S&P Global Platts

Insight

December 2020

US energy policy after the election

Sustainable aviation fuel takes off

China's road to net zero carbon

S&P GLOBAL PLATTS
GLOBAL ENERGY AWARDS

The new energy landscape

Insight

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Editor's Note

Emma Slawinski

Editor

Coming to the end of a full year living with a global pandemic, thoughts are turning to the future, not least the hope of a quick rollout of promising vaccines that could gradually restore lives to normality in 2021.

For the energy sector as for most others, it has been a year of upheaval that has required companies and individuals to dig deep and respond with agility and ingenuity. With demand dented by lockdowns, for many producers and sellers, scaling back has been the order of the day.

Concurrently, there is the sense that energy transition will not wait – if anything, it must speed up. The signals are everywhere, from decarbonization pledges on the part of global energy companies and governments, to national plans and stimulus funding for a green and high-tech revolution.

Energy transition features prominently in the top five commodity themes for 2021 chosen by S&P Global Platts president, Martin Fraenkel (page 8), who stresses that a multi-strand approach, including technology and policy levers, is required to meet global decarbonization goals.

Platts global director of Analytics, Chris Midgley, considers the twists and turns of oil markets over the last 12 months and gives his outlook on what's to come from page 20, pointing out the long-term damage to economic development, which will in turn significantly impact energy demand.

Politics and energy have been as intertwined as ever in 2020, and nowhere was this combination more volatile than the US presidential election. As the dust settles, we examine how the results could shape US energy policy both at federal and state level (page 14).

However, it was China that provided one of the biggest surprises of the year, with its public pledge to reach net zero CO2 emissions by 2060. Eric Yep looks at how the country might meet that commitment, given its current high dependence on coal (page 24), while Sebastian Lewis analyzes China's evolving approach to natural gas (page 32).

Turning to Europe's plans for decarbonization, from page 56, Frank Watson explains what lies ahead for the EU Emissions Trading Scheme, which will step up a gear going into 2021.

This edition of Insight also takes in the rise of sustainable aviation fuel and biofuels more broadly, including the US refining sector's pivot to produce them at a time of weak margins for traditional products (pages 34 and 40).

Against the backdrop of huge challenges and rapid change, it is especially important to recognize the outstanding achievements of companies and individuals in the energy sector, as the 2021 S&P Global Platts Global Energy Awards continues to do in its 22nd year.

You can read about this year's winners, their contributions to the industry and our judges' commentary on how they were selected, from page 76.

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spglobal.com/commodities-2021

Five commodity themes for 2021

After a turbulent 2020 for all commodities, what can we expect in the coming year? S&P Global Platts president Martin Fraenkel shares his outlook

This year has been unlike any other in recent history. The coronavirus pandemic has left the commodities industry reeling, disrupting supply chains and slashing demand.

Performance has varied across the commodities sector, with some – such as metals and agriculture – experiencing effects that are likely to be short-lived when the economy begins to rebound. In others, the fallout of the pandemic could have more lasting implications, as the chaos of COVID-19 has exposed existing weaknesses or the need for structural change.

The power and transport industries have been hit particularly hard at a time when the decline in hydrocarbon demand is looming on the horizon, resulting in a pivotal moment for policy makers, trade flows and energy companies the world over.

While challenging, the current climate creates opportunities and two, intertwining developments – the ever-increasing focus on ESG and rapidly evolving technology – are key factors in driving change.

During this period, I have been asked countless times "What impact will the pandemic have on the energy transition?" and "What might the commodities industry look like in the future?"

The answers, of course, are not simple, particularly when one considers the implications of ESG, which we at S&P Global see across each of our divisions. But here is my view through five commodity themes to watch as we move into 2021.

The path of energy transition

The coronavirus pandemic has not only altered near-term energy supply, demand, and prices, but also, to some extent, their long-term trajectories.

There is debate as to whether coronavirus will accelerate the energy transition. S&P Global Platts Analytics believes that, while coronavirus has reduced long-term global oil demand by 2.5 million b/d, this is not enough to substantively bring forward the year of peak oil demand that we project for the late 2030s.

In addition, while the pandemic is forecast to cut energy sector CO2 emissions by 27.5 gigatons over 2020-2050 – equivalent to almost one full year of emissions – more than 10 times this reduction is needed to meet a scenario in which global warming is limited to 2 degrees through 2050.

In short, for both long-term global oil demand and supply, the impact of coronavirus is a decided step down, but not a step change.

Looking out to 2050, and as global demand for energy continues to grow, there will be an extensive focus on renewable/clean energy, but fossil fuels will continue to provide most of the energy supply. However, there is an expectation that green recovery plans, launched by national governments seeking to pivot toward decarbonization and sustainability as they emerge from the crisis, could change the state of play.

Reducing and valuing carbon

Existing markets and technologies alone will not be enough to reach net-zero targets in the coming decades. Cross-sectoral pathways to climate neutrality will have to include energy efficiency, electrification, sustainable hydrogen, advanced biofuels and carbon capture.

Under the Paris Agreement, more countries will have to adopt carbon targets, forcing out CO2-intensive processes and encouraging sustainability. This creates the need for a global carbon price to understand the broader picture.

Unlike other technological leaps necessary for new markets to evolve, carbon pricing is a proven means of incentivizing lower-carbon solutions. While power generation has been the main arena for carbon pricing so far, looking ahead, we must consider that coal use will begin to shrink after 2021. Therefore, we need to identify whether transportation, industrial and agricultural processes could become the marginal generator of carbon reductions.

Hydrogen could play a key role due to the abundance of supply sources and its wide-ranging applicability. The vast potential for global renewables can be harnessed via electrolysis to produce this zero-carbon energy carrier, for injection into gas grids, for fuel cells, and for applications from power generation to industrial and domestic heat.

Establishing hydrogen supply lines will be critical in 2021, with projects testing different modes of transportation by vessel, truck

> Oil demand is relatively price inelastic and much more responsive to shifts in trend regarding income – and other economic drivers

or pipeline. For these markets to scale, we will need policy drivers from governments to bring down costs. Similar advances will be needed in carbon capture and storage technology used in the manufacturing of so-called "blue hydrogen", which unlike "green hydrogen" is produced from fossil fuels like natural gas. This makes up the bulk of existing supply and will likely provide a pathway for those early adopter companies.

Europe is a leading proponent, with an ambitious hydrogen strategy, supporting projects and driving development of regulation as it seeks to establish 6 GW of electrolysis capacity by 2024. Meanwhile, the fourth phase of the EU emissions trading system will tighten the supply of allowances in 2021, supporting carbon prices and potentially narrowing the price gap between conventional and renewable hydrogen.

Commodities supercycle 2.0

Many of these clean energy technologies require substantial investments over the next few years. Central banks are setting ultra-low interest rates as an important part of monetary policy towards recovery. This may help those clean energy technologies to find their first investments, while we see that companies putting into practice ESG standards are compensated by their investors.

The makings of the next commodity supercycle are perhaps falling into place in 2021 and beyond, but with many caveats, which makes this cycle somewhat different to those seen after previous price falls. Oil demand is relatively price inelastic and much more responsive to shifts in trend regarding income – and by extension – fiscal stimulus, tax incentives and other economic drivers.

As such, the pace of economic recovery remains critical. The global economy has been recovering from its lowest point in April 2020, but it is not likely to reach 2019 levels before the third quarter of 2021. In addition, we forecast global GDP will contract by 3.8% this year, compared with a 0.1% contraction during the 2009 global financial crisis, creating further headwinds.

There are some bullish undertones to watch out for, however, with a weaker US dollar and a possible coronavirus vaccine providing some support in the short term, while so-called green recovery funds unveiled by the EU (€225 billion dedicated to the energy transition over the next three years in July), the US (a $2 trillion energy transition plan under the Biden administration), and China (further details are expected in the 14th Five Year Plan in Q1 2021) provide some long-term buoyancy.

