

The Solar-Powered Future Is Being Assembled in China



On a recent morning in central China, workers in blue jumpsuits and white masks placed clamps around a bar of shiny metal and fed it into a powerful cutting machine. The bar was an ingot made of polysilicon, a heavily refined cousin of the same material that makes up sand. Inside the cutter, it was sliced into thousands of small squares slightly larger than a CD case and thinner than a thumbnail. These wafers would then be shipped on to other factories to be infused with conductive elements such as phosphorous and boron, then wired into cells and assembled into panels—the base unit of solar energy generation.

The owner of this factory, Longi Green Energy Technology Co., is the world's largest producer of solar wafers and the world's largest solar company by market value. As of the end of last year it created about 1 of every 4 wafers made anywhere on the planet, and since then it's announced at least five projects to expand its factories or build new ones. Despite a pandemic that may slow the growth of new solar power

installations for the first time in decades, Longi expects its production capacity by the end of 2020 to have increased by two-thirds compared with 2019.

Longi and the other Chinese companies that dominate solar—collectively they control at least 60% of global capacity for every step in the supply chain—are playing a risky game. The short history of the solar industry is a tale of repeated boom and bust, with abrupt technological and policy developments rendering multibillion-dollar investments obsolete. Industry leaders one day have, again and again, become bankruptcy filers the next.

The bet in China is that this time is different. Plunging costs have left solar the cheapest form of energy in parts of the world. Subsidies are disappearing as it becomes more competitive with other forms of electric generation, making demand less dependent on political decisions. And advances in energy storage are opening a tantalizing possibility: that solar could, in the near future, replace fossil fuels in many places. “We believe the solar market will maintain the trend of rapid growth,” says Li Zhenguo, Longi’s billionaire president. A physicist by training, he founded the company in 2000, naming it for a university principal who’d impressed Li with his academic rigor. “Current global production capacity, including Longi’s, is nowhere near enough to meet the coming demand.”

Longi dates to a time when Chinese solar manufacturers were relying primarily on cheap labor to undercut more established players from the U.S. and Europe. That strategy can collapse once wages rise, as they have in China. But, in Li’s telling, Longi was focused on coming up with a product that could compete in the longer term.

That aim led the company to make a momentous choice early on. There are two ways to make the blocks that solar wafers are sliced from: by cooling molten silicon into one homogeneous

structure or encouraging it to crystallize from different points. The first approach, known as mono-crystalline, provides greater conductivity and efficiency. But it's more expensive than multi-crystalline products, which most manufacturers favored in their efforts to compete with cheap fossil fuel generation.

Li decided that Longi, which in its early years relied on other companies to turn its wafers into cells and panels, would focus on mono fabrication, even if it meant losing out on short-term sales to less-expensive producers. For a long time the choice was eccentric; as recently as 2014, mono made up only 20% of the market. But around that time, China began to heavily subsidize solar installations, turbocharging demand and providing manufacturers with an incentive to compete on technology, not just cost. As its clout grew, Longi expanded vertically, and now it competes in nearly every part of the supply chain. The subsidies "transfused blood to the manufacturing sector," says Yali Jiang, a BloombergNEF analyst in Hong Kong.

It's now clear that Longi's bet paid off. Li estimates mono will account for 90% of the market in 2020—a development that's helped the company establish a commanding position. Part of the explanation is that, as costs have fallen, planners have placed a higher priority on mono's superior efficiency. This preference is reflected in Longi's \$37 billion market capitalization on the Shanghai stock exchange, by far the highest of any solar company. Its success, Li says, came from picking a technological horse early, sticking with it, and "looking for measures to rapidly put it into production."

As dominant as Longi might appear, no one stays on top of the solar industry for long. Yingli Green Energy Holding Co. was the world's biggest maker of solar panels as recently as 2013, but aggressive borrowing to fund new production combined with a plunge in solar equipment prices drove it to the brink of

collapse. In all, about 180 solar manufacturers have exited the industry or gone bankrupt in the past four years, according to Jiang.

Longi is trying to avoid their fate by not overextending itself financially. It's managed to keep a lid on labor costs by boosting productivity, sometimes at the cost of the so-called green jobs that politicians in China and the West love to promote. At a wafer plant not far from Longi's headquarters in the ancient imperial capital of Xi'an, producing 350 megawatts' worth of product required about 1,000 people in 2010. Today its output is equivalent to 6,000 megawatts, with the same number of employees. At a nearby panel plant, the company's smallest, only 100 or so workers are needed to operate a facility the size of 10 basketball courts. During a recent visit, the company was testing a packaging system that could allow it to get rid of forklift drivers and other logistical staff.

Cost-cutting can't fully neutralize the other major threat to China's solar industry: politics. The U.S. and European Union have periodically targeted Chinese manufacturers with anti-dumping tariffs since the early 2010s, claiming that subsidies allow them to sell below cost. The U.S.-China trade war kicked off in 2018 with duties on panels, and India, which is trying to reduce the economic influence of its giant neighbor, recently extended tariffs that had been set to expire on Chinese solar products.

