Photo: Alion Energy

Mounting systems manufacturers are striving to reduce the solar BOS cost and save on installation time. Alion Energy's "Rover" extrudes concrete rails and fixes the panels.

Is concrete next?

Mounting Systems: At Intersolar North America, solar PV mounting systems manufacturers presented interesting innovations and new designs.

PV mounting system manufacturers demonstrating their latest configurations at Intersolar North America in July espoused a similar theme: simplified design, increased factory pre-assembly and reduced metal content. All these goals are aimed at reducing the solar balance of system (BOS) cost, and more importantly, aimed at saving on installation time. "Metal costs can represent 80% of a total mounting system price tag," reckons Kasim Ersoy, the CEO of Mounting Systems, of West Sacramento.

One novel approach to reducing the cost of metal structural materials in mounting systems came from Alion Energy, which is now demonstrating its ground-oriented mounting system made of extruded concrete, into which panels are epoxied. The company uses one proprietary robot to form the concrete and affix the modules, and then uses another robot, when needed, to ride the concrete rail and clean the modules.

Cost reduction a central target

Mounting systems represent the lion's share of the BOS cost in a total solar PV system. Several manufacturers suggested that since module prices have gone down to the point that they represent only about a third of a total solar PV system's cost, BOS has to drop in line with modules as well.

"If you analyze a roof mount system, for example, it is basically 7 to 13% of the total cost of the system; we see no need for that component to be more than 10%, and we'll help drive it down to a single digit," vows Jack Meng, the President of Fortune Energy, a full portfolio solar PV distributor based in Chatsworth, CA. His company unveiled Dual-Rack, a double-tracked rail that accepts multiple mounting hardware designs, at the Intersolar trade show.

Another system manufacturer has also targeted the single-digit percentage cost

range. "In a two dollar per watt peak complete system, our new Sigma I XL single-pole ground mount system costs less than 10% of the total system cost," says Mounting Systems' Ersoy.

One strategy for reducing mounting system cost is to bundle BOS components as part of a complete system sold at the distributor level.

"As a distributor, we can sell the racking system for less than single-product manufacturers because we sell complete systems including modules," says Fortune's Meng. "I don't even mind giving the racking away, if I can make up for it with the rest of the system. Downstream integration is the trend, and system integration is a very aggressive strategy. I don't see single segmentation suppliers doing a better job," he suggests.

The universe of mounting systems manufacturers is large, and, not surprisingly, heavily populated with Chinese companies.

According to solar research company ENF, among the mounting system companies which offer a 15 year or longer warranty, 46 are from China, 22 are from Germany, eight are from Spain, and another nine hail from elsewhere in Europe. As more strategic partnerships are formed, more vertically integrated suppliers will emerge.

Photo: Unirac Incorporated

Unirac's RM mounting system consists of a sleek frame plus clip.

Paring down parts and volume

Many of the mounting system companies displaying products at Intersolar claimed to have achieved parts reductions with their latest models, and as a result, are using less metal volume. "Our EkonoRack, out about a year, has only three components, a module support, a clamp and a wind shield, and it uses less metal than our lightweight system," says Mallory McKay, a marketing coordinator for KB Racking, of Toronto. The company has also reduced the need for traditional array grounding: "Being able to ground only once per array significantly reduces the amount of parts and labor required to install the system, reducing our customers' costs by at least five U.S. cents per watt," says Peter Aulich, the COO of KB Racking.

Photo: Orion Racking

Orion's Saturn carport design invokes classical industrial architecture.

Photo: Sollega Inc.

Sollega's Fast Rack tray system installs quickly.

Another exhibitor at the show touting reduced grounding costs was RBI Solar, of Cincinnati, which utilizes technology from Wiley Electronics to streamline its mounting system, notes James Cormican, a company marketer. "The new bonding and grounding methodology provided by Wiley Electronics will go a long way towards lowering total installed costs by reducing both the labor and materials required for code compliant PV system grounding. RBI's solar ground mount and ballasted roof mount systems have been tested with WEEB bonding washers, lay-in lugs, and bonding jumpers," the company indicates.

Among mounting system companies with new products that are reducing the number of rails from a standard configuration is Solar SpeedRack, based in Santa Ana, CA, which unveiled its new product at the show. "Commonly, a 10 watt system would use four rails per panel, but we use the top rail as the bottom of the next row, so we use three rails in place of four," explained Fred Fairbanks, the director of business development for the new company. "Usually we are about 50 cents per watt in entry level cost," he noted.

Similarly, Unirac's new RM mounting system consists of only two parts: the pre-assembled ballast bay and a module clip. The Albuquerque-based company in April of this year also introduced its U-Builder design system, which assists customers with the design of a complete system.

