

2020 in retrospect: A year in solar

2020 review | While COVID-19 may have dominated headlines internationally this year, 2020 has been a year of considerable progress for the global solar supply chain. Here, the PV Tech editorial team re-cap some of the biggest and most impactful stories of the year.



Solar has continued to march onwards in 2020, despite the year's challenges

Credit: Array Technologies

Q1: Manufacturing ramp-ups, O&G firms eye solar capacity, pandemic impacts

Setting the tone for a year that has seen large-scale manufacturing capacity expansions and new size wafers and modules, **LONGi** announced plans to construct a new 20GW wafer plant in Yunnan province, China, with an ambition to grow the facility to 40GW in the future. The company then went on to secure two separate three-year wafer supply deals that together are purported to be worth more than US\$3.3 billion.

But LONGi was not finished there. After expanding its business overseas through the acquisition of Vietnamese PV cell and module manufacturer **Vina Solar**, the firm then started production at a new 5GW module assembly plant to produce its Hi-MO series modules using large

area 166mm x 166mm (M6) wafers. The company said at the time that output at the facility would be “at the forefront of the industry”.

Q1 also saw a significant module manufacturing development from **Trina Solar**, which launched its Duomax V bifacial double-glass modules based on 210mm silicon wafers and mono-PERC cells, a landmark that the company said would see it embrace a “new era” of solar. Compared to more conventional 410W bifacial double-glass modules, the Duomax V can reduce balance-of-system costs by between 6 – 8% and the LCOE of projects by 3 – 4%, according to Trina.

In terms of polysilicon manufacturing, **Daqo New Energy** was said to have taken the average total production cost of primarily monocrystalline-grade polysilicon to a record low, while **Tongwei**

announced it would significantly increase high-purity polysilicon production and high-efficiency solar cell production over the next five years.

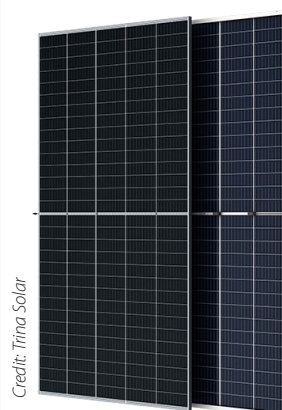
China's dominance in solar manufacturing had a knock-on effect elsewhere, however, as **Wacker's** polysilicon division revealed it had slumped to a loss in 2019, with CEO Rudolf Staudigl noting that underlying conditions for solar-grade polysilicon “remained unsatisfactory”, with prices falling “amid high overcapacity built up by state-subsidised competitors in China”. Meanwhile, South Korea's **Hanwha Solutions** said it would close its solar-grade polysilicon production business by the end of 2020. Polysilicon pricing would remain turbulent throughout the year.

The effects of COVID-19 on the manufacturing sector were noted early in the quarter, with component shortages and factory closures slowing production. Official data from China said solar exports from the country in January were around 35% lower than in the prior year period.

A recurring theme for the year has been oil and gas (O&G) majors announcing aggressive green energy capacity expansion targets alongside plans to reach net zero emissions. The “deep pockets” of the O&G industry could be crucial in accelerating the deployment of renewables, the **International Energy Agency** (IEA) said a report. After increasing its stake in PV project developer **Scatec Solar** in late 2019, Norway's **Equinor** pledged to achieve net zero greenhouse gas emissions at operations by mid-century, by which time its O&G production business is expected to have halved in size.

Taking a similar strategy was

Trina Solar's Duomax V bifacial double-glass modules.



Credit: Trina Solar

BP, which, having upped its stake in global solar developer **Lightsource BP** to 50% last year, announced it would aim to attain net zero status “by 2050 or earlier”. The company’s CEO Bernard Looney said at the time that the world needed a “rapid transition to net zero”, adding that energy that is just reliable and affordable is “no longer enough”. “It must also be cleaner. To deliver that, trillions of dollars will need to be invested in replumbing and rewiring the world’s energy system. It will require nothing short of reimagining energy as we know it.”

Before announcing its own net zero target later in the year, France’s **Total** was especially acquisitive in the solar sector in Q1, taking a 50% stake in Indian conglomerate **Adani Group’s** solar business for approximately US\$510 million and purchasing a 1.2GW portfolio of projects from Spanish firm **Solarbay**. **Eni’s** new emissions reductions plan, meanwhile, foresees the Italian company deploying 55GW of renewables by 2050, as it focuses on green energy developments mainly in OECD countries.

As well as the manufacturing-related disruptions, COVID-19 and the resulting lockdown measures began to impact PV project development, as **Bloomberg-NEF** reduced its global solar demand forecast for 2020. The research organisation highlighted the possibility that the pandemic may have such an impact on demand that 2020 could mark the first time in several decades when annual demand falls below that of the previous year.

