

Cheaper, changing, crucial: the rise of solar power



AFP/Paris

Generating power from sunlight bouncing off the ground, working at night, even helping to grow strawberries: solar panel technology is evolving fast as costs plummet for a key segment of the world's energy transition.

The International Energy Agency says solar will have to scale up significantly this decade to meet the Paris climate target of limiting temperature rises to 1.5 degrees Celsius above pre-industrial levels.

The good news is that costs have fallen dramatically.

In a report on solutions earlier this year, the Intergovernmental Panel on Climate Change said solar unit costs had dropped 85 percent between 2010 and 2019, while wind fell 55%.

"There's some claim that it's the cheapest way humans have ever been able to make electricity at scale," said Gregory Nemet, a professor at the University of Wisconsin-Madison and a lead author on that report.

Experts hope the high fossil fuel prices and fears over energy security caused by Russia's invasion of Ukraine will accelerate the uptake of renewables.

Momentum gathered pace last Sunday with the ambitious US climate bill, which earmarks \$370bn in efforts to cut greenhouse gas emissions by 40% by 2030.

An analysis by experts at Princeton University estimates the bill could see five times the rate of solar additions in 2025 as there were in 2020.

Nemet said solar alone could plausibly make up half of the world's electricity system by mid-century, although he cautioned against looking for "silver bullets".

"I think there really is big potential," he told AFP.

Rapid changes

The "photovoltaic effect" – the process by which solar cells convert sunlight to electrical energy – was first discovered in 1839 by the French physicist Edmond Becquerel.

After decades of innovations, silicon-based solar cells started to be developed in the United States in the 1950s, with the world's first solar-powered satellite launched in 1958.

The IPCC said of all energy technologies, small-scale ones like solar and batteries have so far proved quicker to improve and be adopted than bulkier options like nuclear.

Today, almost all of the panels glimmering on rooftops and spreading across vast fields are made in China using silicon semiconductors.

But the technology is changing quickly.

In a recent report, the IEA said these new solar cells have proven to be one-fifth more efficient in converting light to energy than standard modules installed just four or five years ago.

There are also a host of new materials and hybrid cells that experts predict could supercharge efficiency.

These include cheap, efficient and lightweight "thin film" technologies, like those using perovskites that can be printed

from inks.

Experts say they raise the prospect of dramatically expanding where solar energy can be harvested – if they can be made durable enough to withstand a couple of decades of use.

Recent research has raised hopes that it could be possible.

In one study, published in the journal *Science* in April, scientists added metal-containing materials to perovskite cells, making them more stable with efficiency near traditional silicon models.

Other research mixes materials for different purposes.

One study in *Nature* used “tandem” models, with perovskite semiconductors to absorb near-infrared light on the solar spectrum, while an organic carbon-based material absorbed ultraviolet and visible parts of the light.

And what happens after sunset?

Researchers from Stanford said this year they had produced a solar cell that could harvest energy overnight, using heat leaking from Earth back into space.

“I think that there’s a lot of creativity in this industry,” said Ron Schoff, who heads the Electric Power Research Institute’s Renewable Energy and Fleet Enabling Technologies research.

Location, location

Generating more energy from each panel will become increasingly crucial as solar power is rolled out at greater scale, raising concerns about land use and harm to ecosystems.

Schoff said one efficiency-boosting design that is becoming more popular for large-scale projects is “bifacial” solar.

These double-sided units absorb energy not just directly from the sun’s rays, but also from light reflected off the ground beneath.

Other solutions involve using the same space for multiple purposes – like semi-transparent solar panels used as a protective roof for strawberry plants or other crops.

India pioneered the use of solar panels over canals a decade ago, reducing evaporation as they generate power.

Scientists in California have said that if the drought-prone US state shaded its canals, it could save around 63bn gallons. Construction on a pilot project is due to begin this year.

All shapes, sizes

Experts say solar will be among a mix of energy options, with different technologies more suitable for different places.

Schoff said ultimately those energy grids with more than 25% solar and wind need ways to store energy – with batteries or large-scale facilities using things like pumped water or compressed air.

Consumers can also play their part, said Nemet, by shifting more of their energy use to daytime periods, or even hosting their own solar networks in an Airbnb-style approach.

He said the modular nature of solar means it can be rolled out in developing countries with sparse access to traditional grids.

“You could have solar on something as small as a watch and something as big as the biggest power plants in the world,” he said.

