

**Andalay™**

**Now There's a Whole New Look to  
Solar Power**

**An Akeena Solar Whitepaper**

## Introduction

It takes just over eight minutes for light to travel from the Sun and hit a rooftop solar panel here on Earth where it is converted into useable energy. It takes considerably longer for the base material of that solar panel, silicon, to find its way up on that roof. First it must pass through four hands, each one adding value to what will become the finished product—the Silicon Foundry, which turns sand into refined silicon; the Wafer and Cell Manufacturer, that processes the silicon into photovoltaic cells; the Panel Manufacturer, that adds glass, aluminum and cardboard; and finally the Solar Installer, who markets and sells multiple finished panels as part of a complete solar system to consumers.

Residing on the top of the value chain, today's solar installers have the opportunity to drive substantial improvements in solar system aesthetics and reliability as well as reductions in system costs (roughly 50 percent of which lie in cost of sales and in the mechanics of the actual installation, including racking, wiring and grounding). In doing so, they can accelerate consumer demand for solar power, which is good for the country, the economy and the environment, as well as for their own top and bottom line growth.

This paper introduces Andalay™, the first radical improvement in rooftop solar system design, packaging and installation in more than a decade. Resulting from the R&D efforts of Akeena Solar, the leading solar installer in the US, Andalay delivers extensive reliability, aesthetic and cost benefits to consumers and installers. This paper examines these advantages in detail and discusses how Andalay is poised to change the face of solar power in America.

### 1. Andalay—the first integrated rooftop system

Solar power systems convert sunlight into electrical energy through the use of photovoltaic cells that are electrically interconnected into solar panels. The standard process for mounting these panels on a roof has been unchanged for many years. You locate attachment points; securely attach roof brackets; lay down an aluminum racking system across these brackets; and then painstakingly mount, wire together and ground the actual solar panels. It is an intricate manual process—labor-intensive and time-consuming. There are numerous pieces to assemble on the roof, numerous parts to inventory and misplace, and multiple tools to keep track of as you work. And all this adds inexorably to the cost of the installed system.

Determined to find a better way, Akeena Solar set out to develop a truly integrated solar power system that would change the way solar systems install and look, and which would eliminate the above pain points. The result of this investment and effort is Andalay, a patent-pending solar power system that, for the first time, fully integrates all wiring, grounding and racking into the solar panels themselves.

This integration enables Andalay to significantly improve the reliability of roof-top solar installations while, at the same time, greatly enhancing their aesthetics. Equally important, it enables installers to reduce rooftop labor by over 50 percent, decrease their rooftop assembled part counts by over 70 percent, and cut net installation costs by as much as **10** percent. All told, its impact is revolutionary.

### ***How Andalay assembles—like LEGO™ bricks***

Designed to work with existing and new solar cell technology, Andalay consists of plug and play panels that assemble quickly on the rooftop in much the same manner as LEGO bricks. Installers still locate attachment points and securely attach roof brackets, but there are 25 percent fewer of them—meaning 25 percent fewer roof penetrations.

Then, because the racking is integrated into the Andalay panels themselves (on all four sides for maximum rigidity), installers avoid having to lay down an aluminum racking grid. This takes a full and very major step out of the installation process. Instead, Andalay panels attach directly to the brackets and a few turns of a screw pull them together quickly and securely in a self-tightening fashion. And this, as detailed below, makes all the difference

### ***How Andalay performs—built-in reliability***

The innate simplicity of Andalay translates into substantial reliability advantages over ordinary rooftop solar installations. The first set of advantages are in the realm of the electrical connections between panels.

Andalay panels have built-in panel-to-panel connectors. There are no exterior wires between panels. Instead, all inter-panel wiring connections are made automatically when the panels are pulled closely together in their self-tightening fashion. This means no pinched wires and no bundles of wires dangling under the panels where they can corrode and/or abrade on the roof. Electrical resistance losses are also minimized with connectors that are assembled in the factory – and not field-installed on a rooftop.

