Signed, sealed, delivered

Logistics | As PV expands its global footprint, logistics – transporting goods from factory to project site – is becoming a complicated challenge for manufacturers. Sara Ver Bruggen reports on efforts by the industry to reduce costs arising from equipment damaged in transit

Credit: Hellman Worldwide Logistics.

According to German test institute TÜV Rheinland between 5 and 10% of PV modules sustain a degree of damage during transportation, from when they leave the factory gate to arrival at their final destination. During transportation, loading and unloading, and handling, modules are exposed to shocks and vibrations that can potentially have a damaging effect on fragile solar cells, reducing the module's power output. Considering the global PV module market was worth just over US$30.5 billion in 2013, according to GTM Research, this percentage represents a significant figure.

Not only that, logistics, if poorly addressed, can incur costs in other ways too, through lengthy delays of shipments at major ports and complex customs procedures, for example. The industry association Solar United (previously the International Photovoltaic Equipment Association) estimates the PV industry annually loses between US$400-500 million due to inefficient logistics processes along the entire supply chain.

Adapting to new market challenges

Logistics is more than just having warehouse facilities at strategic locations to serve local markets in different continents. Some manufacturers and suppliers in the PV industry are recruiting specialist staff in response to the challenge. During 2014 German inverter supplier SMA has reorganised its global logistics strategy, which had previously operated along product lines. Now this part of the business is organised globally with local logistics teams established at the company's factory locations around the world and in local sales and services offices.

This is in response to what SMA's head of global logistics, Axel Brewe, describes as the fragmentation of the PV industry, where new markets are opening up across the continents. The Germany-headquartered inverter maker has also been investing in its staff, hiring people with backgrounds and skills in freight forwarding. SMA also works with large as well as local logistics service providers across air, sea and road freight.

The safe transportation of PV equipment to site is becoming a key part of the cost equation in plant economics.

"We are prepared for the market today but this will probably change in future so we will have to keep an eye on this development," says Brewe.

SMA started as a mainly domestic supplier but as the PV industry has grown and become more globalised, export markets make up over 70% of the company's trade, with 17% of sales in Europe, outside of Germany, and just over 55% in the rest of the world. The company procures freight and also warehouse capacity and puts out tenders for the major logistics providers to quote for. "Price is an important factor but so is quality and service," says Brewe.

Logistics hubs are set up at SMA's production sites, which include the US and South Africa. In North America, the company has three logistics centres, including one at its factory in Denver. From the US SMA serves Latin America, supported by local sales and services offices on the ground in places such as Chile. The company's coverage is comprehensive so that the logistics team already has in place agreed lead times for existing routes and lanes.

"However, if a new route or lane is opened due to a new project or client then the logistics team is involved in the deal with a client before it closes. It is crucial to establish lead times and other details, such as custom clearance procedures and logistics costs," says Brewe.

More routes, more issues

According to Holger Meyer, renewable energy manager at Hellman Worldwide Logistics, procuring the sea or air freight is more complex than it used to be. The company's PV industry customers include REC and Talesun, among others.

"The freight industry operates like the stock market. Prices change, depending on routes and how busy they are," Meyer says. When capacity is tight prices are driven upwards. Expensive times are the months leading up to Christmas and Easter, as goods destined for global retail giants dominate container ships on busy routes.

Fab to farm

GPS tracking and sensor technologies combined with smart software is enabling PV suppliers and clients to keep tabs on their shipment and make alternative plans should anything happen to goods in transportation.

Hellmann Logistics, which has been working with the PV industry for a number of years, is able to provide full transparency for shipments with a tool called Smart Visibility, initially launched as a tracking and monitoring system for perishable goods and cold chain logistics. Every five minutes, the small device, attached to cargo, transmits the location of the shipment and the exposure of goods to various factors and forces.

The tool was developed using conventional freight tracking hardware combined with real-time data transmission. The device, powered by a solar cell, tracks the geo-position of the shipment, which lets the logistics manager know the current location of products.

Temperature, pressure, light exposure, shocks and motion of goods, even the opening of container doors, are all measurable incidences that can be transmitted in real-time.

Such information ensures PV shipments cannot get lost and provides manufacturers with information they need to take measures such as organising a compensation delivery, or alarming security agencies if it looks likely that theft has occurred.

Many of the global logistics firms have their own tracking systems that enable customers in the PV industry to keep a close eye on their cargo. An advantage of the Smart Visibility technology is its open platform design that means it can be used by any customer independent of the logistics service providers used.

Using GPS hardware and specialist software Hellmann Worldwide Logistics is able to track the whereabouts of PV module shipments worldwide for clients.

Credit: Hellmann Worldwide Logistics

With fragmentation of the market, PV manufacturers are more likely to be sending cargo on several different containers as opposed to one bound for one or two destination ports in Europe. "How do you control your stock on three to five carriers? If your volume is down on each one, so is your influence. Then prices go up," says Meyer. Global logistics and freight forwarding service companies, like Hellman, have relationships with large shipping firms and knowledge of global routes and networks.

Even savings achieved by securing cheaper freight costs can disappear or even start to eat into earnings when shipments that have been offloaded at port exceed moorage times – a grace period, usually several days for shipments unloaded at ports. Meyer refers to a case in Europe where containers of PV modules destined for a project in eastern Europe were held up because the correct documentation for customs could not be found. Once moorage times are exceeded a daily fee is charged, which can range from US$150 to US$500 a day. Extrapolate this across tens and even hundreds of containers, in different ports, across a year, and the costs can begin to mount.

