

Bridging the solar skills gap

Workforce | As demand for solar grows, so too must its international workforce. But there are concerns that a shortage of skilled workers could stymie deployment just as it's needed to accelerate. Jules Scully assesses where the solar skills gap is looming and industry efforts to ease it.



Credit: Solar Energy International

When Rick Naranjo in 2015 realised his executive role in the mining sector was at risk, he decided to take action and follow his interest in renewables by contacting a solar firm he had previously been a customer of. Fortuitously, that company – Pennsylvania-based commercial and residential PV installer Paradise Energy Solutions – was at the time looking for someone with his skillset to help run the business.

Seven years later, Naranjo is now the firm's vice president of operations, drawing on his knowledge of areas such as automation from previous roles. "I've always felt that the skills that you learn in one vocation can oftentimes be applied to a new vocation," he says.

Naranjo's move from mining to solar is a story being played out globally, with soaring PV deployment leading to a war over talent as solar firms seek candidates with the right skillset as the energy transition accelerates.

Global solar PV employment increased to 4 million workers in 2020, according to the International Renewable Energy Agency (IRENA), with the segment

employing a third of the total renewables workforce. Under IRENA's pathway for the world to achieve the Paris Agreement goals and limit global temperature rise to 1.5°C, solar employment could reach 20 million by 2050.

Despite positive recent developments, skills gaps and shortages are increasing and will likely be widespread globally unless proactive measures are taken, IRENA said.

In 2019, 83% of solar employers in the US reported it was either "very difficult" or "somewhat difficult" to find qualified applicants, with installation and project development firms having the most challenges hiring, according to the 2020 National Solar Jobs Census report. A lack of experience, training or technical skills were the most significant reasons for their challenges when hiring, followed by a competitive job market and small applicant pool.

Solar developers spoken to by PV Tech Power say that recruiting, training and retaining workers is among the key priorities that the sector needs to address. There's currently a lack of qualified candidates compared to demand, says Nikos

Papapetrou, general manager of Greek industrial group Mytilineos's renewables and storage development business, adding that issue is compounded by the so-called Great Resignation, during which workers have quit their jobs at historic rates.

Papapetrou says that with the industry growing, more specialisation is needed among workers, while PV plants continuously increasing in size means that developers require more people with large-scale project management skills.

This is a trend also noted by renewables recruitment consultancy Taylor Hopkinson, whose clients are now requiring talent with large utility-scale solar experience, including special planning experience, a track record in managing multi-landowner negotiations or a history in constructing these projects.

Jamie Taylor, the company's managing director of onshore renewables, says there is an influx of demand for talent in the UK solar developer space, with companies expanding or setting up teams and all looking for the same skillset – someone with a track record in originating and developing utility-scale solar PV farms. "This poses its own challenges as demand outstrips supply and the talent pool is stretched, with salaries for this skillset becoming inflated and companies vying for the same candidates," he says.

Among the challenges that solar companies face when sourcing suitable candidates, Taylor says, include budget expectations not being aligned with market rates and inflexibility on candidate location and working patterns. He says companies that are unwilling to offer flexible working – a perk that is often top of candidates' wish lists – may need to pay a premium to secure the right talent.

While increased homeworking due to COVID-19 has meant some employers are now more receptive to office-based staff working remotely, this is obviously not possible for many manufacturing, development and construction roles.

One company that has benefited

Trainees at Solar Energy International's lab facility in Colorado.

from its location in Nashville, Tennessee, is independent power producer Silicon Ranch. “Nashville’s a good draw for talent. We’ve recruited and brought people from across the country and around the world,” says the company’s chief commercial officer, Matt Beasley.

Silicon Ranch earlier this year raised US\$775 million in new equity capital to support the construction of its solar pipeline and potentially enter new markets. Beasley says the equity raise shows that capital is not the constraint for the solar industry, it’s instead “finding the people, making sure that we are continuing to expand the workforce who is trained and ready to participate in the energy transition”.

Projections by job type

In terms of employment by segment of the US solar sector, installation and construction-related jobs were the vast majority in 2020, representing more than two-thirds (67%) of the total, the country’s National Solar Jobs Census revealed.