Interestingly, the Chinese government has a new twist to its traditional five-year infrastructure-based stimulus package, with the focus on 5G, data centers, AI, the industrial internet and EV charging infrastructure. This will accelerate the construction of the data and communications networks needed to support smart manufacturing and smart cities, with internet-enabled transport and energy networks. This aims to shore up the economy, which S&P Global economists forecast has dipped 3.8% in 2020 and will grow by only 1.5% in 2021 compared with 2019.

Innovative disruption: 5G and AI

Disruptive technologies will play an increasingly transformative role in the coming years, particularly in the context of the energy transition. As 5G, AI, big data, blockchain, smart metering and the Internet of Things become ubiquitous, they have huge potential to change how and when energy is generated, how trading occurs and how data is ingested and acted upon.

This year S&P Global Platts partnered with Blocklab, the Port of Rotterdam's blockchain subsidiary, to launch Distro Energy. This is a high-frequency, decentralized energy market that uses AI and blockchain's distributed ledger technology to enable energy consumers in the port to manage their power consumption by trading renewable energy from solar and battery storage.

In the two months after launch, consumers reduced their costs by 11%, while the renewable producers saw a 14% improvement in their revenues. While this is a small pilot scheme, it has exciting potential to be rolled out more extensively.

Increasingly, we see demand for real-time data analysis to optimize production and reduce costs among industry participants. But in order to be truly transformative,

these technologies need to function not only along individual energy value chains – from production through to distribution and consumption – but also across them, where the oil, gas, coal and electricity energy systems interface and interconnect.

The future of unilateralism

Global lockdowns have provided a further accelerator for "deglobalization", as business and governments attempt to "reshore" global supply chains where possible, reducing dependencies on imports and exports, and focusing on domestic markets.

Food security is expected to be a key theme for 2021 as a result, with exporters that have already curbed outgoing supplies in 2020 still looking to meet domestic demand and maintain internal price stability. Experts believe that, while there is no shortage of food and grain supplies, several factors have created unease among buyers. This was highlighted by stockpiling of grain reserves in 2020 by state buyers in China, the Middle East, Turkey, Southeast Asia and Africa: at times some were forced to sell imported grains at a loss in domestic markets to limit food price rises.

The return of China as a major force in the global corn and soybean markets may add a further bullish factor to sentiment, as the restocking of the hog population affected by the 2018 swine flu outbreak could increase the country's corn import quota threefold from 2020's 7 million mt.

Agencies such as the Food and Agriculture Organization of the United Nations have predicted that rising prices, coupled with economic turbulence, leave low-income countries in a precarious position, further undermining food security. ■

Energy on the ballot

The 2020 US elections underlined divisions between states in approaches to energy and climate, while at federal level President-elect Joe Biden's action is likely to be constrained. By Meghan Gordon, Jasmin Melvin, Maya Weber and Jeff Mower

US President-elect Joe Biden has promised a different approach to shaping energy and climate policy, vowing to pass a $2 trillion climate plan aiming to displace fossil fuels, and a halt to new drilling permits on federal lands and waters.

But Biden faces significant obstacles ahead, including a split US Congress and a deepening divide in the US on energy issues that will make it harder to achieve his goals.

At the federal level, while Democrats will retain control of the House of Representatives, a win by Republican Senator Dan Sullivan in Alaska means the party will need to win both January 5 runoff elections in Georgia just to secure a 50:50 tie in the Senate, which would mean Vice President-elect Kamala Harris holds the tie-breaking vote.

"Historically, the US Senate has been the key obstacle for comprehensive climate legislation, and the results from [the November 3] elections suggest that this dynamic may not change," said Jeff Berman, S&P Global Platts Analytics' director of emissions and clean energy analytics.

Without control of the Senate, it will be a challenge for the Biden administration to get far on its green energy agenda.

"A bitter battle could eradicate Washington's shrinking political center, potentially aligning lawmakers more closely with national party ideologies than home-state resource bases, and leaving less room for energy policy compromises," said Kevin Book, managing director of ClearView Energy Partners.

Book doubts the fracking debate and Biden's plans to "transition" away from oil and gas definitively swayed any races. But they could have combined with social issues to draw Republican support in rural, producer districts, he said.

Tight Senate races

US Senator Joni Ernst, Republican-Iowa, held onto her seat after a tight race that tested her support of biofuel makers and knowledge of commodity prices. In her first term, Ernst played a key role in White House negotiations over the US biofuel mandate, defending the Renewable Fuel Standard on behalf of biofuel makers as oil refiners pushed for exceptions and lower blending requirements.

Ernst promised to vote against any climate legislation like California's recent goal to end new sales of gasoline-powered passenger vehicles by 2035. She

North Carolina's Democratic Governor Roy Cooper will get a second term to continue efforts to harden infrastructure against extreme weather and cut carbon emissions in the politically conservative South

said it amounted to "outlawing fossil fuels, ethanol and biodiesel in a matter of 15 years."

Alaska's Sullivan pushed to open the Arctic National Wildlife Refuge to oil and gas drilling during his first term, which the Trump administration approved in August, setting the stage for a possible lease sale by December. In April, Sullivan urged the Trump administration to retaliate against Saudi Arabia for sending a flood of crude to the US at the height of Riyadh's oil price war with Russia, when US producers were scrambling to find storage for their own supplies.

No blue wave

State and local election results showed a lack of a Democratic "blue wave to easily sweep in national US climate policy," said Amy Myers Jaffe, research professor and managing director of the Climate Policy Lab at Tufts University's Fletcher School. Jaffe pointed to Florida and Texas as two states hit hard by recent severe weather events that nevertheless reaffirmed support for Republicans who oppose climate legislation.

Democratic hopes of flipping state legislatures, with important energy policy implications, were not realized. Republicans held onto state House control in Texas, the Senate in Minnesota, both chambers in Pennsylvania and the Michigan House. One notable flip came in New Hampshire, where voters gave Republicans the trifecta of gubernatorial, Senate and House control.

States with climate focus

Gubernatorial races offered few surprises. States that have been vocal about leading on climate change in the absence of federal policy, or that have experienced economic wins from renewable energy in the state, retained their Democratic incumbents.

For instance, Democrat Jay Inslee held onto his seat as governor of the state of Washington. Climate policy will remain a priority in his third term, with the state on a path to a carbon-neutral electric grid by 2030 and 100% renewable energy by 2045.

North Carolina's Democratic Governor Roy Cooper will get a second term to continue efforts to harden infrastructure against extreme weather and cut carbon emissions in the politically conservative South. His plan to address climate change and transition to a clean energy economy looks to accelerate coal plant retirements, expand renewable energy growth and reform utility regulation and rate setting. North Carolina already ranks second among US states in solar energy capacity.

Cooper's reelection does not bode well for the oil and gas lobby. He has opposed drilling off the North Carolina coast. And while his position on pipelines and fracking has wavered in the past, lately he has taken a more critical view of gas pipeline projects routed through the state.

Fossil fuel-friendly states

States dependent on fossil fuels or that remain significant players in coal production, on the other hand, held onto their Republican leaders.

Republican Indiana Governor Eric Holcomb, a fossil fuel advocate, won reelection. Neither climate change nor the environment made his top-five list of priorities as Indiana ranks seventh among US states in coal production and second in coal consumption. In 2019, coal fueled 59% of Indiana 's net power generation, according to the US Energy Information Administration. Renewables accounted for just 7% of the state's generation in 2019.

New Hampshire's Republican Governor Chris Sununu secured a third term in office, defeating a Democratic challenger who planned to take a more proactive stance on mitigating climate change. Sununu, though no longer touting the GOP line of climate skepticism, has rejected regional initiatives to cut greenhouse gas emissions, making New Hampshire a regional outlier among New England states.

