"A spirit of cooperation": tackling challenges in the solar EPC sector

EPCs | Booming solar deployment in solar markets worldwide has led to fears that a bottleneck in the availability of qualified contractors could squeeze project completion rates. As JP Casey discovers, the reality is more complicated than that

In many jurisdictions, the future is bright for solar power. Analyst McKinsey and Company expects solar PV to be the driving force behind the expansion of US renewable plus storage capacity to 1.2TW over the next decade, a rate of growth that is 2.7 times faster than what was seen prior to last year's passing of the Inflation Reduction Act (IRA).

There is a similar story in Europe, with trade body SolarPower Europe expecting European solar capacity to exceed 50GW this year, and reach 85GW by 2026, while China is on track to install a record-shattering 230GW of new renewable capacity this year alone.

While the sudden expansion of new renewable capacity, and new solar projects in particular, is encouraging for those involved in the sector, the rapid change in the global solar industry is putting unique strains on the supply chain. This has been most keenly felt in the area of grid connection, with the Lawrence Berkeley National Laboratory noting in April 2022 that almost 1TW of renewables were waiting for connection to the US grid alone, but the supply chain is facing other challenges.

One such issue is that of capacity among engineering, procurement and construction (EPC) contractors, with the very real prospect of the construction industry simply not having the requisite number of interested and capable companies to install the vast quantities of solar capacity that the renewables sector is planning to build. McKinsey and Company reports that, in the US alone, EPC capacity will have to almost triple to meet the demand for new renewable projects just to 2027, to say nothing of the demand on the EPC sector in other jurisdictions, and farther into the future.

With projects growing larger than ever before, and more money being committed to the global solar sector than at any other time in history, there is considerable pressure on EPC contractors, developers, investors and permitting organisations to work effectively together to ensure that the world can install the solar capacity necessary to meet its climate targets.

Credit: Brookhaven National Laboratory via Flickr

Pressures on EPC capacity from booming demand has prompted concerns over a looming bottleneck

Growth leading to uncertainty

"I think there is a bottleneck at the moment, but I think it is also because the portfolios of larger projects are getting more and more," says Stefan Müller, chief operating officer of Enerparc, a German contractor that has completed extensive EPC work in the solar sector. The growth of both total installed capacity and size of individual projects is evident in Germany, with the German solar association BSW reporting that the sector added 7.2GW of new capacity in 2022, a 28% increase on the previous year.

Critically, the number of large-scale ground-mounted installations built in 2022, funded by the Erneuerbare-Energien-Gesetz, the German renewables energy act that came into force in 2021, increased by 70% over 2021 figures, suggesting that large-scale projects are increasingly popular in the German solar industry in particular.

"You see new developers coming into the markets, for example, big utilities, and I think they have a bit of their own process," continues Müller, suggesting that a wider range of investors and players in the solar industry could disrupt the established operating procedures for EPC companies.

"Probably they are, I would say, a bit behind how the market really works and really ticks and very often they make a tender, for example, and a lot of EPCs are not participating in tenders anymore."

The more varied nature of the German solar industry, with an increasing number of EPC players conducting business in a greater variety of ways, is part of a wider trend in the European solar sector, where the complexities of governance in individual countries, and the sophistication of each solar project, is slowing down the processes of permitting and construction.

"There is availability for the right

projects," says Isabel Rodriguez, investment director at clean energy fund manager Glennmont Partners, suggesting that EPC companies are willing to engage in the sector, but that processes such as permitting are creating delays in project commissioning.

"It's not that there is less [capacity], they are there, and they'll continue to be available, but there seems to be a greater number of megawatts to be built, because for reasons that probably were not the right ones, [EPC contractors] were obtaining permits that are going to be difficult to build given certain conditions surrounding the permits or the location," she says.

These delays in the processes necessary to develop a project from planning to permitting to commissioning is evident around the world. The US Energy Information Administration reported that, in 2022, 1.9GW of solar capacity came online later than expected in the US, and another 1.7GW of capacity additions were pushed back to 2023, as the country's appetite for new solar capacity was not matched by the capacity of the EPC sector to deliver these projects.

There is also considerable regional variation, in both EPC capacity and interest in building new solar projects.

"If you look at what's going on in Europe, Spain is going gangbusters and sucking in a lot of EPC capacity, particularly from the French companies," says Philip Wolfe, former director-general of the Renewable Energy Association and the man behind utility-scale solar deployment and EPC tracker site Wiki-Solar.

"The main topic is the grid connection"

However, a lack of EPC availability, and regional variation in the number of companies involved in the sector, is perhaps not the most pressing concern for the European solar sector. When asked about the greatest challenges for the industry, Wolfe suggests that EPC capacity is one of several questions the sector still has to answer.