Manufacturing jobs, meanwhile, were 14% of all solar industry employment, while sales and distribution and O&M represented 11% and 4%, respectively. The ‘other’ category, comprised of workers in fields such as finance, legal, research, advocacy and communications, made up 4%.

The jobs census found that without significant policy shifts, the US solar industry is on track to employ 400,000 workers in 2030, representing a 73% increase on 2020’s figures. However, achieving President Joe Biden’s goals of decarbonising the grid and expanding domestic manufacturing will require more than 900,000 solar workers across the US supply chain by 2035.

The number of installation and development jobs might be expected to rise roughly in proportion to increasing annual installations, according to the US Department of Energy (DOE), which estimates

that the clean energy transition could drive job growth in more than 100 occupations to support the emerging solar industry.

While the DOE predicts gains in module efficiency and efforts to streamline installations would increase labour productivity and thus result in smaller job gains, such efficiency advancements may be offset by combining solar with storage and blurring the line between solar, roofing and new home construction that could all affect solar labour intensity.

Increases in US solar O&M jobs will likely be smaller, the DOE said, owing to developments that could improve labour productivity such as longer inverter lifespans, improved monitoring systems and anti-soiling coatings.

In the European Union (EU), the vast majority (80%) of solar jobs in 2020 were associated with deployment, followed by O&M (10%), manufacturing (6%) and decommissioning and recycling (4%), figures from trade body SolarPower Europe (SPE) reveal.

Driven by competitive costs and facilitated by the easing of administrative and permitting procedures, the utility-scale segment’s contribution to total EU solar jobs is set to surge from 19% in 2020 to 38% by 2025, according to SPE, with several countries – France, Greece and Italy – getting close to a 50-50 split between rooftop and utility-scale positions.

The growing fleet of PV projects across the EU will see the bloc’s solar O&M workforce grow 82% between 2020 and 2025, says Sien Van de Wiele, project and communications officer at SPE. “These workers will need to be regularly retrained to be able to install rapidly developing technologies like batteries or new digital technologies such as energy management systems.”

By the end of the decade, new EU plans to raise the share of renewable energy to 40% of final consumption by 2030 will see solar jobs across the bloc more than double compared to current levels,

reaching 742,000 full-time equivalent jobs. SPE said this will lead to the share of deployment roles falling to 61%, while manufacturing (18%), O&M (14%) and decommissioning and recycling (8%) will all raise their shares.

Despite utility-scale solar jobs increasing their portion of the EU total, projections from EuropeOn, the European association of electrical contractors, suggest that reaching the EU’s renewables target for 2030 means hiring an extra 225,000 professionals this decade to install and maintain rooftop solar systems.

There are two ways to look at it, says Julie Beaufls, EuropeOn secretary-general: “Either the green transition can trigger the creation of 225,000 jobs in this segment, or the solar market will be slowed down because of a huge gap between the available and needed workforce.”

Such an expansion could see companies in the sector double down on workplace learning to support trainees. IRENA analysis on 35 key occupations in the global solar PV sector shows that only 16 of these jobs require a university degree, with the remainder of skills built through either on-the-job training, vocational training or apprenticeships.

Workforce training

For solar companies looking to achieve their workforce development targets, the US National Solar Jobs Census suggests options including tapping into local workforce development resources – such as training providers and community colleges – and expanding work-based training programmes that allow entry-level employees to learn on the job.

One organisation that has benefited from an uptick in demand for its programmes is Solar Energy International (SEI), which provides a raft of PV workshops and online courses. “We’ve seen hockey stick growth in the number of students that are enrolling in our courses worldwide, especially last year,” says Chris Turek, SEI director of marketing and communications.

Carrying out training from the entry level, such as onboarding new installers, to courses for advanced O&M technicians, SEI tends to see a 50-50 split in its programmes among students that are new to the sector and those that already have jobs and want to upskill.

Turek says there has also been a rise in the number of people with transferable skills enrolling on courses that are aiming to use their existing knowledge from

2020 US solar employment by labour category	
Installation and developers	154,610
Manufacturing	31,050
Sales and distribution	25,663
Operations and maintenance	10,077
Other	10,073
TOTAL	231,474

2020 US solar installation and developers employment by market segment	
Residential	84,946
Non-residential	27,971
Community solar	11,677
Utility-scale	30,017
TOTAL	154,610

Source: National Solar Jobs Census 2020



Credit: Nextracker.