Sununu's approach to climate policy has emphasized keeping costs down. He has opposed various renewable energy proposals from lawmakers and more ambitious emissions-reduction goals, but has been a vocal proponent of offshore wind development. With a legislature now in his corner, his position is only strengthened, making it unlikely that state Democrats could advance more aggressive policies to combat climate change in line with New Hampshire's New England neighbors.

North Dakota's Republican Governor Doug Burgum easily won a second term as the state grapples with an economic downturn brought on by the oil price drop and weak global demand. North Dakota is the No. 2 oil-producing state after Texas, but it fell to the third spot behind New Mexico in May and June when producers rushed to shut in wells in response to low prices.

North Dakota's oil output had recovered to 1.16 million b/d in August, the highest since April, but state regulators continue to predict that another sharp downturn lies ahead after all easy-to-restart wells return to production. A lack of new drilling will bring on the next downturn as natural declines outpace new production.

Ballot measures

In state-level voting, clean energy advocates failed to rack up the wins seen in the 2018 midterms, when multiple states flipped to single party control.

Scott Segal of Bracewell's Policy Resolution Group said the results mean the calculus doesn't change a lot, but if a federal stalemate continues, certain states with current Democratic majorities will play stronger roles advancing the clean energy agenda and activist governors could continue to push the envelope. Even states with incumbent fossil-fuel interests such as Texas have seen fit to debate renewable policy initiatives, he said.

In Nevada, voters amended the state's constitution to require electric utilities to source 50% of their power from renewable resources by 2030. The amendment prevents a future legislature from reversing the existing renewable portfolio standard without the additional say of voters. Question 6, the 50%-by-2030 requirement, was backed by voters a first time in 2018, with nearly 60% voting yes, and required a second affirmative vote to become final.

In New Mexico, residents also voted to revamp oversight of the Public Regulation Commission, handing governors greater control over the body that regulates utilities. Prevailing with 55.6% of the vote,

the constitutional amendment would end election of commissioners and cut their number from five to three. The commission has become increasingly contentious since the state adopted a 100% renewable energy mandate by 2050, clashing with Democratic Governor Michelle Lujan Grisham over implementation of the act.

Executive orders

While Biden will face opposition to his green energy goals from Republicans in Congress and at the state level, he has one card up his sleeve that has increasingly been used by recent administrations: executive orders.

A Biden administration could still make strides on climate goals without a Democratic majority in the Senate by using executive actions just as the Trump administration did during a divided Congress. He could rejoin the Paris Agreement, block new federal drilling leases, require lengthier environmental project reviews and halt the use of small refinery waivers to the federal biofuel mandate.

Rapidan Energy Group predicted Biden could also pursue climate action through the Federal Reserve or Securities and Exchange Commission to restrict the fossil fuel sector's access to low-cost capital.

> In Nevada, voters amended the state's constitution to require electric utilities to source 50% of their power from renewable resources by 2030

Biden's Environmental Protection Agency could reverse Trump administration rollbacks of vehicle fuel efficiency targets and protect California's waiver to set tougher-than-national standards. The waiver is key to California's latest zero-emission vehicle goal of phasing out all new sales of gasoline-powered cars by 2035.

"That's going to put a lot of pressure on EPA," said Eric Washburn, president of Windward Strategies and a consultant for Bracewell's Policy Resolution Group. "I suspect you're going to see a new Clean Power Plan, revisiting methane limits, revising wetlands protection … a lot of what we saw in the Obama administration come back this time in a pretty activist EPA." ■

Event Calendar 2021

The coming year for commodities will be defined by the pace of recovery from the impact of the COVID-19 pandemic, which has hammered demand. 2021 will be marked by the beginning of a new US presidential administration under Joe Biden, which is likely to pivot the world's largest economy towards greener energy policies. Also watch out for a new economic plan coming out of China and global climate change talks towards the end of the year in Glasgow.

Petrochemicals | Energy transition | Cross-commodity/oil | Agriculture | Power/gas | Steel

JAN

EU plastic tax
Each member state will make a contribution to the EU budget based on the amount of non-recycled plastic packaging used.

Basel Convention Plastic Waste Amendments
Amendments to incorporate plastic waste destined for export under the umbrella of "hazardous waste".

Thailand plastic import ban
Thailand bans all imports of foreign plastic scrap as of 2021

US carbon markets
Virginia to join Regional Greenhouse Gas Initiative's US GHG emissions market.

US Presidential Inauguration
Likely will be accompanied by energy and climate-related actions.

FEB

Russia limiting grain exports
Russia is expected to reintroduce a quota on grain exports to maintain food security. The quota will be apply to wheat, corn, barley and rye.

US Budget
New US president's budget is sent to Congress

US power market development
Southwest Power Pool to launch its Western Energy Imbalance Service across the US western states

US Federal Energy Regulatory Commission
First meeting of the Federal Energy Regulatory Commission under the new administration

MAR

Murban futures trading
The Intercontinental Exchange plans to launch a Murban futures contract.

China releases its 14th Five Year Plan
China sets development policies for the next 5 years. Expect a focus on peak carbon emissions by 2030.

UK hydrogen strategy
UK will join the ranks of several other EU nations by announcing its national hydrogen strategy.

US power capacity markets
Q1 decision on New York's generation capacity market, which could be abandoned.

US state nuclear subsidies
Likely Q1 decision on whether nuclear subsidy law in Ohio will be repealed.

APR

US nuclear plant retirements
Entergy plans to retire the 1,030-MW Unit 3 of the Indian Point nuclear plant in New York.

MAY

US power generation capacity markets
Likely that the first PJM capacity market auction since 2018 will be held in May.

JUN

Iran elections
Presidential election in Middle East's second largest holder of oil reserves

OPEC+ meeting
OPEC alliance expected to delay the scheduled tapering of their crude oil production cuts in 2021.

St Petersburg Economic Forum
Russia's main economic conference led by President Vladimir Putin

EU climate, energy proposals
EC to publish legislative proposals on a carbon border tax and on methane emissions.

EU hydrogen regulations
New terminology will allow for a European certification for all renewable and low carbon fuels.

JUL

Malaysia, Indonesia biodiesel mandates
Malaysia to roll out the B20 mandate to manufacture biofuel with 20% palm oil inclusion. Indonesia is scheduled to start mandatory sales of B40 in July.

EU steel import safeguards expiry
The EU's safeguards system is scheduled to terminate June 30.

AUG

Tokyo Olympic Games, peak season air travel
If the delayed Tokyo Olympics go ahead from their new opening date of July 23 2021, it will be a strong signal that economies are firmly on a track back to normality. July and August are also high season for flights, providing a litmus test for air travel recovery.

SEP

Russian State Duma elections
Changes to the legislative body could result in changes to energy and climate policy as well as taxation.

German elections
Germany to seleeect a new Chancellor to replace Angela Merkel

OCT

Russian Energy Week
The main conference in the calendar for the Russian energy sector.

German gas hub merger
A new single gas trading hub in Germany called Trading Hub Europe is to begin operations.

NOV

COP26
UN climate change conference hosted by the UK in Glasgow.

GECF summit
GECF heads of state summit in Qatar as calls grow for group to take coordinated market action.

DEC

UK CFD auction
UK government has pledged to double support for low carbon generation in this auction.

Paradigm shift: how the global pandemic is shaping energy transition

The coronavirus pandemic has accelerated change in the global energy system, from historic declines in GHG emissions, inflections in demand trends and shifting production patterns, to an increased energy transition focus and aspirations towards net-zero emissions, writes S&P Global Platts' global director of analytics, Chris Midgley

What a difference a year makes. This time last year at the S&P Global Platts Global Energy Outlook Forum we were anticipating that 2020 would be all about IMO 2020, which was set to bring upheaval to the shipping sector but opportunity for refiners.