China's solar industry is nonetheless growing rapidly. According to BloombergNEF data, at the end of 2019 Chinese panel factories had an annual capacity of 193 gigawatts, 60% more than was installed worldwide in that year. Planned expansions could increase that total by more than half.

There's an argument to be made that Chinese solar leadership is at worst benign and at best a source of considerable innovation. The raw materials for panels are inexpensive and

abundant, and it would be easy for companies in places such as Malaysia and Vietnam to set up factories if Chinese producers raised prices. The hothouse atmosphere of China's industry, meanwhile, has encouraged manufacturers to drive down costs. Measured per watt of output, the average price of panels has plunged 91% since 2010.

Solar optimists believe developments such as these might leave the world on the verge of an inflection point. In many places, generating electricity from the sun is now significantly less expensive than doing so from coal or natural gas. (Picking a location with sunny weather, as well as cheap land and financing, helps a lot, too.)

There's also been significant progress on the technology's biggest problem: that it can only generate electricity when the sun is out. When solar was primarily a supplement to traditional power plants, that wasn't a major concern, because power demand tends to peak in daytime. But it becomes a serious constraint as more panels are installed, creating a daytime surplus that's not useful at night. Engineers are refining a huge range of storage technologies, from improved batteries to "pumped storage" systems, which use solar electricity to send water uphill during daylight hours, releasing it through turbines when needed.

None has yet emerged as a game-changing solution, but Li is bullish on batteries, and he expects that a combination of live generation and storage will be enough to replace fossil fuels around the clock in at least some locations within a decade. He predicts that demand for solar installations will triple by 2025, to 300 gigawatts a year, before hitting 1,000 gigawatts in 2030. Those projections are wildly optimistic, however: BloombergNEF expects the 2030 figure to be closer to 200 gigawatts annually.

Whatever the rate of growth, the economics of the solar market "have significantly improved in the past decade," Li says.

Now, “energy is going to be more electrified, and electricity will be cleaner.” –*With Dan Murtaugh and Feifei Shen*

Green energy's \$10tn revolution faces oil crash test



In 2014, when the price of oil last crashed, the world's governments had no agreement in place to fight climate change. The following year leaders signed the Paris accord. Green investments have soared since then. Some \$1.2tn has been poured into renewable energy, and global electric vehicle sales reached 2mn last year. Bloomberg NEF expects as much as \$10tn poured into clean energy by 2050. The accord also marked a cultural watershed, with emissions targets now policed by a growing environment movement that's shaping politics from Germany to India. In a sign of the times, activist Greta Thunberg and Tesla Inc founder Elon Musk are now two of the most famous people in the world. So when this week Saudi Arabia and Russia joined in a price war that wreaked havoc on global markets already rattled by the coronavirus, it looked

like the major oil-producing nations reasserting their supremacy in the short term. Instead, it may prove to be another step in a longer-term trend towards ending oil's power to hold the world to ransom. The price of a barrel of oil remains an important economic indicator. But the relentless push to move away from fossil fuels suggests that its geopolitical impact is likely to be softer than in the past, with the imperative to combat global warming assuming its place. "The impact of the oil price on broader economic growth has been decoupling ever since the 1980s," said Shane Tomlinson, deputy chief executive officer at environmental think tank E3G. "We could see exceptional movements in the oil price in the next few months, but I don't think that changes the fundamental need to address climate change." Oil's fall to some \$35 a barrel from \$55 just last week has major implications for addressing climate change. Low prices incentivise more use of oil; it squeezes the budgets of oil companies, putting clean-energy projects in doubt; and some governments feel pressured to prop up struggling oil companies. All that drives up emissions, which is bad news for global warming. However, if low prices are sustained this time, there might be big positives for fighting climate change. Renewable energy is a more mature industry than five years ago. As it becomes a less risky investment, it has attracted big investors who are showering a lot of cash and building some projects that rival the capacity of conventional power plants. At the same time, oil exploration is becoming less viable economically, with an increased risk that even those projects that go ahead no longer yield good returns and with worries about stranded assets growing. "Now it doesn't make sense to reduce your investment in renewables if the oil price crashes," said Mark Lewis, head of sustainability at BNP Paribas Asset Management. "It's more logical to reduce your investment in oil." That reality points to a broader change in investor sentiment since Paris that affects companies and governments alike. A number of large investors have come together under groups such as Climate Action 100+ to demand