"I don't think it's a primary constraint at the moment," says Wolfe. "Obviously, the market continues to expand very rapidly and that places demands on all sorts of things to increase, [such as] volume and capacity. But I think typically what we've seen when there have been these growth spurts, it's been things like supply of solar panels [and] supply of inverters, that has tended to be the real constraint.

"I can't say I've noticed in the global utility-scale industry that the availability of EPCs has been a primary bottleneck, let's put it that way."

Indeed, many of the challenges faced by the global solar sector pertain to the international supply chain, rather than EPC capacity. SolarPower Europe has called for European governments to do more to protect European solar manufacturing, following layoffs at Norwegian solar ingot manufacturer NorSun due to cheap Chinese-made products undercutting those made in Europe, and uncertainties regarding the financial viability of manufacturing, and how these materials are traded internationally, poses an existential question to the sector.

Similarly, the passing of the IRA dramatically incentivised US-made solar components but raised concerns that it would simultaneously dissuade imports of foreign-made modules. Considering that such products, notably those made in China, are often the most cost-effective materials for contractors to use, this push to emphasise domestic-made equipment could make the entire solar industry less financially viable.

Müller, meanwhile, notes that grid connectivity, a longstanding issue in a number of energy issues, continues to be a challenge for the solar sector, particularly as a lack of available grid capacity could dissuade developers from applying for solar permits in the first place, and EPC companies from making themselves available to commission those projects.

"The main topic is the grid connection – transformers and whatever handover stations – and they have a delivery time, easily, of up to two years," says Müller. "This is the biggest issue. If you do not get a guaranteed slot or semi-guaranteed slot, then you cannot develop anything that you want."

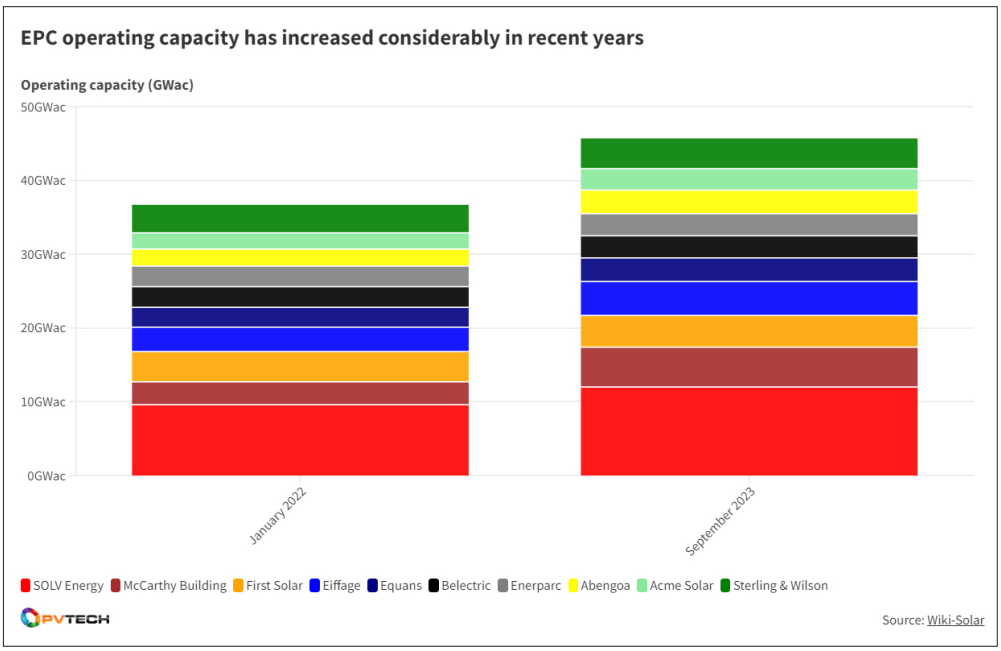
New players, new relationships

The presence of a greater range of companies in the investment and commissioning of new solar project is not an inherent problem, however. The graph in Figure 1 shows the ten EPC companies with the largest operating capacity as of September 2023, according to Wiki-Solar, sorted geographically, with US companies in red, French firms in blue, German companies in black, the sole Spanish company Abengoa in yellow and Indian firms in green.

The graph demonstrates that, over the last two years, the distribution of EPC capacity around the world has remained mostly stable, with US companies dominating global EPC capacity. However, the work of Eiffages, which added 1.3GWac of new capacity, the most of any company in the top ten not based in the US, suggests that the EPC sector exists in a state of flux, with new players expanding their influence in the sector.