Meanwhile, the **IEA** called on countries to keep the clean energy transition “front of mind” as they prepared coronavirus stimulus packages.

The impacts from the pandemic must

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not be allowed to compromise the “inescapable challenge” of climate change and global emissions, **IEA** executive director Fatih Birol said. “The coronavirus crisis is already doing significant damage around the world. Rather than compounding the tragedy by allowing it to hinder clean energy transitions, we need to seize the opportunity to help accelerate them.”

Q2: COVID’s looming shadow recovery prospects

There is an elephant in the room when it comes to the second quarter of 2020. Whilst this year has seen numerous milestones reached when it comes to the solar sector, it remains a simple fact that COVID-19 hit this quarter the hardest, resulting in slowdowns, shutdowns and various impacts on the supply chain.

Analysis from **Wood Mackenzie** in April found that as much as 2GW (dc) of utility-scale PV projects could suffer various delays over the year due to COVID-19, with some in the sector suggesting the plummeting power prices seen in Europe as a result of the lockdowns could dampen investor enthusiasm for subsidy-free solar. Prices of €20/MWh were seen in Spain, as well as €32/MWh in Italy as Q1 came to an end in March, throwing uncertainty over project finance. Alessio Cipullo, head of European Affairs and Studies at Italian association **Eletricità Futura**, pointed to how there were questions over

what “merchant investments and grid parity investments will look like with such weak prices”.

Away from COVID-19, there were other concerns to contend with. The quarter was one in which research was released by **Dupont Photovoltaic Solutions** that identified a rapid increase of cracking in PVDF (Polyvinylidene Fluoride) backsheets. This was notable in the overall outer layer cracking rate of PVDF backsheets, which had increased four-fold (from 5 to 23%) in module arrays in the field for between four and nine years, according to Dupont.

However, Q2 was certainly not all doom and gloom for the solar sector. In May, investment bank **Roth Capital** suggested a V-shaped recovery was on the cards for the US residential solar market, and it was widely discussed – and strongly recommended – that renewables – solar

PV included within this – could help drive a green recovery from the pandemic. In Europe in particular, this call started to gather steam in Q2, with **SolarPower Europe** joining nearly three dozen other associations in urging the EU to ensure recovery measures followed the principles of the European Green Deal.

The quarter also saw huge gains made when it comes to the costs of both solar and renewables. Research from **Bloomberg-NEF** found that utility-scale solar and onshore wind new builds had become the cheapest option in countries home to two-thirds of the world’s population, with solar’s levelized cost of electricity (LCOE) being pushed below US\$30/MWh. The LCOEs for storage batteries were also reported to have fallen to US\$150/MWh, half the figure reported two years back.

Meanwhile, Abu Dhabi claimed the world’s lowest tariff for solar for its 2GW Al Dhafra project, with the first-ranked bidder out of five tendered for the project setting their price at US\$0.0135/kWh. This came in cheaper per kilowatt-hour than the previous solar record of US\$0.0164/kWh, claimed by a bidder in Portugal’s major solar tender in 2019.

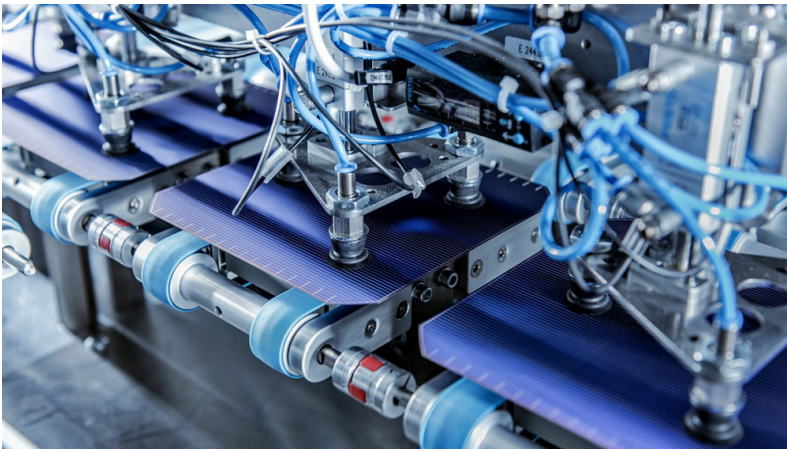
Favourable policy decisions were also made in Q2. In the US, measures designed to support solar and other renewables in the US were proposed within a landmark US\$1.5 trillion infrastructure investment Bill, tabled by House Democrats. Prospective measures outlined in that bill included a modernisation of energy

US\$30/MWH
Solar’s LCOE in Q2 2020,
according to
BloombergNEF



Credit: Total

Total is targeting 35GW of renewable generation capacity by 2025.