companies put sustainability at the heart of their business models, and that isn't likely to change. Tesla has effectively become a proxy for how the green economy is viewed by investors. Musk has demonstrated that a mass-market electric car is viable, prompting all the major carmakers to follow his lead. He's building his latest plant outside Berlin, in a show of his intention to take the fight to the heart of Europe's leading luxury car producer. Tesla is after all the world's second-most valuable carmaker by market value after Toyota Motor Corporation. For governments worldwide, pressure for policy measures has mounted as the issue increasingly resonates, in part due to the kind of direct action and media campaigning espoused by Greta Thunberg. Low oil prices offer one reason to heed that voter call, since it's a good time to end fossil-fuel subsidies or to raise taxes on consumption of fossil fuels. Such a move can also help avoid the sorts of destabilising anti-government protests seen in France, Iran and Ecuador when energy-price increases were proposed. It could even be done in a way that "protects or even benefits poorer households and communities," said Helen Mountford, vice president of climate and economics at the World Resources Institute. The goal of reaching out to "left-behind" communities is a dynamic driving policy from the post-Brexit UK to South Africa and swaths of Latin America that suffered waves of unrest late last year. During the last down cycle, between 2014 and 2016, when oil briefly dipped below \$30 per barrel, India cut annual fossil-fuel subsidies from \$29bn to \$8bn and even raised taxes on consumption. Some of the money raised was diverted to renewable-energy subsidies, after setting an ambitious goal to deploy as much as 175GW of mainly solar and wind power by 2022 – about twice the power generation capacity of the UK. "Many countries are pursuing electrification and decarbonisation to make them less dependent on the volatility of oil markets," said Adnan Amin, former director general of the International Renewable Energy Agency. "This kind of event will only reinforce that momentum." Also since 2014, the power of Opec's 14 nations to

shape the market has been weakened by the impact of US shale production. (Opec's Vienna base is home to an Austrian government that now includes the Greens as junior coalition partner.) The US – which is not a member of the group – became an oil exporter again on the back of its shale revolution, surpassing Russia and Saudi Arabia in 2018 to regain its status as the world's biggest producer. President Donald Trump has cheered America's energy resurgence as an example of taking back control. However, the collapse in oil prices weakens the shale industry's ability to pump at a profit and even pushes some of the producers toward bankruptcies, adding to economic uncertainty surrounding the virus that may hurt Trump's re-election bid, says Amin. Since Trump unilaterally pulled the US out of the Paris agreement, it could yet tilt the presidential race in favour of a candidate more in favour of climate action. In Brussels, meanwhile, European Commission President Ursula von der Leyen doubled down on European Union plans to achieve climate neutrality by 2050, despite the emergence of what she called "unforeseen challenges." "Today it's no longer the question if there will be a European Green Deal or whether the EU will become climate-neutral but the question is how we're proceeding and how far-reaching will the transition be," Von der Leyen said on Monday. That stance is understandable given that EU citizens say they want the bloc to focus on tackling climate change and preserving the environment as its No 1 priority, according to a recent Eurobarometer survey for the European Parliament. "Clearly we cannot ignore what's going on globally," said EU Environment Commissioner Virginijus Sinkevicius on Bloomberg TV. The global "climate emergency didn't go anywhere."

Clean energy is also resilient energy



NASSAU – The Caribbean and its surroundings are on the front lines of climate change. The Bahamas, the archipelago that stretches over the crystal-blue waters between Florida and Cuba, have been battered in recent years by devastating hurricanes, which have increased in severity and frequency as a result of global warming. As is the case worldwide, there is an element of injustice to this. Given that the Bahamas and Caribbean countries emit relatively minuscule amounts of carbon dioxide, their residents bear very little of the blame for the climate crisis.

But the people of the region are now flipping the script, transforming themselves from victims of climate tragedies into global leaders in clean, secure energy. The Caribbean countries have compelling economic reasons for embracing the green-energy transition. For generations, they have relied on imported fossil fuels to power their economies, which means they have long had to deal with the uncertainties of world oil

markets and thus significant cost fluctuations for electricity.

Thanks to advances in renewable energies, that economic challenge has created an opportunity. Unlike imported fossil fuels, which are subject to rising costs, the prices of solar power and other clean energy sources, along with the necessary battery storage systems, continue to fall. As these technologies have become more affordable and competitive with older, dirtier fuels, they have created a powerful incentive for island countries to move away from conventional fossil fuel-fired power plants. Moreover, this trend will only grow more pronounced from here on out, as the cost advantages of newer, cleaner energies make them increasingly attractive relative to fossil fuels.

For regions like the Caribbean, solar and battery storage systems do more than simply reduce the costs of electricity; when deployed in the right way, they also improve climate resilience. As the Bahamas and other countries across the region have demonstrated over the past few years, solar- and battery-powered microgrids can provide critical services for island communities during and after severe weather events that otherwise would knock traditional energy sources offline.

But in order for these new energy solutions to provide real resilience, they themselves need to be able to withstand the storms, which tend to ravage power lines and disconnect communities from centralised sources of energy generation. Thus, in the case of solar, much depends on the methods used to secure solar panels to the ground and to rooftops.

We already know that it is possible to construct photovoltaic (PV) systems capable of surviving even the most severe category of hurricane. Through a collaboration between the Rocky Mountain Institute, the government of the Bahamas and the country's national utility, the Bahamas Power and Light Company, we have developed and installed a solar parking

canopy at the National Stadium in Nassau that can withstand the winds of a category-five hurricane. We have also built the country's first category-five resilient solar and battery storage microgrid on Ragged Island, and are now focusing on designing and delivering sustainable and resilient microgrids for critical facilities on Abaco, following the destruction wrought by Hurricane Dorian in September 2019.