Workers at Nextracker's PowerworX training programme.

previous jobs in areas such as the electrical trades or construction industry.

With solar companies looking to continuously update their teams' knowledge of new technology and components, SEI is ramping up its partnerships with PV manufacturers this year, allowing them to offer their training through its online platform.

To keep up with demand and the growth of the solar industry, Turek says "there's going to have to be a full commitment from the training providers, the students and the employers to create that 360-degree continuous training cycle".

Among the solar manufacturers that have partnered with SEI is tracker manufacturer Nextracker, which last year announced an initiative to support more women in joining the solar workforce. That programme is in addition to the company's PowerworX training programme, providing participants with instruction on the design, installation, commissioning, software and O&M of its PV systems.

Nextracker will ask engineering, procurement and construction (EPCs) contractors that are installing its equipment if they want their teams to take a course on-site or at one of the company's training facilities in the US, Brazil, Spain and Australia. "We're firm believers in supporting any programme that has skills transfer, whether you're a coal worker and you're coming into the solar field or an oil and gas veteran and you want to join the solar workforce," says Kristan Kirsh, Nextracker vice president of global marketing.

Graduates of the PowerworX programme receive credits from the North American Board of Certified Energy Practitioners, with the certification organisation reviewing the curriculum each year.

According to the 2019 US Solar Jobs Census, 14.5% of solar employers reported that insufficient qualifications (certification or education) was the most significant reason for their difficulty hiring. The Interstate Renewable Energy Council (IREC), which publishes the jobs census and accredits clean energy educa-

"There is a need to make this sector more attractive, by showing its many perks"

tion programmes, is working to ensure that training providers and employers themselves can more effectively train workers.

The renewables industry is still catching up with other sectors in terms of employers requiring certification when hiring, says Laure-Jeanne Davignon, vice president for workforce programmes at IREC. Employers "need to know whether someone was adequately trained, by knowing what training programme they attended or by their performance on a certification exam", she says.

As part of IREC's efforts to grow an inclusive renewables workforce, it recently launched a cross-sector initiative called the

National Clean Energy Workforce Alliance. Aiming to promote more effective recruitment, training, credentialing and employer placements, the alliance brings together four main stakeholders: employers, training providers, community-based organisations and policymakers.

Davignon says it is essential that these four cohorts are actively communicating and have effective processes in place to move workers and learners through the training and employment pipeline.

But one of the biggest issues the sector faces, she says, goes beyond those four, and centres around connecting with the public. "Not a lot of people know about these jobs," she says. "We think that youth, especially, will care a lot about these occupations, but we need to do a better job of getting the word out."

Marketing and policy

To showcase the diverse range of careers in the solar sector and connect potential workers with training programmes, trade body SPE recently partnered with Google to launch the #SolarWorks campaign.

A video series tells the story of PV workers from across Europe, as they share their experiences and advice on kickstarting a solar career, while an online platform provides details of solar training programmes in markets such as France, Germany, the Netherlands, Poland and Spain.

"We need to communicate on the needs of the solar industry and ensure existing training is as accessible as possible," says SPE's Sien Van de Wiele.

Alongside the trade body and Google, partners on the #SolarWorks campaign include renewables developer BayWa r.e., independent power producer Sonnedix, module manufacturer Meyer Burger and EuropeOn, among others.

EuropeOn's Julie Beaufls says that while the solar industry has launched many marketing campaigns in recent years, public authorities and the education sector should look to encourage a change of mindset among young people so that they enter technical studies.

"There is a need to make this sector more attractive, by showing its many perks," she says, adding: "Governments must promote technical education and make it a positive alternative to university."

And with a higher volume of students, Beaufls believes it will be necessary to progressively update existing training

programmes and set up new facilities across Europe.

IRENA calls for financial support to be provided to technical and vocational education and training (TVET) institutions to ensure that programmes can meet the workforce needs of a continuously evolving renewable energy sector.