Credit: Meyer Burger

infrastructure, including an investment of more than US\$70 billion to help modify grids to accommodate more renewable energy sources, a commitment to “reinvigorate” the country’s commitment to clean energy by building on existing tax incentives, and promoting green energy and energy efficiency projects that adopt high-road labour practices. The US’ policy framework would draw into sharper focus later in the year, of course.

In June a 20% levy on imported solar modules, cells and inverters was proposed to come into effect from August in India, a move designed to help stimulate domestic manufacturing. However, this decision would be cited as a blow to Chinese inverter manufacturers which, according to research compiled by **JMK Research & Analytics**, had come to dominate India’s rooftop solar inverter market.

Continuing on the finance theme, research from the **Solar Energy Research Institute of Singapore (SERIS)** found that combining bifacial solar modules with single-axis trackers remains the most cost-effective path for developers across much of the world. They modelled the performance of various solar designs based on NASA irradiation figures, with the results, which were checked against field data, showing that mixes of bifacial and single-axis trackers carried the lowest levelised cost of electricity (LCOE) across 93.1% of the areas under analysis.

Meanwhile, **Meyer Burger** announced plans to start exclusive heterojunction solar module manufacturing in the first half of 2021, with the intention of raising CHF165 million (US\$173.4 million) to do so.

It is clear that whilst COVID-19 dominated the headlines during Q2, the quarter was also one of great progress. Low demand and sunny weather led to high levels of solar generation in many countries and the sector emerged from a

quarter full of uncertainty and unprecedented barriers with a greater resilience than when it entered. Q2 laid the foundations for what was to follow in H2, with promises of green recoveries and project completions on the horizon.

Q3: Upstream pinches and a US residential solar shake-up

Throughout Q3 there were several key developments across solar’s upstream sector, including **JinkoSolar** starting off the quarter by laying claim to a record large-area N-type monocrystalline silicon solar cell conversion efficiency of 24.79%. The cells have a practical size of 267.72cm² and are made of high-quality CZ mono-Si substrate, helping them achieve the record levels independently confirmed by the **Institute for Solar Energy Research** in Hamelin, Germany.

Further progression was made by competitor **Trina Solar**, which announced in August that it was planning its first major solar cell manufacturing expansion for years due to its migration to large-area PV modules using the 210mm wafer size. This change will allow it to increase production of its high-performance mainstream ‘Vertex’ Series modules in 2021 onwards.

Modules featuring 210mm wafer sizes have been in the spotlight for much



Credit: LONGi

Heterojunction solar cell production.

of 2020, in particular in China, where the production capacity of 210mm mono cells is set to reach an astonishing 120.5GW when combining capacity expansion and production lines of tier 1, 2, and 3 cell manufacturers and new investments, according to an industry survey from September 2020.

One area of the solar sector that has seen volatility through Q3 is the price of solar cells, in particular in China. In early August, **Tongwei** announced that its prices for poly cells had increased by another US\$0.06/W, while its 156.75mm, 158.75mm and 166mm mono cells rose by US\$0.08/W, when compared to prices on 24 July. Following this **LONGi** announced wafer prices were jumping US\$0.03/W and its cells by US\$0.08/W, marking the beginning of what many referred to as a ‘price war’.

Price volatility has been driven by polysilicon supply, with a number of incidents at facilities owned by **GCL-Poly** and previously **Daqo** putting pressure on module price control. For **Tongwei** this was also exacerbated by severe floods

in southeastern China in August forcing it to shut its 20,000-tonne polysilicon plant in Leshan City, Sichuan, further impacting the supply chain.

Other factors played into the growing prices, with the cyclical, seasonal nature to polysilicon, wafer and cell prices impacted as production slowed early in the year due to COVID-19 but demand for solar remained high with strong installation predictions for the second half of 2020.

Manufacturers and developers urged caution in response to the rising prices, pointing to the jump as a reaction to events such as the floor rather than a long-term trend. Despite this, it has undoubtedly caused challenges for module companies that were forced to renegotiate supply prices.

In Europe, record low prices were recorded in Portugal’s second solar auction closing with prices of €11.14/MWh (US\$13.12), or US\$0.0131/kWh. This auction – with 700MW available, of which 670MW was awarded – beat the previous industry record tariff of US\$0.0135/kWh set by in Abu Dhabi by the Al Dhafra project in April. Portugal awarded **Hanwha Q CELLS** half of the 12 lots in the auction, while other winners including **Tag Energy**, **Iberdrola** and **Enel**, with the majority of the bids including battery

US\$0.0131/KWH
Portugal’s new record-low solar tariff

Solar manufacturers are increasingly pushing for larger wafer sizes.