As the planet continues to warm, increased moisture in the air will translate into even more severe and frequent tropical storms and hurricanes. What we saw with Dorian and Hurricane Maria in Puerto Rico in 2017 is likely to become commonplace. Fortunately, as the partnership in the Bahamas shows, many of the same measures needed to build resilience are also those needed to limit greenhouse-gas (GHG) emissions and slow the pace of global warming. Far from requiring a tradeoff, resilient PV systems check both boxes.

The Caribbean and Atlantic are hardly the only regions that will need to build more resilient energy infrastructure to prevent power disruptions. Communities around the world are increasingly confronting the challenges posed by severe and extreme weather, including the devastating fires in Australia, Indonesia and the western United States.

In all of these cases, clean, localised energy solutions offer unique advantages in terms of reducing emissions and keeping the lights on after a disaster. They point the way to a better future for our electricity system. By embracing the clean-energy transition, the Bahamas is setting an example for the rest of the world – and particularly for those countries that are responsible for the overwhelming share of global GHG emissions.

Jules Kortenhorst is CEO of the Rocky Mountain Institute. Whitney Heastie is CEO of Bahamas Power and Light. ©Project Syndicate, 2020.

US caves to Europe over broaching climate change at G20



The US gave into pressure from Europeans over environmental concerns, allowing the word “climate” into a joint communique at a conference overshadowed by a viral outbreak that’s shaken the global economy.

Delegates at the G20 meeting in Riyadh spent much of their time talking about a global slowdown exacerbated by the coronavirus outbreak, but struggled to come up with a united response, according to people familiar with the deliberations. Countries such as Japan, and institutions including the Organisation for Economic Co-operation and Development, have been pushing for those with surpluses to spend more.

One of the main addressees of the calls for more spending is Germany. So far, the export-driven country has showed little interest in significantly boosting expenditures, arguing

fiscal stimulus can't bolster foreign demand.

On climate change, differences of opinion in the Saudi capital were more stark. The US, represented by Treasury Secretary Steven Mnuchin, objected to including a reference to the subject, according to four people familiar with the communique-drafting process. The Saudi delegation, which is hosting the event, didn't show much enthusiasm for it either, according to two of them.

After several days of heated debate, including France finance chief Bruno Le Maire cornering Mnuchin late on Saturday in Riyadh as the G20 economic leaders dined, the US reluctantly agreed to a mention of climate change, according to two people familiar with the matter.

A Treasury spokeswoman didn't reply to a request for comment. As of Sunday morning in Riyadh, it was also looking unlikely that representatives would leave Saudi Arabia with any breakthroughs on a global taxation system that would apply to multi-national companies including tech giants like Alphabet Inc's Google and Facebook Inc, according to the people.

Europeans have balked at a US proposal that new global rules should be a "safe harbour" regime. Mnuchin sought to reassure his counterpart by insisting such a system would not mean the rules would be optional, but Europeans said they still needed to fully assess the proposal.

If there's no agreement, several European nations will go ahead with taxes on revenues of multinational digital firms. That could spark a transatlantic trade war as the US says such measures are discriminatory and has already threatened France with tariffs.

France and the US have held tense discussions on the subject since France introduced a 3% levy last year on the digital revenue of companies that make their sales primarily online. The move was supposed to give impetus to international talks to redefine tax rules, and the government has pledged to abolish its national tax if there is agreement on such rules.

In introducing a so-called global minimum tax – a measure intended to prevent large companies from shifting profits to

low-tax locales to avoid paying them at home – the sides are closer to compromise as there's little difference among current corporate tax rates among major economies, and little concern that the minimum tax would be too low, one person said.

Electrical tape on speed limit signs tricks Tesla vehicles into violations



McAfee security researchers were able to trick Tesla vehicles into breaking the law by placing electrical tape on speed limit signs, in a demonstration of another vulnerability for self-driving cars.

In findings disclosed by McAfee through its official blog, the security company revealed that it fooled 2016 models of Tesla's Model X and Model S, which used camera systems by

Intel's Mobileye, into breaking speed limits with the strategic placement of electrical tape.

Researchers applied a single piece of black electrical tape to extend the middle line in the "3" of a 35-miles-per-hour speed limit sign. This tricked the MobilEye camera into reading the sign as 85 miles per hour, forcing the Tesla vehicle's cruise control system to accelerate the car beyond the true speed limit.

Intel disputes that the trick was an adversarial attack, as the tape may also have fooled some human drivers into thinking that the tampered sign said 85 miles per hour.

Tesla, however, stopped using Mobileye's camera systems in 2016, which means that the newer Tesla vehicles are not affected by the electric tape trick. In addition, other vehicles using newer versions of Mobileye technology also appear to be resistant to the manipulation.