In the carport niche, Orion Solar Racking, of Commerce, CA, also rolled out its Saturn series carport solution, which includes a single-piece stress-reducing structure that resembles Victorian industrial architecture.

Material savings have gained some mounting manufacturers laurels from the industry. For example, SnapNrack, based in San Luis Obispo, was selected as a finalist by Intersolar North America 2013 in the "Solar Projects in North America" category. The award was for use of their Series 350 snap-together rail mounting system at the Progress Solar II project in North Carolina, developed by O2energies and REC Solar, according to Greg McPheeters, an engineering manager for the company.

Greater adaptability a goal

Specialized in quick mounting, KB Racking performs a maximum amount of pre-assembly in the factory to save installer time; this year the company added manufacturing capacity in Los Angeles to help serve regional customers.

"The EkonoRack design permits three to four kilowatts per man hour of installation time," McKay says. The company completed its Underwriter's Laboratories' 2703 industry standard testing for the new model, and was certified by Intertek in June.

Mounting systems that fold out or have other quick assembly features were highlighted by several manufacturers at the show. Sheridan, Colorado-based S:FLEX, for example, introduced LEICHTmount, its lightweight, low ballast, client-customized flat roof PV mounting system. The flexible configuration of the system permits either landscape or portrait orientation, with any desired angle.

Photo: Alion Energy

Alion also offers a module-cleaning robot, named Spot, to battle soiling problems.

Unfolding pre-assembled racks were also featured by Mounting Systems. "Our new Sigma I XL is a single-post ground mount system, which came out about two months ago," says Ersoy. "It comes pre-assembled on legs with cross rails, which it unfolds; as such, it includes a higher degree of pre-assembly. We were using a two-post system, to withstand high winds in some locations, but here in California, one post is sufficient."

Solar FlexRack, based in Youngstown, Ohio, is also offering a system with unfolding connecting channels between rails. The company's FlexRack ground mount, which comes pre-assembled, can adapt to east-west slopes of up to 20%, noted Ryan Petruska, the Marketing Manager for the manufacturer. Solar FlexRack indicates that a crew of three can assemble a module in less than five minutes. The company, now in business for three years, has 420 MW of mounting systems installed in North America.

Concrete replaces metal

Several rooftop mounting system makers offering plastic trays for ballast noted that their products are designed to take standard sized concrete blocks. Sollega, based in Markham, Ontario, featured its FastRack thermo-formed high density polyethylene trays with ultraviolet inhibitors, which were introduced to the U.S. market in September. The trays are designed for 10 degree or 15 degree slopes and are pre-formed to take a variety of module clips, says George Schnakenberg, the Design Director for the product. The company's mounting systems are in use in over 20 U.S. states and across Canada. The cost of the system is estimated at US$0.25 per module.

Similarly, several ground-mounted systems offered concrete ballast designs that are used to cover rough terrain or landfill locations where pile driven or excavated methods are not an option. Schletter, of Tucson, for example, demonstrated its new PvMini, which enables an array layout with fewer concrete foundations than a standard mounting system. A smaller, lighter version of the company's PvMax design, the PvMini, is designed for one vertical or two horizontal rows, according to Angela Kliever, Vice President of Marketing for Schletter.

A far more comprehensive use of concrete is advocated by Alion Energy, which is using standard 3,000 psi concrete to form continuous concrete rails, into which modules with flip-down legs are subsequently fixed with epoxy, explains Mark Kingsley, the CEO of the Richmond-based company. A novel element of the process is the Alion robot – named Rover – that both extrudes the rails and fixes the panels on sites that include terrain with an 8% grade. "If the standard mounting system accounts for 40 to 50% of the total system cost today, we cut that mounting system component by 25 to 30%. Overall, we can reduce total system costs by at least 10%," reckons Kingsley.

The Alion demonstration module design is optimized for a five watt installation on 400 foot runs, but is scalable, using joints between the concrete rail sections. The design is initially intended for utility-scale projects, but the technology could be adapted for smaller ground-mounted situations. The extruder robot follows a pre-set laser to assure a constant elevation of the form, and to adjust for bumps and holes. Alion is now building demonstration plants in California, Western China and Saudi Arabia.

The use of long extruded rails might also be applied to a rooftop through the use of multiple plastics, suggests Jesse Atkinson, the Vice President of Business Development for the company. Not to leave maintenance service revenue on the table, Alion also offers clients the use of its module-cleaning robot, named Spot, to battle soiling problems. "Soiling losses in the United States may account for four or five percent per year, which is typically modeled for systems here, but in Saudi Arabia, soiling losses can be as high as 40%, so system owners there are spending a lot on manual labor," Kingsley says. ◆

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