European Energy's Apulia solar farm is particularly significant as it has not been supported by state subsidies.



Credit: European Energy

storage. The result was particularly significant as prices came in around 25% lower than in the previous year, when the lowest bid in the country's first auction was €14.76/MWh, itself a record at the time.

Elsewhere in the continent, **European Energy** forged on with Italy's largest solar farm. The 121.5MW Apulia triplet of sites, secured €96.5 million (US\$113.59 million) in funding in August from French financial service firm Natixis. As well as the sheer scale of the project – which is comprised of three sections: a 63MW site that's been in operation since November 2019, a 40MW site in grid parity completed in June 2020 and a 18.5MW site in grid parity due to be completed later in 2020 – the Apulia solar farm are significant as it is thought to be the first Italian PV farm to be financed without having first been supported by state subsidies.

In the US, **Sunrun's** acquisition of rival **Vivint Solar** in July shook up the sector, creating a combined entity with a customer base of nearly 500,000 and 3GW of installs on its balance sheet. The sheer scale of the resultant company from the US\$3.2 billion all-stock acquisition will allow it to "accelerate the adoption of solar" in the US residential market it said.

While Sunrun secured its top spot in the US, others have struggled more in 2020. In particular, Tesla announced that Q2 2020 was its worst quarter for deployment on record. Across the three months it installed just 27MW of rooftop solar, alarming watchers as it fell 7% year-on-year despite Q2 2019 setting its previous record low. Chief executive Elon Musk remained upbeat about the long-term prospects of the technology however, adding that he was "very excited about that business potential".

Q4: A bitter election campaign and the new king of power

As the year drew a close, all eyes narrowed in on what became a bitterly

contested US election campaign, marked by accusation of vote rigging and election fraud. Nevertheless, Joe Biden was declared President-elect, and he will become the 46th President of the United States in January 2021. Upon entering the White House his in-tray will be dominated by pandemic measures, but the defeated Donald Trump did manage to throw one solar curveball by managing to force through the repeal of bifacial's exemption from Section 201 tariffs that he fought for throughout the year. Further measures to extend the tariffs and make them steeper at 18% were also included within a Presidential Proclamation issued in October, and more detail is expected to emerge in the coming weeks.

"I see solar becoming the new king of the world's electricity markets"

Staying in the US, a study conducted by analytics firm **kWh Analytics** found what it deemed to be a "troubling reality" in October, revealing that swathes of completed solar farms in the country were underperforming against original projections. From a sample of projects assessed, kWh projected that more than 30% of solar farms had missed their production targets by more than 10%, even accounting for weather fluctuations. The company had suggested that developers may have been too optimistic when taking into account technology evolution.

Moving upstream, material and component costs were again proving to be a particular point of contention. A consortium of major Chinese module manufacturers including **Canadian Solar, Risen Energy, JA Solar, JinkoSolar, LONGi** and **Trina Solar**, amongst others, issued

a joint statement calling for government intervention regarding solar glass prices that they said had spiralled "out of control" in recent months, with prices in some instances more than double what they stood at even in Q3. The breathtaking pace of capacity expansions had, evidently, not spread throughout the chain.

Meanwhile, manufacturers to have thrown their weight behind the 210mm class of large-area modules issued a further plea for industry standardisation, issuing a range of ideal formats and specifications that, they said, would allow the entire solar industry to deliver "the best possible scale" if they were adhered to.

But, after what has been an altogether difficult and at times troubling year for many, it is imperative that the solar industry reflect and acknowledge a year littered with sterling achievements and considerable progress. Capacity expansions galore and cheaper-than-ever solar tenders are just the start of a decade of progress that other power industries can only dream of replicating.

That much is evident from the slew of reports and analyses published towards the end of 2020, not least of all the **International Energy Agency's** World Energy Outlook, which said solar would become the new king of worldwide electricity markets courtesy of significant price reductions and consecutive years of record deployment throughout the next decade. Leading that charge will be Europe and China, with the US not far behind, however concerns remain over the pace at which grid improvements may be needed to facilitate such an increasing demand for solar power.

New analysis from **Lazard**, published in late October, also concluded that solar's levelised cost of electricity (LCOE) had continued to fall, dropping to between US\$31 – 42 in 2020, a drop of some 9% as technologies continued to mature. At those prices, solar is now cost-competitive with coal nuclear and combined cycle gas generation (CCGT) when US government subsidies are included, and baring down on those prices when they are not. PV, it would seem, stands on the edge of a grid-parity precipice, after which electricity markets will change for good. Solar is moving into 2020 with the wind in its sails, and wind and other generators in its rear-view mirror. ■

Joe Biden won November's election and will become the 46th President of the United States in January 2021.



Credit: Adam Schultz / Biden for President