The Rich World Must Take Responsibility for Its Carbon Footprint



China and other developing economies are instinctively wary of developed-country proposals to combine domestic carbon prices with “carbon tariffs” imposed on imported goods. But such policies may be the only way for rich-world consumers to take responsibility for their carbon footprint in other countries.

LONDON – The climate activist Greta Thunberg has accused developed economies of “creative carbon accounting” because their measures of greenhouse-gas (GHG) emissions, and of achieved and planned reductions, fail to consider the gases emitted when imported goods are produced in other countries. As Chinese officials quite rightly point out, about 15% of their country’s emissions result when goods are made in China but consumed in other, usually richer, economies.

China and other developing economies also are instinctively wary of developed-country proposals to combine domestic carbon prices with “carbon tariffs” imposed on imported goods. But such policies may be the only way for rich-world consumers to take responsibility for their carbon footprint in other countries.

The “creative accounting” charge would be unfair if it were meant to imply deliberate concealment; the United Kingdom’s

government, for example, publishes an easily accessible carbon-footprint report. But the figures certainly support Thunberg's point. In 2016, the UK emitted 784 million tons of GHGs on a consumption basis, versus 468 million tons on a production basis. And from 1997-2016, the UK's consumption-based emissions fell by only 10%, compared to a 35% decrease in production-related emissions.

Likewise, the European Union's total consumption-based emissions are about 19% higher than those related to production. And while the United States' gap of 8% is smaller in percentage terms, on a *tons-per-capita* basis it is just as large.

China is easily the biggest counterpart to this developed-economy gap, with consumption emissions of about 8.5 gigatons per year, versus ten gigatons on a production basis. And while China's *per capita* emissions have already overtaken the UK's on a production basis, it will be several years before the country's *per capita* consumption footprint exceeds that of the UK.

So, if the developed world is serious about limiting potentially catastrophic climate change, it must take responsibility for emissions that its consumption generates abroad.

There are only two ways to do this. One is for the rich world to consume less. But although more responsible lifestyles – buying fewer clothes, cars, and electronic goods, or eating less red meat – should certainly play a role in making zero-carbon economies possible, such changes alone will not get us close to zero emissions. Nor will they necessarily close the consumption-versus-production gap, because consumption of domestically produced goods could fall as much as that of imports. And reduced imports by developed countries mean reduced exports for poorer economies, creating challenges for economic development.

The alternative is to ensure that imported goods are produced in a low- and eventually zero-carbon fashion. The ideal policy to achieve this would be a globally agreed carbon price, which would encourage producers in all countries to adopt low- or zero-carbon technologies. Absent this ideal, there are now growing calls in Europe and the US for a second-best solution – domestic carbon prices imposed in particular countries plus “border carbon adjustments,” meaning carbon-related tariffs on imports from countries that do not impose an equivalent carbon price on their producers.

The immediate reaction of policymakers in China, India, and many other developing countries may be to condemn such policies as yet more protectionism in a world already destabilized by US President Donald Trump’s tariff wars. And anti-Chinese political rhetoric in the US – sometimes including the absurd accusation that China is an irresponsible polluter even though its *per capita* emissions are half those of the US – creates a difficult environment for rational policy assessment.

But in most industries, the combination of domestic carbon prices and border carbon tariffs poses no threat to the competitiveness and growth prospects of exporting companies in developing economies. Imagine that European steel producers were subject to a new carbon tax of €50 (\$54) per ton of CO₂ within Europe, which also applied to imports of steel from China or anywhere else. In that case, the relative competitive position of European and foreign steel producers seeking to serve European customers would be unchanged compared to the no-tax starting point. And Chinese or Indian steelmakers, or companies in other high-emission sectors, are as well placed as their European or US peers to adopt new technologies that reduce the carbon content of their exports (and thus their liability to border carbon taxes).

Indeed, domestic carbon prices plus border adjustments are

simply an alternative route to achieving the international level playing field that ideally would be secured through a global carbon price applied simultaneously in all countries. There is one crucial difference, though: if carbon taxes are imposed at the importing country's border, rather than within the exporting country, then the importing country gets to keep the tax revenue.

That fact increases the incentive for exporting countries to impose equivalent domestic carbon taxes, rather than leaving their companies to pay taxes at the importing country's borders. As a result, domestic carbon taxes with border adjustments could well prove to be an effective stepping-stone toward common global carbon prices, even if explicit international agreement on a global regime cannot be achieved.

Furthermore, such an approach suggests a potentially attractive way to encourage wider acceptance of border tariffs as being legitimate, necessary, and unthreatening. To be sure, the revenues from any carbon taxes levied on domestic producers should be used within the domestic economy – whether to support investment in low-carbon technologies or as a “carbon dividend” returned to citizens. But there is a good argument for channeling the revenues from carbon tariffs to overseas aid programs designed to help developing countries finance their transition to a zero-carbon economy.

Thoughtful developing-economy negotiators should argue for such revenue transfers, rather than opposing a policy that developed countries will have to deploy. After all, richer economies must not only drive down their own industrial emissions, but also take responsibility for those that their consumption is generating elsewhere in the world.