"I think what is already happening, as the market accelerates in certain parts of the world, is that rather than relying on the expansion of existing participants, if you like, it draws in specialist participants from other sectors," says Wolfe, suggesting that this breadth of expertise could be a benefit for both individual EPC contractors, and the quality of EPC work done in the solar sector in general.

Figure 1 The operating capacity of EPC firms has increased. Source: Wiki-Solar



Credit: PV Tech

"What we've seen in Europe in the EPC sector, for example, [are] substantial engineering companies like Eiffages in France and Bouygues in France coming into the market as EPC contractors because they have the EPC skillset, albeit not historically from solar, and they're bringing that skillset in into the industry," adds Wolfe.

"On the EPC contractor side, I do see the benefit of a framework agreement, where there is an alignment of interest and there is skin in the game for both of them, so I do see that as a possibility," adds Rodriguez, suggesting that the inherently collaborative elements of EPC work, in which contractors must work alongside permitting authorities and solar developers, could benefit from a greater range of companies, from multiple sectors and offering multiple skillsets, working together.

However, this state of affairs could make EPC work more challenging, at least for the EPC companies themselves. Müller suggests that there is so much interest in developing new solar capacity, and so much money going towards these projects, that developers and investors feel empowered to set the terms of their relationships with EPC contractors, potentially presenting challenging working conditions for EPC companies, or encouraging competition between EPC players to win lucrative large-scale contracts.

"The reality now is very clear," says Müller: "Big investment funds, and let's call it Blackrock KKR, Vattenfall, IKEA [or] big utilities, who have 500MW to 1-2GW portfolios around the globe, they generally are keen working with one or two companies only.

"For example, somebody like Blackrock says, 'We only work with companies who can provide 10% bank guarantees and have a strong balance sheet', and then automatically 15 of the 20 EPC companies in the market are out of this range," adds Müller. "So financial expectations, technical expectations and HSE topics [are] on a very high level on these companies, and I think a lot of I would say medium-sized companies probably cannot manage this."

Delivering EPC work

Ultimately, while suggesting a lack of EPC availability could stymie the world's solar plans is perhaps strong, the fact remains that many of the processes that go into EPC work and solar deployment could be improved. Rodriguez is confident that improving the efficiency and effectiveness of permitting will go a long way to accelerating EPC work across the sector.

Credit: Asian Development Bank via Flickr

"The only way to accelerate [permitting] is to be quite efficient in preparing all the documentation that needs to be prepared for starting construction, and also for reaching the operational phase," says Rodriguez. "It's quite important that the different sets of paperwork and the tests are progressed in the set time that they need to be progressed and they have the engagement at the local level with the different technicians."

Ensuring good relations between the various players in the installation of solar projects is also essential. With a number of groups working on a number of objectives within the process, from permitting and planning to construction and maintenance, a situation where companies are looking to protect their own interests, and deflect responsibility for perceived errors and delays, is harmful for the entire sector.

"The level of risk is transferred from the construction company to the sponsor from that point in time, once all the permits have been achieved, and then it goes to the penalties and the delays that you put onto the contractors and then they will try to say that it's not their fault, but the fault of the authorities," says Rodriguez.

"There's always a little bit of a game, but that's all normal," Rodriguez concludes. "But if it becomes too cumbersome, and there are some points where actually [contractors] really tried and they did everything that they had to do by the book, and yet still the permits are not there, it can create an area of tension between the two counterparts, and that's not a good time and it's not good for the industry."

There are a number of joint venture projects in the solar sector that have failed to reach commissioning. In March, Singapore's Sembcorp, utility company PT PN Batam and renewable developer PT Trisurya Mitra Bersama abandoned plans to commission a 1GW solar-plus-storage project in Indonesia after completing construction work.

New players are coming into the solar EPC business, potentially bringing new skills and expertise

Another example is the high-profile plight of Sun Cable, the vast project that aimed to build a subsea power cable connecting solar farms in Australia to Singapore. The project's backers, billionaires Mike Cannon-Brookes and Andrew Forest are reported to have fallen out over the future of the plan, culminating in the latter's departure from the project, and questions as to what will come of the ambitious international solar project.

Clearly, this is an extreme example, but the presence of more decision-makers, and critically more decision-makers with a great interest in solar power but little experience in the practicalities of commissioning projects, in the solar industry could lead to uncertainty as to how projects are built and commissioned.

As a result, what Rodriguez calls "a spirit of cooperation" between investors and EPC companies from a range of backgrounds could be necessary, if the world is to realise its ambitious solar capacity goals. ■

PV Tech Power publisher Solar Media is hosting a panel on EPC availability at the 11th annual Solar Finance & Investment Europe held in London on 31 January-1 February, which will be moderated by Isabel Rodriguez. Further details are available at https://financeeurope.solarenergyevents.com/