The same holds true for grounding. To be compliant with National Electric Code safety regulations, grounding needs to be in place prior to making the DC connections between each module, and this grounding needs to remain in place as the DC connections are removed (if it ever becomes necessary to disassemble a system). Traditionally, grounding has been one of the most painstaking tasks of a solar installation, involving reaching around and under racking and panels, and manually making wiring connections to each panel and racking component. Because of these difficulties grounding is often done incompletely – and it is almost impossible to connect the grounding conductors before the DC connections are made.

Grounding is integral to the Andalay system: as the panels are attached together the ground is made before the DC connection is established – and as the panels are disassembled the ground is maintained as the DC connection is removed. Andalay solves these grounding problems completely – enhancing both safety and reliability.

In the mechanical arena, Andalay's integrated racking and connections results in more rugged yet lighter weight installations. Fewer roof penetrations (all of which are flashed to prevent leaks), means fewer chances to compromise a roof. The same is true for less weight. Significantly fewer parts, meanwhile, means significantly fewer potential points of failure.

Then there's the integrity of the panel-to-panel connections. Andalay eliminates the friction clips used in conventional installations in favor of threaded splices, leading to tighter, more secure connections that completely eliminate the possibility of a panel loosening due to high wind and to heating and cooling cycles over the years.

Additionally, Andalay panels pull more closely together than conventional systems leading to a more rigid framework. Moreover, the lack of external racking enables Andalay installations to sit several inches closer to the roof, further protecting the system from the effects of high wind.

### ***How Andalay looks—superior aesthetics***

The same Andalay features that increase rooftop solar reliability also resonate in the sphere of aesthetics. Just as solar systems deliver clean, renewable power, Andalay delivers a clean and contiguous look.

The first thing one notices is that there are no gaps between the solar panels in an Andalay installation to jar the eye. Instead there are simply smooth, barely noticeable seams, like those on a fine car. Nor are there any unsightly external racks to add visual bulk, or dangling wires to distract from the clean look. Closer mounting to the roof also adds to the streamlined appearance.

Moreover, all Andalay hardware, from the panels to the attachments, are a uniform black to avoid visual confusion and to better blend with their environment. The result is a rooftop solar panel installation that looks very much like a designer skylight or glass section of a roof rather than an industrial-looking set of solar panels.

## **2. Benefits to the customer**

The benefits of Andalay to the solar consumer are manifold. They start with being able to have the cleanest-looking, most modern solar system available. From its integrated look to its fewer roof penetrations and lighter weight to its lack of roof-abrading wires, Andalay is simply less invasive on the rooftop and more pleasing to eye than ordinary systems.

Andalay also enables a much faster and thus less disruptive installation process. In a conventional installation, box upon cardboard box of panels and racking have to be unpacked before the components can get up on the roof. In contrast, an Andalay install can easily be complete before a comparable conventional install literally gets off the ground.\*

With its far fewer parts and lower labor requirements, an Andalay installation means far less roof time for installer personnel. This translates to less wear and tear on the roof. In addition, because Andalay panels pack so closely together, less roof space has to be dedicated to the solar system. This higher packing density means that more roof space is available to accommodate a higher output system if desired.

Moreover, if an Andalay panel should fail overtime, it is easier to remove and replace that panel for all the same reasons that Andalay is easier to install to begin with. By the same token, should a customer want to re-roof at some future point, the entire Andalay system can be quickly and easily disassembled and subsequently reinstalled on the new roof.

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\* In fact, Andalay panels are packaged without external cardboard—hence consumers benefit from lower manufacturing and landfill disposal costs (on top of less wiring and racking waste).

Finally, in terms of system performance, Andalay's use of latest-generation monocrystalline solar cell technology results in more solar power per square foot of installation than most conventional systems. Similarly, Andalay's shorter wire lengths (leading to less resistance loss) and output tolerance to within 3 percent help ensure that customers get the full measure of solar power generating capabilities that they are paying for.