In addition we were forecasting weather to have a larger impact on commodity supply and demand, dislocation between Dated Brent and ICE Brent futures, a tightening of US natural gas supply/demand balances, agriculture facing ongoing impacts of trade wars and African Swine Fever, and a greater focus on climate change, with hydrogen in the spotlight.

Most of these forecasts weren't wrong, but none of us imagined the primary driver of market dynamics would turn out to be a global pandemic.

That said, 2019 did end with the gasoil-fuel oil spread blowing out to over $50/b as shippers switched to 0.5% sulfur fuel oil ahead of the January 1 IMO deadline. Fuel oil fell down to coal parity pricing, as it had to compete with LNG and coal into thermal power. Initially it was the weakening of the gasoil crack that narrowed the spread, as the mildest winter on record softened heating oil demand by far more than the increase from demand for gasoil into bunkers. With a loss of 800,000 b/d demand, simple refineries started to cut runs, resulting in a tightening of supply of high sulfur fuel oil, which pulled the gasoil-fuel oil spread back below $30/b.

In March, even as the reality of the pandemic was rapidly dawning, a price war suddenly broke out in the oil market. Russia decided it had had enough of providing price support, arguing that the strategy had allowed the US shale industry to take too much market share, and with this the OPEC+ agreement collapsed. In response Saudi Arabia immediately vowed to flood the market, an ill-timed move that came only days before the World Health Organization declared the novel coronavirus a global pandemic.

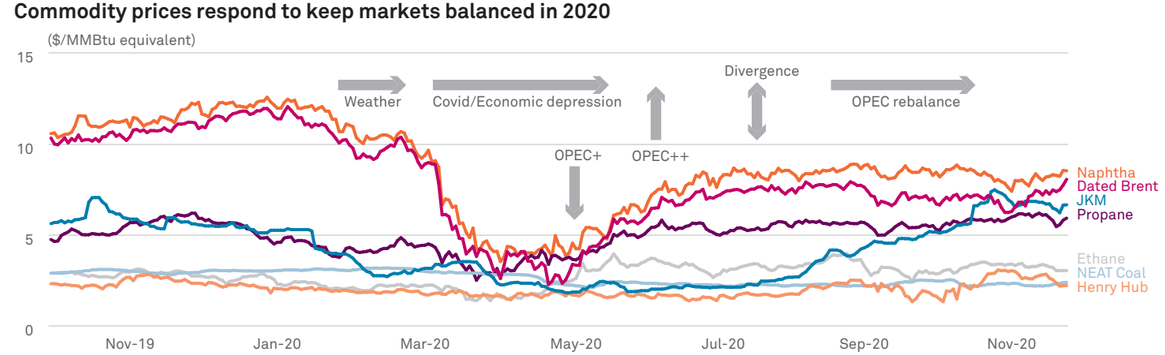
Just as OPEC and Russia were piling supply onto the market during April, global oil demand was collapsing by an unprecedented amount – more than 20 million b/d. Fossil fuels across the board fell to coal parity, as ahead of a supply response they all competed for what little demand was left, triggering coal-to-gas switching and driving the ICE Brent crude futures structure into a steep contango to incentivize floating storage, in what proved to be an unexpected windfall for the shipping industry.

Despite US crude futures benchmark WTI trading in negative territory for the first time ever, and tumbling all the way down to a historic low at minus $37/b during a chaotic expiry of the front-month contract on April 20, commodity prices in general behaved in a rational manner to address the multitude of supply-demand imbalances.

Crude prices fell to curtail production, initially gasoline cracks collapsed and gasoil rose in order to rebalance refinery production in response to the collapse in passenger transportation. Natural gas liquefaction margins went negative in the US, causing utilization to eventually fall below 40%. With major curtailments to air travel, jet fuel prices collapsed, incentivizing refineries to displace it, 70% to gasoil, 30% to heavy naphtha. This in turn forced gasoil cracks down and caused refinery margins to rapidly converge to zero, resulting in huge refinery run cuts.

With Russia and Saudi Arabia overcoming their differences in the face of collapsing oil prices, OPEC++

Commodity prices respond to keep markets balanced in 2020



Source: S&P Global Platts

responded with a historic agreement to cut production by almost 10 million b/d. Prices found support but with the majority of cuts coming from heavy sour crudes, the yield of HSFO declined and with it the gasoil-fuel oil spread collapsed to just $10/b.

The pandemic has led to vast cuts in upstream capex across the industry, but the US shale sector has been hit hardest, with a 40% collective cut in spending and, at one point, rigs and frack crews collapsing by 80%. The pandemic has done more than any OPEC deal could have achieved to rein in production from the US shale oil patch – production has declined by 1 million b/d this year and is forecast to drop a further 1 million b/d next year. In 2021, OPEC's market share will rise for the first time in five years, but with that, oil prices will become increasingly vulnerable to geopolitical tensions in the Middle East.

The fall in US shale production has also resulted in a loss of associated gas production. With LNG demand recovering in Asia, and hurricane disruptions in the US Gulf Coast impacting supply and liquefaction, the Platts JKM price benchmark for Asian LNG has rallied and improved US netbacks. That in turn has tightened US natural gas supply-demand balances.

The more bullish natural gas and LNG outlook is in stark contrast to the bearish oil outlook. While gas and power demand are benefiting from a recovery in industrial activity and duplication in demand from heating and cooling of homes and offices with the

> In a year where inequality has rightly been put in the spotlight, too little has been said about wealth inequality and its deeper, longer-term impacts

widespread switch to working from home during the pandemic, oil demand has been heavily hit from the fall in aviation and lower passenger vehicle miles travelled. This narrower gas-to-oil spread has had impacts on petrochemicals, shifting the advantage in US gas (ethane) cracking to liquid (LPG/naphtha) cracking in Europe and Asia, with LPG getting an additional boost from home cooking and heating – and those outdoor heaters that enable outdoors socially distanced meetings to occur.

While demand for most petroleum products has been negatively impacted, overall petrochemicals have seen year-on-year demand growth, as packaged goods and PPE leant support. While aviation has clearly been heavily impacted, gasoline and gasoil have seen mixed fortunes. Avoidance of public transport has driven increased use of personal transport, whether private jets for a small minority of the world's population, second-hand cars bought by a larger constituency to enable safer commutes, or even, in the US, recreational vehicles as holidaymakers hit the road for their socially distanced holidays.

It is here that we have seen significant signs of wealth inequality, as consumers adapted to the pandemic in whatever way their income allowed. Nevertheless, in a year where inequality has rightly been put in the spotlight, too little has been said about wealth inequality and its deeper, longer-term impacts.

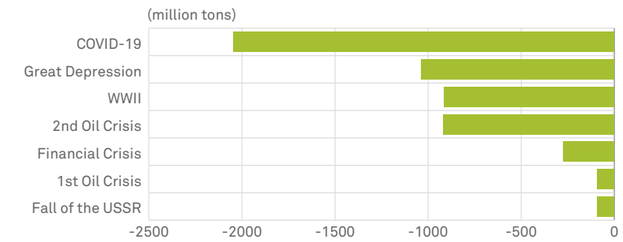
GDP is unlikely to recover to pre-COVID levels until 2022, but less talked about is the "global regression" associated with the pandemic. Millions of people have become permanently unemployed and as a result families will not be able to afford to pay for education, limiting the employment potential of millions of young people who have not recovered from the huge loss of jobs after the great recession.