“I think that’s what’s making people excited about it.” – Reuters

Coal giants are making mega profits as climate crisis grips the world



The globe is in the grips of a climate crisis as temperatures soar and rivers run dry, and yet it's never been a better time to make money by digging up coal.

The energy-market shockwaves from Russia's invasion of Ukraine mean the world is only getting more dependent on the most-polluting fuel. And as demand expands and prices surge to all-time highs, that means blockbuster profits for the biggest coal producers.

Commodities giant Glencore Plc reported core earnings from its coal unit surged almost 900% to \$8.9 billion in the first half – more than Starbucks Corp. or Nike Inc. made in an entire year. No. 1 producer Coal India Ltd.'s profit nearly tripled, also to a record, while the Chinese companies that produce more than half the world's coal saw first-half earnings more than double to a combined \$80 billion.

The massive profits are yielding big pay days for investors. But they will make it even harder for the world to kick the habit of burning coal for fuel, as producers work to squeeze out extra tons and boost investment in new mines. If more coal is mined and burned, that would make the likelihood of keeping global warming to less than 1.5 degrees Celsius even

more remote.

It's a remarkable turnaround for an industry that spent years mired in an existential crisis as the world tries to shift to cleaner fuels to slow global warming. Banks have been pledging to end financing, companies divested mines and power plants, and last November world leaders came close to a deal to eventually end its use.

Ironically, those efforts have helped fuel coal producers' success, as a lack of investment has constrained supply. And demand is higher than ever as Europe tries to wean itself off Russian imports by importing more seaborne coal and liquefied natural gas, leaving less fuel for other nations to fight over. Prices at Australia's Newcastle port, the Asian benchmark, surged to a record in July.

The impact on profits for the coal miners has been stunning and investors are now cashing in. Glencore's bumper earnings allowed the company to increase returns to shareholders by another \$4.5 billion this year, with the promise of more to come.

Gautam Adani, Asia's richest person, capitalized on a rush in India to secure import cargoes amid a squeeze on local supply. Revenue generated by his Adani Enterprises Ltd. jumped more than 200% in the three months to June 30, propelled by higher coal prices.

US producers are also reaping bumper profits, and the biggest miners Arch Resources Inc. and Peabody Energy Corp. say demand is so strong at European power plants that some customers are buying the high-quality fuel typically used to make steel to generate electricity instead.

The wild profits threaten to become a political lightning rod as a handful of coal companies cash in while consumers pay the price. Electricity costs in Europe are at record highs and people in developing nations are suffering daily blackouts

because their utilities can't afford to import fuel. Earlier this month, United Nations Secretary-General Antonio Guterres lashed out at energy companies, saying their profits were immoral and calling for windfall taxes.

Coal's advocates say the fuel remains the best way to provide cheap and reliable baseload power, especially in developing countries. Despite the huge renewable rollout, burning coal remains the world's favorite way to make power, accounting for 35% of all electricity.

While western producers cash in on the record prices – with companies such as Glencore committed to running mines to closure over the next 30 years – top coal consumers India and China still have growth on the agenda.

The Chinese government has tasked its industry with boosting production capacity by 300 million tons this year, and the nation's top state-owned producer said it would boost development investment by more than half on the back of record profits.

Coal India is also likely to pour a large chunk of its earnings back into developing new mines, under government pressure to do more to keep pace with demand from power plants and heavy industry.

China and India worked together at a UN conference in Glasgow last year to water down language in a global climate statement to call for a “phase down” of coal use instead of a “phase out.”

At the time, few would have predicted just how expensive the fuel would become. Just a year ago, the biggest international mining companies – excluding Glencore – were in a full retreat from coal, deciding the paltry returns were not worth the increasing pressure from investors and climate activists.

When Anglo American Plc spun off its coal business and handed

it over to existing shareholders, one short seller, Boatman Capital, said the new business was worth nothing. Instead the stock – known as Thungela Resources Ltd. – skyrocketed, gaining more than 1,000% since its June 2021 listing, with first-half earnings per share up about 20-fold.

Glencore itself snapped up a Colombian mine from former partners Anglo and BHP Group. The nature of the deal, and rising coal prices, meant Glencore essentially got the mine for free by the end of last year. In the first six months of this year, it made \$2 billion in profit from that one mine, more than double its entire coal businesses earnings in the same period last year.

The earnings look set to keep rolling in, as analysts and coal executives say the market will remain tight.

“As we stand today, we don’t see this energy crisis going away for some time,” Glencore Chief Executive Officer Gary Nagle said.

