

Just-in-time delivery of PV power plants

Planning and logistics | Meeting the exact delivery schedule of large-scale power plants is crucial to fulfilling customer expectations, the specifications of the EPC contract and local regulations, some of which may affect the profitability of a project. For the EPC contractor this means careful planning to ensure local climatic, cultural and logistical conditions are anticipated and prepared for. Mauro di Fiore and Maren Orgus of Hanwha Q CELLS discuss how to overcome specific local challenges to deliver large-scale power plants on time and on budget



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When it comes to large-scale power plants, one general rule applies, no matter where in the world the park is located: all involved parties, from the developer to the EPC contractor to the suppliers and the investors, want to make sure they fulfill their business plan and create a safe and predictable return on their investment. Therefore, the exact planning, construction, connection and delivery of solar parks according to time schedules and EPC contract specifications are crucial for everyone. However, the challenges that globally operating EPC contractors are facing on their way to achieve that differ greatly in different regions of the world.

National renewable energy policies for solar energy, weather conditions, labour laws and working cultures, customs regulations, criminality and the dialogue with neighbouring communities are just a few of the challenges that have to be taken into account. They show that EPC contractors today have to manage very broad sets of challenges and bring a whole range of skills in order to master them.

This article takes a closer look into three of the hottest markets for PV power plants of recent and coming years: Chile, Turkey and the United Kingdom. It illustrates some of the challenges involved in delivering projects on time and on budget.

Chile is an attractive place to build PV power plants – if the EPC knows about the specific challenges in the country and can manage them.



When it comes to the safety of the working crew, the high UV radiation in Chile is just one important factor that has to be addressed right from the beginning.

CHILE: THE BOOM MARKET IN SOUTH AMERICA

So far, Chile doesn't have any kind of feed-in tariff programme; so electricity is sold either to spot markets, or through power purchase agreements (PPAs) signed with utilities or large consumers, or as a result of the tender processes organised by the government. Therefore the only framework setting limits and deadlines for the construction of PV power plants according to schedule is the EPC contract with the customer and the obligations under those PPA agreements, when applicable. Missing the deadlines would lead to liquidated damages the contractor would have to pay in case the solar power plant does not produce electricity at a given date.



Building access roads to remote building sites can be one of the requirements for an EPC in Turkey.

International teams and cooperation needed

With regards to language and knowledge of local laws and regulations it is important that the whole permission process is organised by local employees who work hand in hand with a global EPC centre, where all the expertise and experience from projects in different parts of the world come together. Therefore Hanwha Q CELLS has established an office in Chile where tasks such as environmental permits and grid connection are best understood and implemented during the construction process. Moreover, the international team on site in Chile should be supported by external local legal and tax advisers in order to optimise the processes of delivery and construction. At all times, the team in Chile should be supported with technical expertise from a global EPC division headquarters or centre, which in the case of Hanwha Q CELLS is located in Berlin, Germany. This way, the local and global expertise can best be combined in order to implement lessons learned from the plants the EPC contractor has already built in other parts of the world.

Due to the fact that the solar energy market in Chile is relatively new and still immature, one of the main challenges is the lack of knowhow and experience among locals regarding the construction of utility-scale solar power plants. One way to overcome this problem is to work with international, Spanish-speaking teams. Since the once-booming solar market in Spain has almost come to a full standstill, Spanish expatriates bring a lot of experience and are an attractive option. Nevertheless, intensive technical in-house training for the Chilean colleagues continues to be one of the keys to successfully realising large projects in Chile.

Tax optimisation and supply efficiency

Usually, the main components for solar

power plants are being delivered from overseas, mainly from China and Europe. Therefore an EPC contractor in Chile has to consider the fact that Chile does not have free trade agreements like the United States, Europe or China; therefore the collaboration with competent Chilean tax advisers is important in order to optimise the project in terms of taxes. Moreover, a tax agency needs to look after custom regulations – which are being handled very strictly in Chile – as well as documents for importing components, such certificates of origin, certain forms of packaging lists, invoices and so on. The agency should ideally work together with the subcontractors directly in order to ensure a smooth execution procedure.

Another important point is the in-time delivery of components and materials to the construction site. Renting warehouses close to the construction site for component and module storage is crucial in order to avoid delays in construction and being dependent on subcontractors and transport companies and their delivery schedules.

Health and safety

Complying with local health and safety regulations is important anywhere in the world and especially in Chile. A specially educated and licensed local EHS coordinator has to be employed during the whole construction process in order to observe regulations like wearing long-sleeved clothes and face cover at the construction site at all the times. Also, applying high sun protection factor cream (50) is crucial against the background of the extreme levels of UV radiation especially in the Atacama region. A continuous checkup of the UV levels has to be provided at the building site with displays like the ones in the pictures on the previous page.

The wellbeing of the working crew brings additional tasks – especially if the

construction site is located in the Atacama Desert: showers and social facilities as well as accommodation container units have to be provided directly at the construction site. They have to be equipped with mandatory refrigerators and detached facilities for food intake because of the lack of sleeping facilities for the building and subcontractor crews in the desert region of Atacama.