This "global regression" will result in 400 million people being pushed out of the middle classes over the next 10 years who would have contributed to over 300,000 b/d of oil demand growth each year. Therefore, excluding petrochemicals we expect oil demand to peak 3.5 million b/d lower, but also earlier, at the turn of the decade. This near peaking of demand coupled with a 7 million b/d increase in refinery capacity over the first five years of this decade is likely to lead to peak refining and consolidation in capacity due to weak margins. In addition, recent trends have seen an increase in conversion to biorefineries that turn used cooking oil or tallow into renewable diesel and sustainable aviation fuel, which along with NGLs will displace the need for refinery capacity.

The one big winner of the pandemic has been the environment, which has seen GHG emissions decline more than at any time in human history, enabling us to enjoy clean air and blue skies. In addition, we have seen an increased focus on the energy transition, supported by green stimulus in Europe and commitments to net zero emissions from both international energy companies and countries – most significantly China.

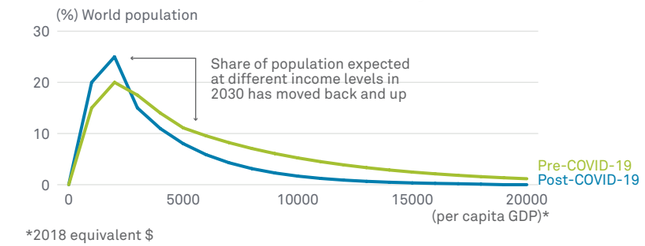
This ambition has seen a move away from enthusiasm for natural gas and LNG as a bridge fuel in the energy transition to a focus on renewable electricity and hydrogen. In reality, the world is going to need a mosaic of integrated energy solutions to achieve its ambition. This is why S&P Global Platts Analytics has rebranded and launched our new Future Energy Outlooks offering, which aims to help our customers navigate the significant future uncertainty with our long-term **outlooks**, thought leadership on energy **pathways**, analysis and ranking of asset carbon **footprints**, as well as tracking of signals and **signposts** of future direction. ■

Largest historical declines of CO_2



Source: S&P Global Platts Analytics Future Energy Outlooks, Global Carbon Project

Coronavirus shifts 2030 income level projections



*2018 equivalent $
Source: S&P Global Platts Analytics Future Energy Outlooks

Go deeper

S&P Global Platts Future Energy Outlooks (FEO) provides a pragmatic view of the long-term trajectory of energy and commodity markets, rich insights about the interconnected nature of technology, policy and consumer preference to explain what tradeoffs are likely and what the world will look like when they occur.

Learn more about Platts' scenario-based energy transition coverage that supports informed decisions in this rapidly changing space.
spglobal.com/feo

China's long march to zero carbon

China's proposal to achieve net-zero emissions by 2060 could be the turning point for fossil fuel markets and the global energy transition, but the scale of the task is huge and the roadmap still vague, writes Eric Yep

At a virtual meeting of the UN General Assembly in September 2020, Chinese President Xi Jinping said the country planned "to have CO2 emissions peak before 2030 and achieve carbon neutrality before 2060" – Beijing's first formal announcement of a long-term plan to lower carbon emissions within a fixed timeline.

Around five years ago at the Paris climate change conference, Xi said China planned to achieve peak CO2 emissions by 2030, but Beijing has never really committed to a zero carbon emissions target before, let alone at a global forum.

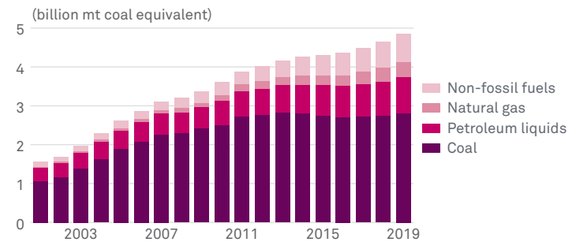
If the pledge is translated into a plan and executed successfully, it has potential to be the most significant development in the energy and fossil fuel markets in decades, but China – a country that still depends on coal for more than half its primary energy – has a big gap to bridge between current reality and stated ambition.

China's plan coincided with Japan formalizing its zero-carbon agenda for 2050 and South Korea following suit. The EU's net-zero plan is also currently for 2050. Beijing's plan, however, will be far trickier to implement. Japan and South Korea are both developed economies in which overall energy demand is unlikely to grow much, making decarbonization easier. China, on the other hand, still needs to cater to growing energy demand, which may account for its target being set for 10 years further out, in 2060.

China's plan is also a departure from the argument made by emerging economies of "common but differentiated responsibility," where developing or underdeveloped economies would opt out of absolute caps on emissions to avoid constraining their growth and poverty reduction efforts, according to Eurasia Group.

In 2020, signatories had been due to update their Nationally Determined Contributions, national commitments for carbon cuts agreed under the Paris Climate Change Agreement, but the pandemic has likely delayed most countries from doing so, further emphasizing the boldness of China's pledge.

China's changing energy mix



Source: National Bureau of Statistics

"The Paris Agreement on climate change charts the course for the world to transition to green and low-carbon development. It outlines the minimum steps to be taken to protect the Earth, our shared homeland, and all countries must take decisive steps to honor this agreement," Xi said in his speech. "China will scale up its Intended Nationally Determined Contributions by adopting more vigorous policies and measures."

Phased strategy

China's stance on carbon emissions puts the country's next 14th Five Year Plan, which starts in 2021, firmly in focus as the main policy tool to pursue its climate goals.

Tsinghua University's Institute of Climate Change and Sustainable Development looked at various scenarios for the country's pathway to decarbonization in a series of workshops and presentations in October 2020. It said Beijing would have to follow a two-pronged strategy to achieve an emissions-reduction pathway that could limit global warming to 1.5 or 2 degrees Celsius – a first-phase plan to meet the stated carbon emissions target by 2030-35 and a more well-defined plan for net-zero emissions by 2050.

This means that China will have to overcome inertia in its energy policymaking and come up with a far more rigorous strategy than its current CO2 reduction plan, and deploy it as early as possible, hence the focus on the 14th Five Year plan.

China is initially expected to set peak carbon emission targets for cities and highly populated and industrialized coastal regions in the coming years, which would be the logical next step after setting country level targets, according to Beijing-based climate experts.

"The Chinese near term announcement is a bit underwhelming: a reiteration of the goal of peak CO2 emissions by 2030 or earlier. Our own Global Integrated Energy Model has China CO2 emissions essentially plateau and peak in the 2026-2028 time period – so we've got that already built in," said S&P Global Platts' head of future energy analytics, Roman Kramarchuk.

"To be sure, all eyes will be on the next Chinese five-year plan in March, and there may have been some need for them to publicly reiterate the Paris NDC targets – because their current stimulus package has actually been rather energy intensive (with even a loosening of restrictions on coal)," Kramarchuk said in reaction to China's announcement. "Granted, all countries are supposed to be reviewing their NDC this year – but so far, few have upped their ambition," he added.

To achieve a 1.5 C scenario, China's total energy consumption would have to peak in 2030, then start a gradual decline by 2050

Other China watchers also showed some skepticism: "This is certainly an unexpected and ambitious announcement, and we will have to wait for publication of the plans to achieve this goal," senior principal fellow at the Energy Studies Institute, National University of Singapore, Philip Andrews-Speed, said. "However, if I look at the components of the economic recovery plan, I do not see that it is notably green or low carbon. Even much of the 'new infrastructure' strategy is either not new or is not strongly low carbon."

Andrews-Speed said more importantly, recent developments in the energy sector do not bode well for the longer term, with the continued expansion of coal-fired power generation capacity and a call for greater energy self-sufficiency – which includes support for coal liquefaction – a particular concern.

"The only way around this that I can see is carbon capture and storage/use. It is reasonable to assume that the next 40 years will see the commercialization of CCS/U technology. The challenge will be to scale it up to manage the vast scale of China's carbon emitting industries," he said.

Turning point for fossil fuels

For fossil fuel markets, the domino effect of Chinese energy policy cannot be underestimated, as it is the largest energy consumer and producer in the world.