Many countries globally also need to build local professional capacity to develop, manage and execute renewable energy projects, IRENA said in a report last year, with the building of such capacity requiring close partnerships between universities, governments and the private sector to prepare students in careers such as energy engineering, management and policy.

"Training and workforce development programmes need to expand and be a key part of the solar industry's future," says Jen Bristol, senior director of communications at trade body the Solar Energy Industries Association (SEIA).

Given that the US solar sector is already affected by widespread shortages of skilled trades workers and that it typically takes an electrical apprentice four to five years to become a licensed electrician, Bristol believes this shortage could continue unless there is adequate investment in the workforce today.

She says the US needs more technical training programmes, such as apprenticeships, community college programmes and community-based workforce training initiatives, adding: "We also need to introduce solar curriculum at the elementary, middle school, and high school levels in diverse communities across the country."

While some employers in the solar sector are already struggling with recruiting workers with the right skills ahead of a projected surge in PV deployment globally, IRENA research suggests that almost two-thirds (64%) of the PV workforce needs minimal formal training.

Individuals with degrees in fields such as science, technology, engineering and mathematics (STEM) make up around 31% of PV workers, according to IRENA, while highly qualified, non-STEM professionals – such as lawyers, logistics experts, marketing professionals or experts in regulation and standardisation – account for roughly 4%. Administrative personnel make up the final 1%.

"Solar building and installation work is not unskilled, but it is not rocket science either and people can train to do the work if the economics are in place," says Jenny

War over talent sees solar graduates in high demand

With the energy transition picking up pace and record solar capacity being installed globally, universities are seeing heightened demand for their graduates among employers looking to secure the brightest talent.

In Australia, The University of New South Wales (UNSW) has revised its courses to have a greater emphasis on large-scale solar and wind, energy storage and grid integration, while also offering courses on rooftop PV and demand-side energy efficiency as they remain strong areas of employment, according to Professor Alistair Sproul, head of the university's School of Photovoltaic & Renewable Energy Engineering.

"The boom of large-scale solar and wind energy systems, as well as continued strength of rooftop systems and energy efficiency in Australia, has meant strong demand for our graduates," he says.

With positive messages regarding the renewable energy sector appearing in the media from companies repositioning themselves and from governments globally committing to tackle climate change, Sproul says UNSW is seeing a lot of interest in its courses from existing engineers in other sectors wanting to retrain so they can be involved in the energy transition.

In the UK, meanwhile, more young people are taking higher education courses in science, technology, engineering and maths (STEM) subjects at university than ever before, statistics from the country's Universities and Colleges Admissions Service (UCAS) reveal.

Offering a master's degree in solar cell technology, which is designed to train physical science and engineering graduates in the development of new PV devices, The University of Sheffield has seen graduates from the programme go on to get secure jobs with Chinese solar companies, while others have gone into areas such as supply chain consultancy and energy forecasting.

"We do incorporate case studies and company use cases within the degree," says Alastair Buckley, a professor of organic electronics at the university. Currently, he says, there is an especially high demand for graduates with data science skills, who are able to quickly find well-paid positions.

For the solar sector to overcome a potential skills gap, Sproul says the industry needs to get the message out to young people at school that "there are huge opportunities right here, right now in the renewable energy engineering sector and this will continue for decades to come".



Hands-on classes at The University of New South Wales.

Chase, head of solar analysis at research organisation BloombergNEF. She says the best thing that governments can do is offer sustained demand for solar, not a rapid boom and bust, so that firms invest in training and workers gain experience in the field.

Having taken SEI courses to further his knowledge of the solar sector, Rick Naranjo of Paradise Energy is now also an SEI contract instructor. As part of the company's strategy of onboarding new workers, they are required to carry out on-the-job training while also studying for a six-week SEI course on solar electric

design and installation, allowing them to deploy what have learned in the field.

According to Naranjo, finding employees is "extremely difficult" for Paradise Energy Solutions, meaning the company looks for people that have the right aptitude that can be trained.

For those that do take the leap into the sector as he did, Naranjo says it gives workers a front-row seat to a fundamental shift in how society uses electricity. "The next ten years are going to be very exciting... So if you like change and you want to be part of change, then solar is good for you."