Business must come clean quickly on climate: Carney



LONDON, Feb 14 (Reuters) – Bank of England Governor Mark Carney called on the world’s businesses to publish strategies for cutting carbon emissions and adopting cleaner power sources by November, when world leaders meet in Scotland for U.N.-led climate talks.

“It’s not just green assets and divestment campaigns or certain things are so brown or black. Every company ultimately has to have a plan for a transition and what the opportunities are and where the risks are,” Carney said in an interview.

“For Glasgow that must be well on the path. That that is the norm. That the question doesn’t even have to be asked because companies are answering that question as part of their strategy.

“And the answer is, it’s the transition, stupid,” he said,

referencing a phrase coined by former U.S. President Bill Clinton's election strategist in reference to the U.S. economy.

Carney was speaking to Reuters a month before he leaves his nearly seven-year posting at the helm of Britain's central bank to take a new role as the United Nations' envoy for climate.

The Canadian banker, who disarmed the British insurance industry in 2015 when, in a speech called "Tragedy of the Horizon," he warned of their exposure to climate-related events, has been one of the most vocal public figures to push for better supervision and disclosure of climate risk.

The Task Force on Climate-related Financial Disclosures (TCFD), which he launched in 2015, has become a global standard that more than 1,000 companies, financial firms, governments and other organizations have adhered to.

The intentions behind it also chime with a shift of emphasis by another leading central banker, European Central Bank President Christine Lagarde.

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Carney said November's COP26 climate talks would also be a good deadline for regulators to map out how to make the TCFD framework compulsory.

"One of the things we will look at ahead at for the COP26 is 'should we have pathways to make the TCFD mandatory?' Not overnight, but through listing requirements or securities regulation disclosure standards," he said.

Such an effort needs to be global, Carney said, encompassing regions laying out their own plans for cutting emissions. The European Union recently announced a 1-trillion-euro (\$1.08 trillion) effort become carbon neutral by 2050, a strategy that includes introducing a new climate law by next month.

"It would be productive if other jurisdictions that potentially will have mandatory disclosure standards... used more conventional routes than legislation, such as securities regulations or listing standards. Let's have that conversation," Carney said.

Carney could play an outsized role at November's summit, especially in view of a reshuffle of government and other senior positions by Prime Minister Boris Johnson.

Johnson last month sacked former energy minister Claire O'Neill from her role as president of the COP26 talks. Newly appointed Business Minister Alok Sharma was named to the position on Thursday.

Efforts by businesses, investors and financial institutions to disclose climate risk are gathering pace.

BlackRock BLK.N, the world's largest money manager with nearly \$7 trillion in assets under management, said this month that

it would take a tougher view of companies that are not properly disclosing their climate risk.

This week, BP <BP.L> set out one of the oil sector's most ambitious targets for curbing carbon emissions, saying it would reduce its greenhouse gas emissions to net zero by 2050. BP plans to give details later this year.

"Last week, very few people would have said BP was Paris-aligned," said Carney, referring to the 2015 global climate agreement, signed in the French capital. "They've jumped from towards back of the queue to the front of the queue."

(\$1 = 0.9225 euros)

(editing by John Stonestreet)

Landing a Blow Against Climate Change



For the last decade, bioenergy has been confined to the

sidelines of climate-policy debates, owing to the environmental problems associated with its production. But recent innovations have made this option for supplying sustainable, renewable energy not just viable, but necessary.

BONN – In the face of climate change, providing reliable supplies of renewable energy to all who need it has become one of the biggest development challenges of our time. Meeting the international community's commitment to keep global warming below 1.5-2°C, relative to preindustrial levels, will require expanded use of bioenergy, carbon storage and capture, land-based mitigation strategies like reforestation, and other measures.

The problem is that these potential solutions tend to be discussed only at the margins of international policy circles, if at all. And yet experts estimate that the global carbon budget – the amount of additional carbon dioxide we can still emit without triggering potentially catastrophic climate change – will run out in a mere ten years. That means there is an urgent need to ramp up bioenergy and land-based mitigation options. We already have the science to do so, and the longer we delay, the greater the possibility that these methods will no longer be viable.

Renewable energy is the best option for averting the most destructive effects of climate change. For six of the last seven years, the global growth of renewable-energy capacity has outpaced that of non-renewables. But while solar and wind are blazing new trails, they still are not meeting global demand.

A decade ago, bioenergy was seen as the most likely candidate to close or at least reduce the supply gap. But its development has stalled for two major reasons. First, efforts to promote it had negative unintended consequences. The incentives used to scale it up led to the rapid conversion of invaluable virgin land. Tropical forests and other vital

ecosystems were transformed into biofuel production zones, creating new threats of food insecurity, water scarcity, biodiversity loss, land degradation, and desertification.

In its *Special Report on Climate Change and Land* last August, the Intergovernmental Panel on Climate Change showed that scale and context are the two most important factors to consider when assessing the costs and benefits of biofuel production. Large monocultural biofuel farms simply are not viable. But biofuel farms that are appropriately placed and fully integrated with other activities in the landscape can be sustained ecologically.

