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Markets & Trends

Japan: Drastic changes to the country's FIT set to drive the solar market's evolution. *Page 22*



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Recycling: Backsheet considerations are paramount when recycling the whole PV module. *Page 58*



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PHOTOVOLTAIC MARKETS & TECHNOLOGY



O&M plays its hand

Smart strategies come up trumps. *Pages 20, 34 & 70*



Photo: Mounting Systems GmbH

Some seventy percent of the country is covered by mountains, so it can become a challenge to install a utility-scale solar PV farm in Japan. This installation with equipment by Mounting Systems adapts to the undulations.

Withstanding typhoons, earthquakes and volcanos

Mounting systems: When installing ground mounted solar systems in Japan, developers must face a set of challenges almost unique to the country, including tough terrain, adverse weather and a demand for only the very highest standards.

The Japanese market for solar mounting systems is more challenging than other markets its size, thanks to limited land, severe weather, and high quality demand. As the rate of utility-scale installations slows, commercial and residential ground-mounted and rooftop installations are expected to accelerate, industry suppliers say.

Geological challenges abound

“Unlike the United States, Japan has a very limited land area that is flat, which is near the ocean; the rest is undulating,” says Yoichiro Ando, Vice President Asia Pacific Region for Clenergy, a Sino-

Australian joint venture with headquarters in Xiamen. Indeed, some 70% of the country is covered by mountains, to the extent that it is compared in topography to Norway. Another challenging factor is that the country has about 200 volcanoes, of which 60 are still active. As a result, earthquakes typically number 1,500 per year and volcanic eruptions are common.

“A lot of major development companies in Japan have come to us because while other solar frames have come down during earthquakes, ours have stayed up,” Ando says. “Our latest generation frame, the SolarTerrace II-A, can withstand a 60 km/h wind,” he notes.

Ice heave and snow load are also major factors in the longevity of mounting systems in Japan. “We heard of installations done in Hokkaido in which the posts had been driven to two meters before the winter, but after winter, all the posts came out because of the freeze/thaw heave,” says Boris Dya, the Senior Manager for Business Development for Mounting Systems GmbH, based in Rangsdorf, Germany. “So we do extensive test ramming and pull out tests. We may use galvanized steel beams and reinforce with concrete for a location like a rice field, then use aluminum and stainless steel above ground,” he explains.

Typhoons a standard feature

Typhoons in Japan are so common that they are numbered rather than named, suggesting yet another serious challenge for racking manufacturers.

“Because there are so many typhoons in Japan, racks need to be designed so that they can withstand the high wind pressure caused during these types of storms,” says Ichiro Ikeda, a manager in

KEY POINTS

- Siting and weather conditions are major factors in designing PV mounting systems in Japan.
- Aesthetic and unique roof design factors in Japan make customized mounting more desirable.
- Utility-scale installations are destined to get smaller as choice flat sites are taken.
- Commercial installations are expected to grow rapidly with both roof-mounted and ground-mounted solutions, as well as floating designs.
- Residential mounting systems along with other segments will incorporate more aluminum usage in place of steel.
- Foreign competitors need local native language speakers to develop close relationships with potential new customers. That relationship will include quality assurance and O&M aspects.



Photo: Clenergy

Clenergy braces for the snow load in Japan.

Kyocera’s Solar Energy Marketing Division, in Kyoto.

Two to three dozen typhoons form up over the Japanese region of the North-west Pacific Ocean each year, and many of these hit land with wind speeds of up to 200 km/h. “Seven or eight typhoons pass over Okinawa Prefecture every year, and about three hit the Japanese main islands, especially Kyushu and Shikoku,”

say weather analysts at Japan-guide.com. Nonetheless, any region of Japan, including Tokyo, Osaka and Hokkaido is typhoon-prone. High typhoon season is between May and October, with a peak in August through September.

Unique residential construction

Once mounting system providers are prepared for the some of the worst condi-

A+ SUN SYSTEMS TOUTS TENSILE STRUCTURES FOR DIFFICULT INSTALLATIONS

In booming PV markets it has been observed that the more straightforward locations are invariably the first to be developed. Representing the low hanging fruit, it leaves behind more difficult sloping land for ground-mounted arrays or more straightforward flat-roof and curved roof commercial applications. Italy’s A+ Sun Systems believes its tensile-steel-wire-rope solution can be applied to such difficult locations in a cost-effective way. The SunNet Ground employs the tensile-rope solution in a way that the company claims reduces the need for expensive soil and site analysis and does not require the use of GPS or laser point equipment. “Tensile structure is a very smart system,” says Shin Morimoto, the CEO Copia Energy, which has applied A+ Sun Systems’ tensile approach to mounting structures.