Crime protection

Another issue in Chile and generally in South America is security at the building sites. Armed robbery is not a rare occurrence in Chile. Therefore, the EPC contractor has to spend more financial and technical attention to security systems (e.g. video surveillance) and security service. A sufficient number of security staff equipped with arms and dogs has to be ensured. Security problems even occur in the remote Atacama region where most of the larger projects are located.

To find adequate and experienced subcontractors in Chile can also be challenging. The locally available manpower in the Atacama region is not very experienced and expects wages comparable to the mining industry, which is the only operating industry in that area – a fact that the EPC contractor and its subs have to pay extra attention to.

Overall the working environment in Chile for delivering solar power plants just in time can be quite challenging, but with sufficient time for the preparation process and a careful selection of subcontractors things are manageable in a professional manner.

TURKEY: PROMISING MARKET WITH A NUMBER OF CHALLENGES

Turkey is another young and promising market when it comes to solar power plants. It provides a lot of opportunities and holds just as many challenges. Regulatory processes, infrastructure problems, land availability, high upfront costs and financing needs, electricity market inefficiencies and the lack of expertise in the sector are pinpointed as the main challenges ahead of the market.

Bureaucracy remains the main barrier for a faster development of Turkey's PV market. Successfully working in Turkey's PV sector demands time and patience, and in particular, a local staff or partners with reliable ties to the responsible authorities and good local and legal knowledge.

Several factors pose continuing hindrances to PV development, including land availability for ground-mounted systems and adequate financing. Solar parks are prohibited from being built on farmland, making it particularly difficult to find acceptable locations for large-scale projects. The country also suffers from grid connection and capacity problems. The lack of installation experience and quality assurance in the country cause further limitations.

For an EPC provider aiming to do business in Turkey it is again essential to have a branch office in Turkey with experienced local staff. Based on their knowledge about the country and regulations and backed by the technical support from the global EPC headquarters, they can best manage the tasks and challenges including the construction process itself.

Feed-in tariff-driven projects

A feed-in tariff scheme is currently the principal type of subsidy that is being utilised for promoting photovoltaic power generation in Turkey. The government provides a US\$0.133 per kWh feed-in tariff for a period of 10 years. The Renewable Energy Resource Support Mechanism is also applied through EMRA (Energy Market Regulatory Agency). Both licensed and unlicensed generators have to apply to the mechanism on an annual basis to benefit from the feed-in tariff.

The Turkish Electricity Transmission Company handles the interconnection issues – it receives bids for licensed generation and distributes the licenses to the winners. Other government bodies also play a part in the licensing process such as the Ministry of Environment and Urbanisation and the provincial agriculture directorates. The permitting procedure is generally regarded as a long and difficult bureaucratic undertaking.

In the United Kingdom weather conditions can also be very challenging, but in a totally different sense than in Chile.

Solar parks of two different categories are entitled to the feed-in tariff in Turkey: licensed solar parks are PV power plants which are designed to produce and feed electrical energy into the grid. After a tender process and awarded licence fee, the investor receives an energy production licence for the next 49 years, of which the first 10 years are remunerated with US\$0.133/kWp and the time after those 10 years is not fixed.

Unlicensed solar parks are only allowed up to 1MW and are mainly designed for self-consumption of residents and industry in order for them to sell the extra energy they produce with the PV system. However, there is no detailed definition or criteria for the term ‘self-consumption’. In the end, most of the developed and executed solar parks are condemned to pump the grid with 100% of the energy they produce. Due to the high licence fees for the licensed projects and no limitation to self-consumption, the market is very much focused on unlicensed projects at the moment.

The Tedas (Turkish Electricity Distribution Company) approvals tend to take a long time and can even be awaited during the construction process in order to connect the plant to the grid. Quite often an EPC contractor has to adapt the project schedules due to local specifics in bureaucracy.

Staff training, crime and earthquake protection

Turkey is an emerging market with similar challenges regarding manpower to Chile’s. Technical and construction management workshops provided by the experienced experts in the Global EPC Headquarters are essential in order to transfer know how and actively support the local colleagues in a relatively young market.

The technical, logistical and construc-

tion management support from global EPC headquarter is also needed for example to manage the simultaneous construction and operating of more than one PV plant. In the case of Hanwha Q CELLS, the historical ties between Turkey and Germany helped a lot.

The infrastructure around solar sites, which are often located in remote areas, can be quite bad at times. It is not uncommon that an EPC provider has to build access roads, for example to initially be able to even reach the building site with heavy goods vehicles (see pictures).

Cooperation with warehouses for component storage to avoid any delay for delivery with subcontractors is an essential factor for a successful construction progress in time – basically in any country and Turkey is no exception. Import restrictions for components and custom clearance of imported goods with specific procedures are handled through local custom agents like described above for Chile.