Equally important is the context in which biofuels are being produced – meaning the type of land being used, the variety of biofuel crops being grown, and the climate-management regimes that are in place. The costs associated with biofuel production are significantly reduced when it occurs on previously degraded land, or on land that has been freed up through improved agriculture or livestock management.

Under the 1.5°C warming scenario, an estimated 700 million hectares of land will be needed for bioenergy feedstocks. There are multiple ways to achieve this level of bioenergy production sustainably. For example, policies to reduce food waste could free up to 140 million additional hectares. And some portion of the two billion hectares of land that have been degraded in past decades could be restored.

The second reason that bioenergy stalled is that it, too, emits carbon. This challenge persists, because the process of carbon capture remains contentious. We simply do not know what long-term effects might follow from capturing carbon and compressing it into hard rock for storage underground. But academic researchers and the private sector are working on innovations to make the technology viable. Compressed carbon, for example, could be used as a building material, which would be a game changer if scaled up to industrial-level use.

Moreover, whereas traditional bioenergy feedstocks such as acacia, sugarcane, sweet sorghum, managed forests, and animal waste pose sustainability challenges, researchers at the University of Oxford are now experimenting with the more water-efficient succulent plants. Again, succulents could be a game changer, particularly for dryland populations who have a lot of arid degraded land suitable for cultivation. Many of these communities desperately need energy, but would struggle to maintain solar and wind facilities, owing to the constant threat posed by dust and sandstorms.

In Garalo commune, Mali, for example, small-scale farmers are using 600 hectares previously allocated to water-guzzling cotton crops to supply jatropha oil to a hybrid power plant. And in Sweden, the total share of biomass used as fuel – most of it sourced from managed forests – reached 47% in 2017, according to Statistics Sweden. Successful models such as these can show us the way forward.

Ultimately, a reliable supply of energy is just as important as an adequate supply of productive land. That will be especially true in the coming decades, when the global population is expected to exceed 9.7 billion people. And yet, if global warming is allowed to reach 3°C, the ensuing climatic effects would make almost all land-based mitigation options useless.

That means we must act now to prevent the loss of vital land resources. We need stronger governance mechanisms to keep food, energy, and environmental needs in balance. Failing to unleash the full potential of the land-based mitigation options that are currently at our disposal would be an unforgivable failure, imposing severe consequences on people who have contributed the least to climate change.

Bioenergy and land-based mitigation are not silver bullets. But they will buy us some time. As such, they must be part of the broader response to climate change. The next decade may be

our last chance to get the land working for everyone.

Why company carbon cuts should include 'scope' check



When a company pledges to cut its carbon emissions, how big a deal is it? That depends on what's being counted. An oil company's direct emissions – those from its trucks, drills and facilities – are only a sliver of the carbon released when the fuel it sells is burned, and an airport vowing to use wind power for its runway lights is making a much smaller commitment than if its promise covered the flights that take off there. As more investors take environmental factors into account, what had been a technical debate is taking on increased importance, as a matter of “scope.”

1. What does scope mean?

As the effort to boost green investment has grown, so have efforts to create metrics and standards for accounting and disclosure. Counting emissions isn't as simple as tracking what comes out of a smokestack. Under what's known as the Greenhouse Gas Protocol Standard, emissions are classed as Scope 1, 2 or 3. Scope 1 covers "direct emissions" – those from sources that are owned or controlled by a company, like those oil company trucks. Scope 2 covers emissions from the generation of energy the company buys, such as electricity or heat. Scope 3 is everything else: the emissions that come from the entire value chain.

2. What does that mean?

Scope 3 covers emissions from all of a company's non-energy inputs, like steel for a drilling rig or cement for its buildings, and from all the uses to which a company's products are put, like the fuel an oil company sells. It's the complete supply chain, which means that for almost all companies, Scope 3 is far bigger than the other two scopes combined.

3. What's the purpose of breaking it down this way?

To add meaning to company pledges about becoming more climate friendly, and to give investors more objective measures for evaluating how a company or sector is doing on going green. The hope is that disclosure will give the market the opportunity to reward or pressure companies depending on their performance.

Calculating Carbon

Oil companies' carbon footprints are mostly due to scope three emissions

4. Where did this approach come from?

The first investor to measure the carbon footprint of a portfolio may have been Henderson Global Investors in 2005, but the idea gained momentum following the 2015 Paris Agreement on climate change, in which countries pledged to set specific targets for emissions cuts to slow down the threat of global warming. The Task Force on Climate-Related Financial Disclosures, an industry-led group set up that year to encourage companies to put details about their environmental risks in the public domain. It encourages investors and executives to disclose the scope 1 and scope 2 emissions of their portfolios, and scope 3 “if appropriate.” (The task force was founded and is chaired by Michael R. Bloomberg, the majority owner of Bloomberg LP, the parent company of Bloomberg News.)