The company, based in San Bonifacio in Italy’s north, has supplied three pilot projects in Japan. Working with local EPCs, A+ Sun Systems has supplied one flat roof project with its SunNetRoof system, and two ground-mounted projects on sloping ground.

A+ Sun Systems claims that the use of raming equipment is not required through the application of the SunNet Ground, as the anchor points employ micro piles requiring only light pneumatics drills for the installation. The anchor points employ screw pillars that can be at the end of a 150 to 200 meter row. Beyond that, hammers and pneumatic drills are all that is required for the installation of the PV system.

“A+ Sun Systems’ solar tensile structure is made in flexible steel cable and micro piles,” says Alberto Di Gaetano, a spokesperson for the company. “This makes it suitable for hilly lands and sloping ground. What’s more, unskilled operators are sufficient to use a jackhammer and install a tensile structure. This overcomes the big lack of skilled labor in Japan.”

The range of A+ Sun System mounting systems, suitable for the burgeoning rooftop market along with ground-mounted applications, come pre-assembled and at 2 kg/m² (0.41 lbs/ft²) are lightweight when compared to more common steel or even aluminum structures.



Photo: A+ Sun Systems

A+ Sun Systems’ tensile-steel-wire-rope solution SunNet Ground can be applied to difficult locations without using ramming equipment.

A+ Systems says its engineers are available to consult to and support EPCs and installation firms. The range of A+ Sun System solutions are patent pending.

Photo: KYOCERA Solar, Inc.



The Kyocera Samurai roof-mounting system.

tions that the earth and sky can render, uniquely artistic building methods for roofs in Japan require careful load bearing and aesthetic considerations. Japanese residential eaves tend to extend much further out than in U.S. or European housing, requiring complex tiered support bracketing called tokyō.

“Many Japanese roofs have complex shapes and are small in design,” says Kyocera’s Ikeda. “Thus mounting brackets that can correspond to various construction methods and roofing materials are necessary for the residential market,” he says.

“There is high popularity in Japan for systems such as our Samurai series that can be installed on roofs consisting of various shapes and utilize those spaces more efficiently; these systems create heightened unity between the roof and module array,” he says.

Mounting Systems’ Dya says, “We are now working on the perfect tile system for Japan.”

Utility-scale PV space squeezed

It can be difficult to site a utility-scale PV farm in a nation of such mountainous islands. “Japan has really limited space and because the solar industry has been crazy there since 2012, the really good flat areas for utility-scale projects are nearly gone,” observes Dya. “What is left are hilly or mountainous and usually forested sites, so ground conditions can be very strange and hard to build on,” he says. “As a result we have had to develop more specialized east/west tilt arrays on slopes,” he says.

One Japanese developer that is thriving is West Holdings Group, which had installed 122 utility-scale projects by August 2014, along with over 53,000 residential solar systems and 3,700 commercial PV plants. West Holdings has developed its own West Power Screw to facilitate ground-mounted systems.

Similarly, Kyocera is well entrenched. “Our racks are utilized in many utility-scale solar installations,” says Ikeda.

Among foreign challengers in this space, SPI Solar, based in Roseville, California, plans to develop a 22 MW PV farm in Sukagawa, in Fukushima Prefecture. Construction is slated to begin in April 2015 and the array is to come online in early 2016. The company’s Japanese subsidiary, SPI Solar Japan GK, may also install 3 MW more at the site. The company announced in January that it

had severed ties with China’s LDK Solar. Meanwhile, Clenergy is preparing for a transition from utility-scale projects to commercial-scale. Up to now most of the company’s projects have been larger-scale. For example, Clenergy is providing its STII-A ground-mounting systems for a 24.8 MW power plant situated in Nasu-shiobara. Construction began in June 2014 and the plant is expected to come online in September 2015.

Commercial market

In the Japanese commercial solar market, Kyocera is planning 60 MW across 30 sites by the end of this year, utilizing its joint venture with Century Tokyo Leasing. Construction began in September 2014 on the first unit within this wave of projects at a 2.9 MW facility in Kato, Hyogo prefecture.

Clenergy also has a strong presence in this segment. “We have installed about 1,000 projects averaging 800 kW, from Hokkaido to Okinawa,” says Ando. “We mainly do ground-mount systems of 2 MW or less because it is easier to get hooked up to the power station,” he explains.

Another Chinese contender, Xiamen Grace Solar, has supplied the ground-mounting systems for a host of PV plants in Japan. Grace estimated prior to year’s end that it shipped 100 MW worth of mounting systems to Japan during 2014.