### 3. Benefits to the solar installer

The benefits of Andalay to the solar installer are primarily economic and extremely compelling. Faster, easier Andalay installs—requiring 50 percent less roof top labor—provide the ability to do more installations in a given time period, without increasing headcount. Employee learning curves can also be reduced due to the simplicity of Andalay, resulting in lower training costs and faster employee time-to-productivity. And fewer rooftop assemblies to perform can lead to safer installs.

With 70 percent fewer parts to keep track of, Andalay also enables an installer to reduce inventory handling costs, and to reduce wastage from damaged parts or parts loss. And the lack of external racking and wiring means less money tied up in inventory to begin with.

#### **Improved margins**

To net out the economics, the current cost of an installed rooftop solar system is approximately \$8.00 a watt to the consumer, with direct costs to the installer of approximately \$6.00. Andalay can help installers reduce direct costs to \$5.30 a watt through a combination of lower labor and parts costs. This, combined with an approximately 5 percent higher retail price based on increased consumer value, results in significantly increased margins (see charts below).

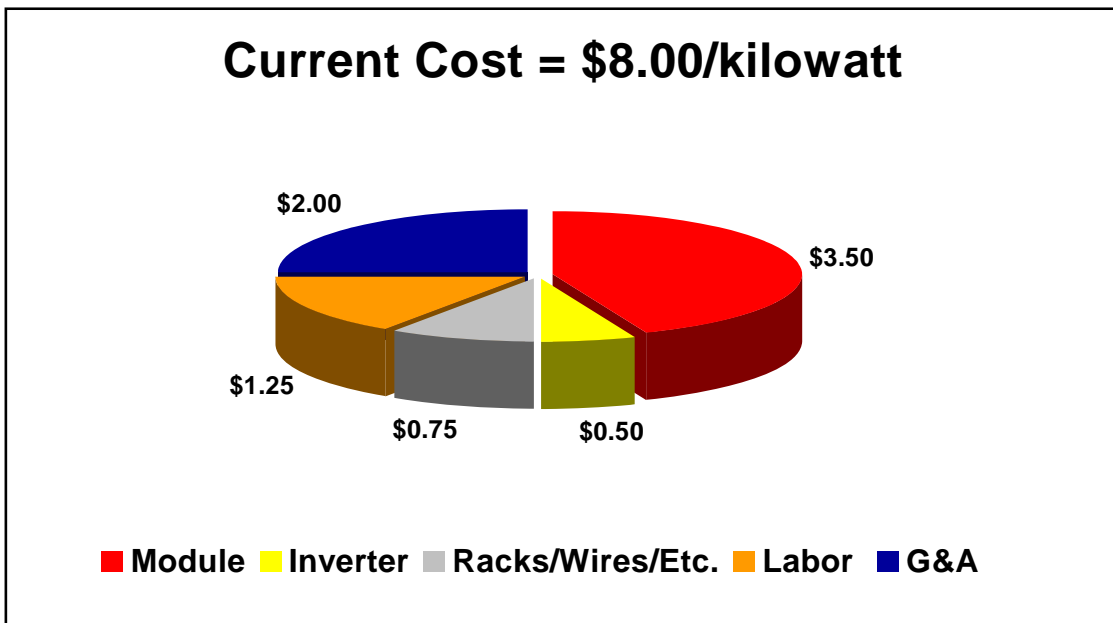


Figure 1: This chart shows the consumer paying \$8.00 per watt, the installer paying a total of \$6.00 per watt in the form of panels, inverters, racks and wires.