"It's not simply moving boxes and containers from one destination to another. We have helped customers bring down costs by optimising packaging, reducing amount of container space taken up. We can manage cashflows, for example by deferring or delaying what would otherwise be upfront VAT costs on entry into destination markets. The company deals with customs too," says Meyer. With Solar United, Hellmann has been discussing logistics issues at PV industry conferences and Meyer hopes to continue educating the industry during 2015.

Such services will be increasingly in demand as new PV markets become established and suppliers are expected to provide goods on 'delivered duty paid' terms, which is where the seller has to bear all of the risks and costs associated with delivering the goods to the destination market, including duties, taxes and other considerations to be cleared for importation. Delivered duty paid is part of a service provided by logistics providers.

According to management consultancy Accenture, as manufacturers and industry sectors enter new markets, especially in emerging economies, they expect much more than traditional transportation and warehousing services from their logistics and freight forwarding service providers, such as customs and insurance brokerage, as well as trade and transportation management.

Logistics, which can cover a myriad of different services, but essentially is about ensuring the timely, safe delivery of valuable goods from one point to another, underpins any globalised industry. Done well, logistics can help manufacturers maintain or even improve their margins and provide their customers with value-added services.

Protecting goods

In mid-2014 Hanwha SolarOne was one of the first PV module makers to be awarded a transport packaging certificate that complies with a new standard, IEC 62759-1 ('Transportation testing of photovoltaic modules').

The module supplier developed the packaging in-house in cooperation with a packaging producer, over several years of iterations. Subjected to the test with partners TÜV Rheinland and logistics

Credit: Hanwha SolarOne.

services provider DB Schenker, the packaging passed the qualification at first attempt.

In reality the number of defective modules during transport is difficult to determine as things like micro-cracks are not visible. "However, by making sure that packaging is designed and qualified for the purpose of transport PV manufacturers can eliminate discussions with customers about potential defects," says Winfried Wahl, senior director, products and marketing at Hanwha SolarOne. "Customers can save money and time on incoming inspection costs and the PV manufacturer delivers a value added service. Additionally, transport insurance costs can be reduced if the risk of damage is lowered through adequate packaging and the IEC certification."

Hanwha SolarOne was one of the first PV module makers to be certified with the IEC 62759-1 standard, 'Transportation testing of photovoltaic modules'.

Good packaging that adequately protects modules during transport and handling can protect them from damage, but to ensure traceability DB Schenker uses sensors to detect when any breaches such as modules being knocked around occur during transport and notify the manufacturer or other companies concerned about any abnormal loads that occur during sea or road transport.

Logistics and PV industry services

For companies in the PV industry robust, efficient logistics strategies are critical to the provision of post-sales service ensuring, for instance, that if a product needs a component replacement when it arrives at a site that this can be delivered to the project within a day or two. "This requires forward planning such as how much buffer stock to keep in strategic locations," says Brewe.

As more solar farms come out of their warranty periods and the services sub-segments of the PV industry grow in areas like operations and maintenance (O&M), logistics will arguably become more critical to ensure that spare parts and repair replacements can be delivered to sites rapidly and cost-effectively. This is the challenging aspect of the job, which Brewe says is also interesting and what makes working in logistics a good career within the PV industry.

In an increasingly competitive global marketplace having a PV module that ticks all the performance versus quality versus cost boxes is one thing. But, customer satisfaction is also influenced by factors dependent on how well, or badly, logistics is done. While some incidences and delays happen even despite the best laid plans, late deliveries, damaged goods and avoidable setbacks can all chip away at a brand, especially if they end up causing project delays or extended downtime, all of which will impact on its profitability. ■

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Pack test for PV modules

With intense cost pressures bearing down on the industry, it can be tempting to claw back savings on module packaging, using corner stacks between horizontal modules on a pallet all wrapped up in film. However, manufacturers can save on transport insurance costs as well as give customers at the other end peace of mind if they invest in adequate packaging for modules.

The certification process developed by TÜV Rheinland for its new transport packaging certificate (compliant with IEC 62759-1) for PV modules has several steps.

First, the sample is exposed to a vibration test, including simulations of shocks from road transport or acceleration procedures during cornering or braking. Serious impacts that could be caused by a shipping unit being knocked over by a fork lift are also simulated.

Next, the solar modules go through a check for possible damage, which includes a visual inspection, EL imaging and STC measurements, as well as dry and wet insulation testing.

In order to identify possible long-term effects, advanced ageing and load tests involving processes such as wind-load simulation and the application of thermo-mechanical loads are carried out in TÜV Rheinland laboratories.

Throughout the process, possible power degradation is analysed and evaluated. In addition, quality management aspects concerning the package and the traceability of the materials are included within the certification.

TÜV Rheinland's work to develop the PV module packaging certification is part of a wider initiative, called PVChain, in partnership with logistics provider DB Schenker, to establish a quality assurance programme for modules in transport to improve transparency and safety during global transportation. The system, launched in February 2014, following a year of development, aims to prevent as well as discover transport damage by monitoring transport, such as freight trucks, and validate the performance of PV modules, for example at their port of entry or at the project construction site, compared with results from the inspection before the modules leave the manufacturer's fab.

Within DB Schenker's facilities at Antwerp, which is a major port of entry into Europe, TÜV Rheinland has set up a testing hub. Here, once unloaded from shipping containers, shipping units containing modules, often several individually packaged units packaged up together or palletised, are unpacked and are flashed – tested – in a small laboratory environment and the data is logged.

More recently TÜV Rheinland has been presenting the PVChain initiative to investors from the finance industry and global insurers, as adopting the system can help manufacturers to reduce their insurance costs if the system is recognised by insurance firms.