To achieve a 1.5 C scenario, China's total energy consumption would have to peak in 2030, then start a gradual decline by 2050, when over 85% of the total energy consumption and around 90% of the power generation would come from non-fossil fuels, with less than 5% of power coming from coal, according to Tsinghua University's ICCSD.

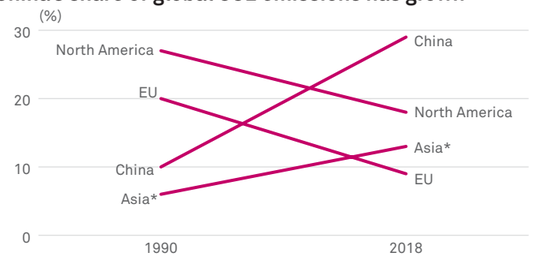
"The end-use sectors will see the increased use of electricity to replace direct combustion of fossil fuels," He Jiankun, professor and director of the Low Carbon Economy Lab of Tsinghua University, said.

"The share of primary energy for electricity generation will increase from the current 45% to about 85% by 2050, and the share of electricity in end-use energy consumption will increase from the current 25% to about 68%," he said.

The scenarios mapped out by ICCSD outline four distinct trends:

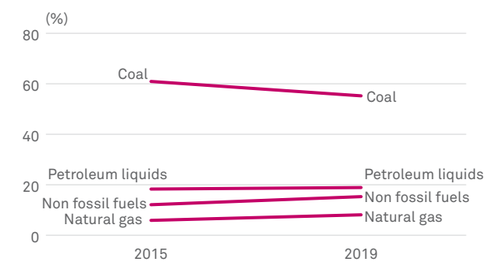
- Coal has almost peaked in China and will plateau for about a decade before it begins to drop sharply
- Oil follows a similar trajectory to coal, but with some scope – though not much – for additional demand growth in the next decade
- Natural gas has yet to hit its peak by 2030 before it begins to decline, but still has a greater role in the energy mix than oil by 2050
- Finally, a steady but undisputable growth trajectory for non-fossil fuels.

China's share of global CO2 emissions has grown



*Asia, not including China
Source: IEA

China's primary energy mix near end of 5 year plan



Source: National Bureau of Statistics

Clearly, demand for coal will contract the most under China's new emissions plan – a worrying development for global coal markets because China accounts for more than half of global coal consumption and is the world's largest coal-consuming country.

Coal accounted for about 58% of China's total primary energy consumption in 2019, followed by petroleum accounting for 20%, then hydroelectric (8%), natural gas (8%), nuclear power (2%), and other renewables (nearly 5%), according to the US Energy Information Administration.

The key question is whether 2030 will lead to an inflection point or simply a plateau in CO2 emissions, Platts Analytics said in its scenario planning report dated September 2020.

"Central to this question is how China's young (and growing) fleet of coal-fired power plants will be treated in the upcoming 14th Five Year Plan. Thus

far in 2020, over 20 GW of new coal capacity has been commissioned, and more provinces have been authorized to bring online coal capacity through 2023 to stimulate the economy," the report said.

"From a long-term decarbonization perspective, the major issue is one of stranded assets: that 80% of China's [coal-fired] fleet is made up of units that have come online over the past 15 years and about half of the current operational fleet is comprised of efficient supercritical and ultra-supercritical units," it said.

Platts Analytics said it assumes China will have about 600 GW of operational coal capacity by 2050, around the same as the total number of high-efficiency units currently online or set to come online in the coming years, and the closure of aged plants really accelerates between 2050 and 2060.

Global impact

Policy aside, China's carbon plan will introduce three new, and potentially powerful, elements to accelerate global energy transition – the muscle of China's national energy companies, which wield the most influence in its energy sector; the creation of carbon-based markets in China; and the backing of Chinese financial institutions.

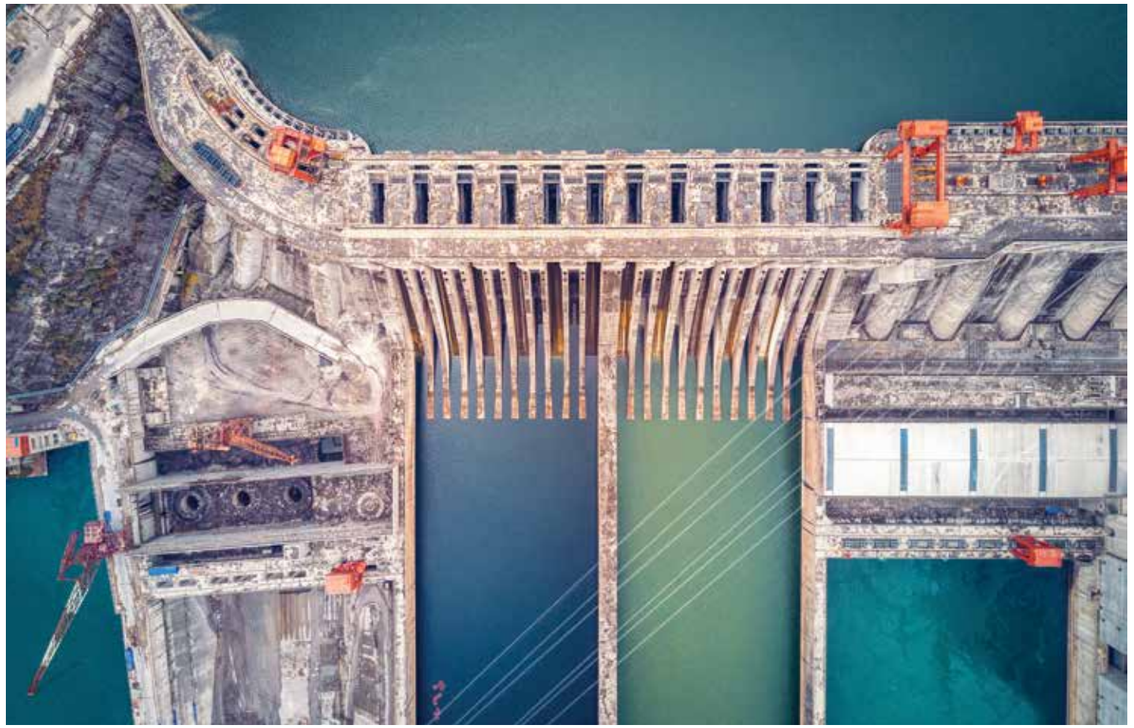
While several international oil majors have made big strategic shifts to align more closely with the global energy transition, much of their effort will be futile in Asia where state-owned national oil companies hold sway over local energy investment

> With a market capitalization and operational base larger than many private oil companies, NOCs Sinopec, PetroChina and CNOOC could move the needle on fossil fuel consumption

and infrastructure. Moreover, NOCs are in greater control of demand-side fundamentals. In Asia's power sector, which will be the battleground for competing fuels, control is even more concentrated in government-owned entities, from distribution utilities to power grid operators and generation companies, where deregulation has been slow.

For example, State Grid Corp. is China's largest utility and operates around 90% of the country's electricity grid. Recently, downstream gas market liberalization led to the creation of PipeChina, the region's largest midstream infrastructure company. With a market capitalization and operational base larger than many private oil companies, China's NOCs Sinopec, PetroChina and CNOOC could move the needle on fossil fuel consumption.

State-owned enterprises accounted for a 36% share of global energy investment in 2019, and around 40% of power, oil and gas investment. This represents



a reduction over the last five years as Chinese companies slowed investment in big coal-fired power plants, while 2020 is set to recalibrate capital expenditure globally due to the coronavirus pandemic.