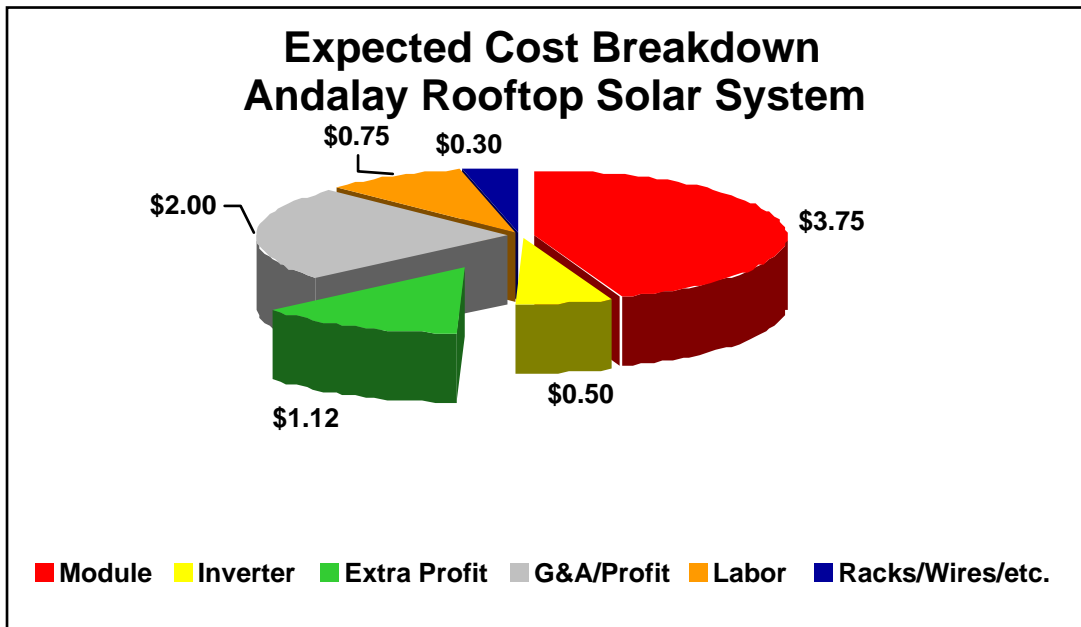


Figure 2: This chart shows the consumer paying \$8.42 per watt, the installer paying a total of \$5.30 per watt for an Andalay system, leaving \$3.12 to cover G&A plus profit, which equates to an expected profit increase of \$1.12 per watt compared to the non-Andalay case.

#### **Improved competitiveness**

Installers embracing Andalay have the benefit of offering consumers the most advanced solar system available, with superior reliability and aesthetics, coupled with the cachet of the new. As demand for Andalay ramps in an installer's local market, a percentage of the savings experienced by the installer can be passed on to its customers resulting in enhanced competitiveness and further increased demand.

#### **4. Going forward with Andalay**

Because of the powerful reliability, aesthetics and costs benefits of Andalay, Akeena Solar will aggressively market Andalay systems to consumers in its primary markets—California and the Mid-Atlantic States. Akeena will also make Andalay available through licensing and distribution agreements to other solar installers in the US and overseas.

As the first major advance in solar installation technology in a decade or more, Andalay will help broaden the market for rooftop solar systems while strengthening a solar installer's business model. Without financially healthy installers in for the long haul, the US market for solar will never realize its full potential.

Today, solar installers hold the key to delivering increased value to consumers. Much of the base cost for solar panels is dependent on fluctuations in worldwide demand for refined silicon. There is little that one can do about that. Hence, the pendulum has swung away from entities further down the solar value chain, such as silicon refiners and

solar cell and panel manufacturers, and towards solar installers. Installers have room to innovate in order to create new efficiencies in their business and installation processes. Andalay represents such an innovation.



Akeena Solar is a proven leader in the design and integration of solar power systems for residential and commercial customers. With operations serving California, New York, New Jersey, Connecticut and Pennsylvania, our skilled team of trained engineers are also dedicated environmentalists who take pride in exceeding customer expectations and protecting the environment. They have been immersed in leading-edge solar technology since its inception—and our growing list of over 1300 satisfied customers underscores the successful outcome of our commitment to personal care and attention.

Contact Akeena Toll Free at 888-253-3628 or visit Akeena on the web at [www.Akeena.com](http://www.Akeena.com)