential conflict between trees and PV arrays arises from a lack of knowledge of how tall a tree will grow. One simple way to preserve the ability to collect solar energy when trees are near buildings is to create solar access zones. Using the path that the sun casts on the ground, SAZs define areas that suggest limits or formally restrict maximum tree heights to lessen the risk of future obstruction of solar collectors (see figures 1 and 2 at left for examples). That is, SAZs allow vegetation, but only vegetation that grows no larger than a defined height within a specific zone.

The zones' restrictions also vary according to structure height, and taller trees are possible closer to a taller structure. With SAZs, the benefits of vegetation — aesthetics, property value, cooling, stormwater and so on — are preserved, and energy production is preserved as well. There is no need for an "either tree or collector" situation. Plus, SAZs eliminate the difficulty for the homeowner or layperson to imagine future tree growth and shading. Lastly, SAZs can be voluntary agreements or legal requirements; any way can work.

Defined solar ordinances, like Boulder's, require up to complete clearance from obstructions during certain times of the sun's pathway, such as between 10:00 a.m. and 2:00 p.m. SAZs can support, add to or complement existing ordinances — or replace them altogether. They also can be oriented to time periods such as 10:00 a.m. to 2:00 p.m. or 9:00 a.m. to 3:00 p.m.

Vegetative SAZs have two key parts. First is width; the SAZ width is defined by the azimuth of the sun for a chosen date and times at a certain distance from a collector. Standard distances

With SAZs, there is no need for an "either tree or collector" situation.

can be equivalent to front setbacks or common distances that are easy to calculate, such as 20 or 50 feet (6 or 15 meters). Solar installers and even savvy homeowners can easily create the SAZ drawings using charts of the sun's movement.

The second defining element is a plant species list for the SAZs. This is where arborists' extensive knowledge of tree species and their maximum heights, as well as maintenance requirements, comes in. For example, in figure 1, the innermost zone sets a maximum height of 15 feet for any vegetation. A species list would include small ornamental trees under a 15-foot height at maturity. Any species list will depend on local conditions such as climate zone, aspect and soils.

K.K. DUVIVIER

Having a solar access permit was not enough to protect this Ashland, Ore., panel host from the neighbor's landscaping choices. Without federal, state or local safeguards that address all obstructions, including vegetation, such permits have proven ineffective.

K.K. DUVIVIER

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Boulder, Colo., and Ashland, Ore., prohibit constructed obstructions in a portion of the sun's path during certain times. However, both cities have separate solar access permit requirements to protect solar installations from vegetation. Boulder refused to grant a solar access permit to protect this home's solar features, so the neighbors planted these two blue spruce trees in the solar skyspace.

A solar installer cannot anticipate that a neighbor or a government tree-planting program will plant a tree *after* installation that will grow to interfere with a panel's performance. Consequently, solar businesses can consider reaching out to jurisdictions to work on local solar ordinances or state statutes. Savvy installers can help create SAZs for vegetation and other obstructions. Working with arborists, solar businesses can help define suitable species and placement in areas such those shown in figures 1 and 2.

Another opportunity for a solar-arborist partnership is to provide advice on whether (or when) young trees nearby will grow into the access planes and reduce power generation. This is particularly important to companies that lease roofs to generate power. The leasing model depends upon an expected generation rate over the contract period. Trees growing into an access plane reduce power generation, which may affect the return on investment and the contract itself.

Solar folks can also partner with arborists to reach out to the sustainable development community to provide custom SAZs to support passive solar designs. Plant lists in these SAZs would be chosen to shade (or not shade) walls and roofs, provide aesthetics and environmental services, and avoid conflicts with infrastructure. Many energy-efficient building designs depend on proper shading in summer and solar gain through windows in winter. This new partnership can ensure green buildings perform as expected and can provide a valuable service to help create green and sustainable buildings. This can be especially important in California, with its new rules for solar roofs (outlined in the California Building Energy Efficiency Standards in Title 24).

SAZs can be voluntary agreements or legal requirements; any way can work.

It is one thing to provide new construction projects with solar access, but what about existing structures with trees nearby? Although many solar rebates or leasing systems have insolation requirements and require a shade analysis before installation of panels, how often do new solar arrays installed on older homes or businesses require removal or heavy trimming of an existing tree? Not all trees can be saved, but there will be times when a solar-smart arborist, working with a solar installer, can perform careful clearance pruning to prevent a tree from coming down or being injured beyond repair. Solar-smart pruning can also help to avoid unwelcome surprises, as when a shading tree must be removed, resulting in increased air conditioning costs that reduce the return on the solar investment.

Solar-smart arborists can perform recurring pruning services to ensure some young trees stay out of solar access planes as they grow and mature. This service will be based on the arborist's knowledge of the solar access plane, the property owner's concerns and the time frame required for clearance. Such considerations will be an important business model in the near future as the need for trees to cool cities grows. Another important — and, we hope, infrequent — service will be for selection and replacement of trees removed from the SAZ for a PV array. The solar-arborist partnership will be valuable to the party losing a tree and seeking a replacement.

Falling prices, energy security and new business models mean renewable energy in cities is likely here to stay. While some solar installers and hosts may dread the "dark side" of trees, trees and solar panels are natural partners and can coexist with thoughtful planning and care. Formal national and local regulations will help us in the long run, but for now there are still ways to get the job done efficiently. Knowing the law is a good start, and knowing a solar-smart arborist is too. **ST**