China's development of its carbon market will also be vital to using market-oriented mechanisms to drive energy transition. China's commodity exchanges in Dalian, Shanghai and Zhengzhou already host some of the world's most liquid commodity contracts, such as iron ore, steel products, agricultural products and energy commodities, and will underpin the creation of a full-fledged carbon market. The CSRC – the futures regulator – also recently announced it had set up a working group to establish a new futures exchange in Guangzhou, and there is speculation that the exchange's first product will be carbon emissions.

One of the main recommendations of Tsinghua University's ICCSD was to improve the national carbon market and expand the scope of the sectors covered, and establishing a measurement, reporting and verification system (MRV) for carbon markets.

Lastly, a decarbonized economy will directly affect China's energy security due to its large imports, not just from the Middle East, but now also from energy producers such as Australia and the US, with whom its relationship has become geopolitically unstable. Its plan for the electric vehicle ecosystem, for instance, is aimed at rejuvenating the manufacturing economy and becoming a leader in technology.

"As well as being a policy to combat climate change, the [zero emission] plans are part of Beijing's approach to combating pollution and creating high growth in green and digital industries and jobs," geopolitical consultancy Eurasia Group said in its October report.

"The reforms will affect China's relationship with the rest of the world, requiring new supply chains with producers of the raw materials needed for this transformation, including copper, lithium, and cobalt. Meanwhile, China will seek to reduce its exposure to regions with high geopolitical instability, including some Middle East oil producers," it added. ■

Insight from Shanghai

By Sebastian Lewis

China's recently announced goal to achieve a peak in CO2 emissions before 2030 and a carbon-neutral economy by 2060 has brought renewed focus on the role natural gas might play in the country's energy transition.

Natural gas has seen rapid growth in the last few years, as government polices to eliminate air pollution and reduce the use of coal supported switching to cleaner fuels. Despite this, natural gas will still account for just 6% of China's primary energy demand this year, below the 8.3%-10% target in the last Five Year Plan, which runs to 2020. This is also well below the global average, with gas forecast to account for 22% of primary energy consumption this year, according to S&P Global Platts Analytics' Global Integrated Energy Model.

In an effort to create a more competitive market, reduce costs and increase the use of gas, the government has engaged in a series of reforms, including making it easier for private and foreign companies to invest in China's upstream sector.

But the most significant change came last year with the formation of a new midstream company, PipeChina, to manage the country's pipeline assets. These were previously owned and controlled by China's three major national oil companies, PetroChina, Sinopec and CNOOC.

Historically, these companies each developed and operated their own pipeline network in order to optimize revenues from their own upstream operations. In 2014 the government passed measures requiring the companies to open up their pipelines to others – so called third-party access – but they had little effect on the structure of the market, and the NOCs saw little challenge to their upstream dominance.

Making space for markets

By spinning off China's pipeline network into an independent midstream company that will focus solely on distribution, the government hopes to attract a wider range of players into the upstream and downstream sectors. Creating a more competitive gas market will, the government hopes, facilitate the emergence of trading hubs where gas prices will be dictated by market fundamentals of supply and demand.

This, in tandem with the development of electricity markets, should help increase the role of gas in the power sector. Platts Analytics forecasts natural gas will only account for 3.6% of China's generation mix in 2020. As the government tries to reduce coal use and increase renewables, gas has a key role to play in balancing the market when renewables, which by nature are intermittent, are unable to meet electricity demand.

By focusing just on the midstream, PipeChina will also be in a better position to develop the network more rationally, extending it to parts of the country that currently have little access to natural gas.

According to Liu Zhongyun, PipeChina's deputy general manager, quoted by local media at an energy forum at the end of October, the company will build more than 25,000 km of pipelines over the next five years, in line with recent 14th Five Year Plan proposals which call for faster construction of national trunk oil and gas pipelines. Even with this investment, China will fall short of the medium-term pipeline network target of 240,000 km of oil and gas pipelines by 2025.

Released in 2017, the medium-term plan envisaged that between 2015-2020 the total length of the gas pipeline network would grow 10% a year from 64,000 km to 163,000 km – a sizeable increase, but one that has to be put in context. The US, which including Alaska has a nearly identical land area to China, has a gas pipeline network of nearly 4.8 million km, according to the US Energy Information Administration.

At the moment, PipeChina controls 90,000 km of mainly inter-provincial, long-distance pipelines. But this is only around 60% of China's total network. There are still around 20 provincial pipeline companies that control distribution networks in their province. Guangdong and Hainan provinces have already incorporated their networks into PipeChina, but other provincial pipeline companies have more complex shareholding structures which may prove harder to incorporate. The dream of a unified pipeline network may be some way off.

LNG expansion

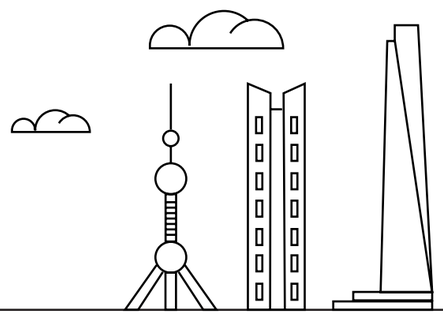
As well as investing in pipelines, the company will also invest in other infrastructure like storage and LNG-receiving terminals. According to Platts Analytics, China currently has a total of 20 LNG terminals, one of which is a floating storage and regasification unit (FSRU). Seven of these, including the FSRU, will be incorporated into PipeChina.

A further three terminals currently under construction will also be transferred to the company, so PipeChina will control 10 terminals in total. This should in theory provide greater third-party access for LNG importers, which hitherto have had to pay highly for the privilege of slots at LNG-receiving terminals.

But building and managing the pipelines and infrastructure might be the easy bit. The bigger question might be whether the government can create a regulatory regime that gives fair and equal access to the pipeline network for new entrants and upstream companies so that they can compete with, and challenge the upstream dominance of, China's NOCs.

There is a tension at the heart of the government's reform agenda that is clearly visible in the recently released proposals for the 14th Five Year Plan, the overarching blueprint to guide China's development from 2021 through to 2025. On one hand, it calls for the market to play a decisive role in allocating resources, as well as in the reform of state-owned companies, but at the same time it emphasizes the strategic supporting role of the state-owned economy.

The creation of PipeChina is an important stepping stone on the way to the creation of more competitive gas markets, and market-based gas pricing. The question is how quickly this can happen if the NOCs continue to play such a big role China's energy industry. ■



Preparing for takeoff

One of the many paradoxes of 2020 has been the rising interest in sustainable aviation fuels as a tool for decarbonization, even as air travel cratered. Matthew Kohlman examines an emerging market and the biggest factors affecting biojet's diffusion

Welcome aboard Pandemic Flights, with service today at half that of a year ago. In this emergency event, please place your mask over your mouth and nose, and keep it there for the whole flight.

There is no cruising for airlines at this unknown economic altitude, but the crew may just offer today's meal ... as tomorrow's jet fuel.

Few industries have suffered as much from the coronavirus pandemic worldwide as airlines. Based on data from FlightAware.com, worldwide commercial airline traffic reached 54,174 flights a day on November 15, 2020, just 55% of the volume on the same date in 2019, although that's better than 23% in April.

On October 18, US passenger volume barely cracked 1 million – a mark that is roughly 40% of year-ago levels – since the low of 87,534 on April 14, which was just 4% of the previous year, according to the Bureau of Transportation Statistics. BTS data also showed the 23 major US passenger airlines had a combined first-half loss – of $16.2 billion – for the first time in 11 years, likely to grow into a record yearly loss.

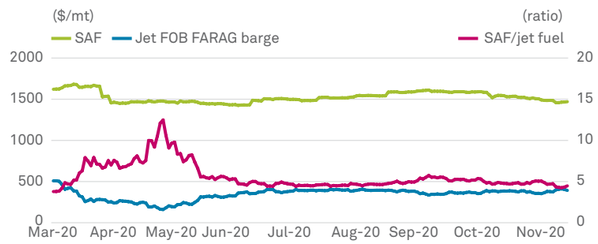
The data shows the airlines' pain. But for once, the big hurt isn't in the cost of jet fuel, which makes up just 5% of total operating expenses, compared with one fourth a few years ago.