France’s Ciel et Terre also offers a commercial rooftop mounting system, Arch’hélios, a patented insulated hot-dipped galvanized steel roof panel that permits rapid installation.

Many Japanese installers still use steel mounting systems rather than aluminum because Japan has such an advanced steel industry. “Installation labor time with aluminum is one third that of steel, in some cases, since one might be able to carry two aluminum rails instead of one steel rail,” suggests Ando, of Clenergy. “We preassemble in China, where the labor cost is lower, so final assembly and adjustments are easier. Most of our customers are repeat customers or those who have heard about us from the EPCs,” he says. China produces about half the world’s aluminum, while Japan is a small producer.

Floating solutions

One solution that seems tailor-made for Japan is floating PV systems. With a

i KRINNER WITH BULLISH MARKET OUTLOOK

Photo: Krinner GmbH



Krinner’s project near Shirakawa, Fukushima Prefecture, is located at a former golf course.

German mounting system supplier Krinner realized 120 MW of installations in Japan. One particularly challenging project was in the Fukushima Prefecture, near Shirakawa. The solar array is located at a former golf course and has a capacity of 19 MW. Krinner sampled the various soil types at various terrain heights to tackle the technical challenges the installation would present. Wind and snow loads were also

taken into account when deciding on materials and power plant design. Krinner is currently executing on a pipeline of 25 MW in partnership with a key account EPC over the next six months. The company expects a further 40 MW of projects to be realized with existing partners in the medium term.

“Our projects in Japan included many challenges,” says Thomas Huber, Head of Engineering at the company. “The Krinner ground screw is our core product. We use the same mounting system technology for Japan as we use for other international projects but of course our solutions have been adjusted to suit the specific loads, norms and standards in Japan.” The Krinner team is bullish as to the market outlook in Japan.

“We expect to keep on participating in the PV boom in Japan,” says Peter Hammer, Sales Manager Export for Krinner. “We have two local partners in Japan. Both are highly skilled, well equipped and very successful in the Japanese PV market.”

Lego-style snap-together system, Ciel et Terre's Hydrelío generates 10% more electricity than rooftop or ground-mounted systems of the same size, given the water-cooling element of the design.

"Our floating solar technology Hydrelío can withstand winds of up to 118 mph (190 km/h) and changes in water levels of up to 20 feet (6 meters)," says Eva Pauly, the International Business Manager for Ciel et Terre International, based in Lille Cedex, France. The system's aluminum rack and fiberglass pin linkage resistance is 3,000 decanewtons (DaN) or about 3 metric tons of force, as tested by Onera, the French aerospace lab. The pontoons are constructed from high-density polyurethane with UV resistance.

The company now has 14.5 MW of floating PV under development that will come online over the next two to three years, Pauly says.

Its 1.2 MW floating project in Okegawa, in the Saitama prefecture, has been linked to the grid since July 2013, and has withstood three typhoons thus far. The project was developed by West Holdings and includes both 10 degree and 20 degree tilts as a test installation.

Apart from power generation, the Ciel et Terre system can incorporate a water treatment module, utilizing Aguago technology. The floating solar panels limit algae growth and can power aerators and circulators to oxygenate the water.

Kyocera is using Ciel et Terre's technology for floating plants it is outfitting. Smart Energy, based in Tokyo, is also using Ciel et Terre technology for a 7.5 MW plant that will be located at Kawagoe, in Saitama prefecture. Construction will begin in March using Yingli panels.



Photo: Ciel & Terre

Ciel et Terre's floating PV farm in Okegawa can generate 10% more electricity than other PV systems because of the water-cooling effect of the design, explains the company.

Foreign competition

"Foreign suppliers, mainly European manufacturers, are steadily expanding into the Japanese market with racks," observes Ikeda, of Kyocera. But the path to success in Japan is not an easy one, explains Dya of Mounting Systems. "Some Japanese solar developers only want to deal with Japanese suppliers, and they won't look at foreign companies or products, but we have hired local staff to have closer relationships with customers. While our heavier foundation solutions may be shipped in from China, we prefer at times to get all other materials shipped from California or Germany," he notes.

Certification, as always, also helps foreign companies enter a new market like Japan. "Our mounting systems are TÜV certified – Japan doesn't have its own solar certification entity, just a structural engineering code requirement that applies to rails, nuts and bolts," notes Clenergy's Ando.

Meticulous customer care is another absolute in Japan. "No other Chinese solar company has the quality assurance that we offer Japan. We send third-party quality assurance experts from Japan to the factory in China every month, and incorporate recommendations," he says. ♦

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