Specific attention has to be given to potential risks for investors coming from the natural conditions in Turkey, such as natural disasters, extreme weather events and especially earthquakes. The EPC contractor should actively address these issues before the building process has even started. Additionally the danger of crimes and theft is another matter to be addressed, usually with fencing around the building site right from the start of construction and having security at the site in a 24-hour mode.

Turkey certainly is one of the hot and promising markets for PV power generation. However, a number of unanswered questions and issues still have to be solved. Currently, changes in the bureaucratic processes and in the regulatory environment, alternative financing mechanisms, introduction of additional subsidy schemes, improvements in the electricity infrastructure and several other measures are being discussed in Turkey. These could certainly help in forming a sustainable and steadily growing photovoltaic market in the country for the near future.

UNITED KINGDOM: ESTABLISHED MARKET WITH STRICT DEADLINES

A completely different picture is depicted in the United Kingdom. Here we’re talking about a well-established PV market where the renewable energy policy has been based on so-called Renewables Obligation Certificates (ROC). One characteristic





of the ROC system is that it has obligation periods of usually one year after which the conditions change for the following period. The deadlines at the end of March are very strict and PV power plants have to be constructed and grid connected on time in order to be operated under a given ROC scheme. Therefore, just before the phase out of a particular ROC level, a kind of construction finishing rush can be observed all over the country, regardless of the size of the PV plants.

Famous English rain

The construction difficulties as you can imagine are of a different nature in the UK; but again the weather conditions play a major role for finishing the construction process before a certain deadline. For example, during the winter months of 2013/2014 Hanwha Q CELLS' technical and construction management team experienced weeks of heavy rain in what was the wettest winter season for 150 years. Severe hindrances because of the muddy soil at the building site were the consequence. However, the ROC system does not account for the English winter, so construction had to take place during the winter months and be finished on time.

The pressure of landing at an exact date of grid connection with the distribution network operators (DNO) to secure the ROCs and the requirement that the DNO representatives have to be on site on the day of connection did not make things easier. After all, fixing a date for connecting to the grid with the DNO can be quite challenging.

Despite the enormous rush to finish off building sites on time, it is extremely important not to compromise on accuracy and exactness. Technical standards have to be fulfilled at all times. Therefore, the EPC contractor may want to pay some extra attention to controlling subcontractors in

these phases of extreme time pressure. In the case of Hanwha Q CELLS, our construction management and engineering teams have worked onsite in the UK themselves, which was possible because of the proximity of the building sites to the global EPC headquarter in Berlin.

Active dialogue

Other significant and specific challenges in the UK implicate narrow access roads at some of the PV plant sites. The often fragmented building spots in the English countryside are mostly close to small villages with their protected hedgerows. Combined with the high consciousness of the inhabitants for tradition, this might create challenges around land use conflicts. In our experience, many people actually are in favour of renewable energy but foster the attitude "not in my backyard". Therefore, the teams on the sites might well get into situations where they have to act as mediators with direct neighbours. In order to address and possibly avoid these challenges in the first place, it is recommendable to proactively enter into a dialogue with the neighboring communities and the local authorities in order to foster an attitude of conversation and collaboration on both ends.

For example, traffic management for deliveries of building material is a very important management task because the infrastructure in the UK countryside is not very modern in general. It also might be a good idea to add local value to the community by employing local companies. However, it is all but guaranteed that local subcontractors have sufficient experience in constructing large-scale solar power plants. Therefore the EPC contractor has to closely manage and continuously take care of local subs against the background of quality assurance counter-partying the financing investors and banks.

While some weeks of beautiful English weather easily can turn the building site into a soft mud hole, the ROC deadlines in the country tend to stand hard as a rock.

Additional challenges can appear when building PV plants in sometimes quite heavily populated areas in the south of England. The complexity of the building sites in these areas as well as possible land use conflicts with agricultural production sites have to be taken into account and managed by the EPC contractor.

Satellite system to combine global experience and local expertise

The above examples from Chile, Turkey and the UK show clearly that while some of the challenges concerning the building of large-scale power plants are the same anywhere in the world, others differ greatly, depending on the region and country the project is located in. Numerous factors have to be taken into account upfront in order for the projects to be successful in the end.

So if an EPC provider aims to successfully operate globally, it is crucial, to install a system that enables it always to combine its full global expertise and experience in the building of solar power plants with profound local knowledge regarding the region a specific project is being built in. In the case of Hanwha Q CELLS this is being achieved by having installed a global EPC headquarters in Berlin and local EPC branches in all relevant international markets. While the EPC headquarters is involved in every project of the company around the world, the operational management of the projects is largely being performed by the local branches with local staff. This way, global expertise and local know-how are added up to form a strong combination. ■

Authors

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Maren Orgus joined Hanwha Q CELLS (back then Q-Cells SE) at the beginning of 2010 from Germany Trade & Invest GmbH. At Hanwha Q CELLS she functioned as senior project coordinator, systems sales and operation utility, assigned with the coordination of project development commercial management and sales support of a 91MWp utility solar park in Germany. In 2012 she became the senior specialist, project sales and development, entrusted with the assessment and development of projects and supporting the sales and EPC business in key markets.