– *With assistance by David Stringer, and Will Wade*

**Russian gas cuts will not
kill German economy**



By Daniel Gros/Brussels

Much of the conventional wisdom about Europe's current natural-gas crisis – triggered by reduced deliveries from Russia – rests on two assumptions: that the German economy depends on cheap Russian gas, and that this bet has gone spectacularly wrong. But while German industry is strong, and the country imports a lot of natural gas from Russia, a closer inspection of the numbers and economics involved does not support the prevailing narrative.

For starters, natural gas does not play a large enough role to drive an industrial economy. In 2019, gas imports via pipeline cost Germany \$30 billion, representing only 0.75% of its GDP, and the overall value of the country's gas consumption was below 2% of GDP. These modest ratios are similar across industrialised economies and suggest that cheap gas imports are highly unlikely to be a major growth factor. Moreover, even though gas consumption has stagnated in Germany and most of Western Europe over the past two decades, the economy grew, albeit slowly.

The argument that cheap Russian gas might have favoured Germany more than other countries also is not backed up by the numbers. In 2019, Germany accounted for only about 2.3% of

global natural-gas consumption, but 4.5% of world GDP. Germany's gas intensity per unit of GDP is thus about one-half of the global average, much lower than that of the United States and many other industrialised countries, including Japan and South Korea.

European economies tend to be thriftier in their energy use than the rest of the world. But even within Europe, Germany performs well, with lower gas consumption per unit of GDP than other large European economies, such as Italy and Spain. This is surprising since these two Mediterranean countries have much less need for heating in winter (and air conditioning in summer requires an order of magnitude less power than heating). Only France, with its large nuclear-power sector, is less dependent on gas.

A similar picture emerges from related metrics, such as the value of energy imports as a percentage of GDP, or gas usage for industrial purposes as a share of industrial value added. All these indicators show that the German economy uses energy less intensively than most others.

The idea that German industry gained an advantage from access to cheap Russian gas ignores the reality that there is a European gas market with, up to now, only small differences in wholesale prices across countries. One could of course argue that Russia sold its energy cheaply to Germany to make the country dependent. But the data challenge the common perception that Germany receives cheap gas.

Over the past decade, German industry has paid about 10% more for natural gas than its competitors in other major European economies. Supplies from North Sea fields have enabled British industrial firms to pay even less than their continental peers, but this does not appear to have helped them much.

The implication is that Russia obtained a non-economic benefit (German dependence on its gas supplies) for almost no cost. The inverse of this is that Germany experienced a loss of energy independence without gaining a noticeable economic advantage.

The one large economy that is both energy-intensive and has

cheap natural gas is the United States. The average US citizen uses more than twice as much natural gas as a European – 25 megawatt-hours per year for the US, compared to about 10MWh for European countries. Moreover, US natural-gas prices have been somewhat lower than German or EU prices for most of the past two decades, and are now only a fraction of the European price, as European prices have increased by a factor of five, whereas US prices have changed little. Despite this cost advantage, however, the manufacturing industry of the US – and that of the United Kingdom – has not grown particularly strongly.

Adjusting to a world without Russian gas is of course a major problem for Europe. Yet, although Germany seems more vulnerable because it used to receive a large share of its gas from Russia, this can change quickly. Germany is building new regasification capacity in record time to allow the country to import the quantities of liquefied natural gas needed to fill the gap between lower Russian supplies and domestic demand, which is already falling because of high prices.

Once this import capacity has been constructed, Germany will be in the same situation as its European neighbours, which also have to bid for LNG. Prices are likely to stay high for some time. But with an energy intensity below the EU average, Germany should be able to bear the burden slightly better than Italy, Spain, and some Eastern European countries. France, of course, will be much less affected, at least if its nuclear reactors can resume full production.

We should also not forget the global picture. Bottling up a large percentage of Russian gas (which is what will happen if Europe no longer buys from Russia) increases the global gas price, which affects Asian countries as well, because they compete with Europe on LNG. South Korea and Japan have a higher energy intensity than Europe, and even China imports large quantities of LNG, at a price similar to what European countries pay.

Expensive energy, particularly natural gas, poses a difficult economic and political challenge for all energy-importing

industrialised countries. Only the US and some other smaller energy producers such as Norway, Canada, and Australia benefit from this situation. But the data suggest that Germany is better placed to weather this crisis than most of its main competitors. – Project Syndicate

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