5. Is it working?

To an extent. Some companies are beginning to clean up supply chains that they’ve left to their own devices for decades. They’re questioning how their raw materials are manufactured and, among other things, are moving to develop greener, cleaner ways of making steel or cement and transporting goods. Vestas Wind Systems A/S, the world’s largest maker of wind turbines, promised to eliminate all waste in the production of its machines by 2040 as part of its drive to hit carbon neutrality by the start of the next decade. Big emitters like Royal Dutch Shell Plc, BP Plc and Equinor ASA have committed to carbon-emissions targets that include Scope 3, that is, the end use of the products they sell, while Repsol SA pledged to eliminate all emissions from its operations and fuel sold to customers by 2050.

6. What kind of problems are there?

Climate disclosure is voluntary, and among the companies that

are making pledges on emissions, there are no requirements about what kind of scope needs to be covered. For instance, last year National Grid Plc, the U.K.'s power network operator, unveiled a plan to hit net zero emissions by 2050, but the plan only covered Scope 1 and 2, which together made up only 18% of emissions when Scope 3 was included.

7. Can that change?

Maybe. The Science-Based Targets Initiative, a non-profit group that encourages companies to set emissions targets based on the latest available scientific pathways, has said that if any member company's scope 3 emissions account for 40% or more of its total emissions, it should set a target covering scope 3. Companies also face growing pressure from asset owners, such as pension plans and sovereign wealth funds, as well as their employees, lawmakers and activists. Money managers from Amundi SA to BlackRock Inc have pledged to use their vast resources to combat climate change. Non-profits like CDP, a U.K.-based group, are pushing for increased transparency, working with thousands of companies around the world including Bloomberg to help them be more open and better understand their environmental impact.

Focus on Exxon, Chevron after BP pledges to be carbon neutral



BP's pledge to zero out all its carbon emissions by 2050 deepens the divide between major European and American oil producers on climate change, increasing the pressure for Exxon Mobil Corp. and Chevron Corp. to do more.

The U.S. giants have committed only to reducing greenhouse gases from their own operations. On Wednesday, BP followed Royal Dutch Shell and Equinor in pledging to offset the carbon emissions from the fuels they sell. Known as Scope 3, the emissions from cars, homes and factories are responsible for 90% of fossil fuel pollution.

"If we do see capital flowing into BP, that may force the U.S. majors to rethink the speed at which they move on carbon reduction targets," said Noah Barrett, a Denver-based energy analyst at Janus Henderson, which manages \$356 billion.

The growing outcry against human-made global warming is increasingly making its way into mainstream business and investment strategies. It has already reshaped the way European oil producers operate by actively engaging in the transition to cleaner energy sources.

Exxon and Chevron agree with the goals of the Paris Climate Agreement, support a carbon tax and are committed to cleaning

up emissions from their vast network of wells, refineries and pipelines. They joined the Oil and Gas Climate Initiative later than their European rivals but are still fully paid-up members. They even lobbied against President Trump's plan to roll back Obama-era emission standards.

But the fundamental difference with European peers is that neither has any plan to allocate a chunk of their multibillion-dollar capital budgets toward proven low-carbon energy sources where they have no competitive advantage. The chief executives of both companies said last year that they remain committed to their core oil and gas businesses and have no plans to chase the crowd into lower-margin renewables such as wind and solar.

That puts them in an increasingly isolated position when compared with BP and Shell, whose executives have vowed to lead the energy transition.

BP went further than any other oil giant by pledging to become net zero, meaning it's aiming to completely offset its emissions with renewable energy. Spain's Repsol recently made a similar commitment.

Even so, environmentalists shouldn't get their hopes up. "I don't see Chevron or Exxon adopting a BP-like strategy in the near future," Janus' Barrett said. "The U.S. majors have historically been less aggressive in their shift away from traditional oil and gas."

When asked about potentially following Shell into the power sector, Chevron CEO Mike Wirth was clear.

"It's a business we haven't chosen to go in," he said in a February 2019 interview. "And it's inherently lower-return than the other things we could invest money in."

Chevron is investing in early-stage technologies that could aid carbon capture and energy storage, but they are small

fraction of its budget.

Effectively reducing Scope 3 emissions requires a combination of well-designed policies and carbon pricing mechanisms, Chevron said in a response to questions. Exxon said Scope 3 emissions are not within its direct control, but rather a function of energy demand and consumer choices.

Exxon CEO Darren Woods sees the answer to climate change as essentially a technology problem that has not yet been solved.

The oil giant is working on proprietary technologies that would reduce emissions in areas such as aviation, heavy-duty vehicles and industrial processes. "We can bring more value in the space where we don't know what the solution is but we need one," Woods said in an April interview.

This approach probably will come under attack at this year's round of annual general meetings in May. Both companies are being asked by Dutch activist shareholder group Follow This to align their strategies with the Paris agreement. Exxon is asking the Securities and Exchange Commission to exclude the proposal from the ballot, arguing it "seeks to micromanage" the company.

Chevron shares rose 0.7% on Wednesday. Exxon shares climbed 1.2%.