S&P Global Platts Analytics estimates a 35% reduction in US jet fuel consumption this year, but expects a path to recovery by mid-decade. Faced with such a crisis, why would airlines devote time to something called sustainable aviation fuel, or SAF?

The clunky acronym refers to an environmentally friendly replacement for jet fuel, made mostly from used cooking oil or rendered beef fat, known as tallow, but also increasing options from algae to alcohol.

A decade ago, aviation experts forecast SAF would be anywhere from 1% to 5% of their fuel supply by 2020. Since the first major airline test using a biojet blend 12 years ago, it has been used in fuel for nearly 250,000 flights globally, usually at no more than a 50/50 split, according to industry group IATA.

Platts sustainable aviation fuel vs jet fuel



Source: S&P Global Platts

For context, though, that's two average days of passenger and cargo flights on jet fuel, pre-coronavirus. Meanwhile, new cost-based SAF price assessments for Northwest Europe and California launched by S&P Global Platts in August and September, respectively, highlight the challenge ahead for the fuel. The spread for European SAF started life on August 17 at 4.3 times jet fuel and by November 13 was 4.14 times jet fuel. That's in line with where market players predicted, but highlights that SAF is nowhere near competitive on its own. The US West Coast SAF assessment tracked 3.08 times Los Angeles jet fuel on November 13.

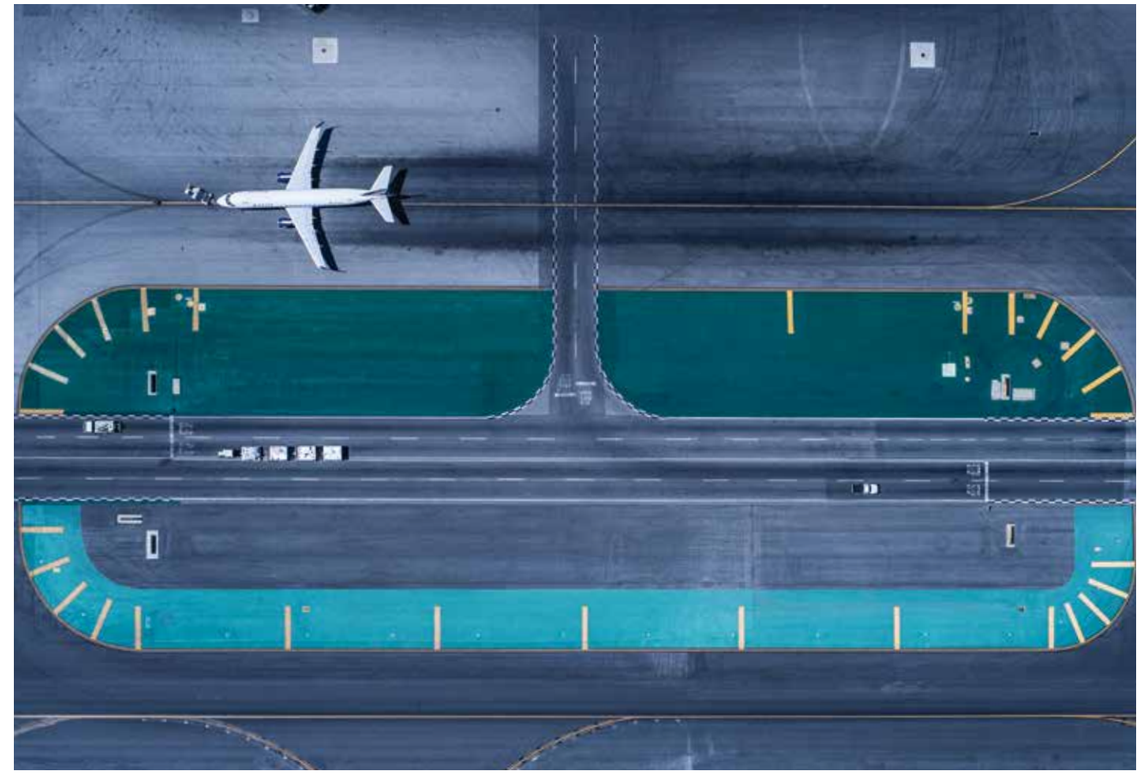
Nevertheless, SAF is a regular agenda item for airline boards, one veteran fuels manager said: from how to get it on board, how to afford it, how to find more of it, "it's a big topic and one of great interest to the airlines."

So why does the SAF push feel different now, even though the stats suggest real volume parity is decades away? The reasons are found in regulation, technology, incentives, and perceptions

Regulation

Norway was the first country known to add a quota requirement for SAF, 0.5% of annual fuel from 2020, with a target of 30% by 2030. Other countries, mostly ones in Europe like Sweden, Finland and France, are proposing similar approaches.

Aviation has been relatively untouched by fuel spec requirements, unlike land-based transport, where



cleaner fuel changes started in the 2000s with introductions of ultra low sulfur diesel in trucks, for example. Then last decade, with the IMO 2020 initiative, marine fuels started moving away from using bottom-of-the-barrel fuel.

Airplane fuel has largely avoided sweeping sulfur and emissions regulation due to safety concerns – you can't just pull over at 30,000 feet and fix a fuel issue. But technology has caught up with those fears.

Technology

The number of certified conversion processes is increasing, from coal-to-jet fuel through the Fischer-Tropsch process to another seven processes, including fatty acids and recycled oil, alcohol-to-jet from ethanol, and lately, co-processing fats and oils from petroleum refining.

All have gone through extensive testing and test flying, to a stage where the bigger worry is how to supply SAF in large volumes. But this year, with the coronavirus-

Federal and state incentives greatly narrow the SAF gap to jet fuel, and even go beyond it

wracked demand for fuels so bad and incentives so good, some major US refiners have accelerated plans to retool refineries into renewable fuels plants by mid-decade, including Marathon and Phillips 66 refineries on the West Coast.

Incentives

While some say the US may mandate biojet use, most see another route due to programs like tradeable RINs credits under the Renewable Fuels Standard.

"SAF uptake in the US is particularly incentivized through federal and state policies – with the ability to earn California Low Carbon Fuel Standard credits, federal RFS D4 RINs and to take advantage of the

federal biomass-based diesel blenders tax credit – which together can total several dollars per gallon," said Roman Kramarchuk, S&P Global Platts' head of future energy analytics.

At least one supply company hired a full-time SAF trader because it sees the market growing due to all the credits. Platts publishes SAF with and without credits for the US West Coast. Federal and state incentives greatly narrow the SAF gap to jet fuel, and even go beyond it as the combined value of credits can be higher than the cost of SAF production.

Platts Analytics expects tallow prices to rise as demand increases, but does not see any direct correlation between the feedstock and traditional jet fuel. So if jet fuel spot prices double or triple to levels often seen in the last decade, credit-added SAF may even be lower than jet fuel, if only temporarily. "Eventually, we'll get to parity but the trouble is as soon as we get close to it, the demand will grow and prices will go up again," the veteran fuels manager said.

Perceptions

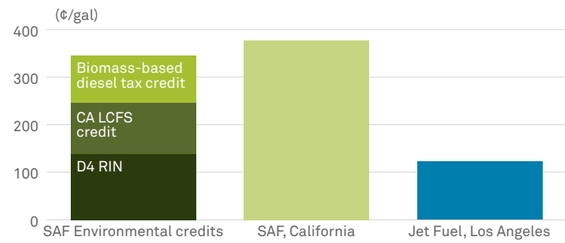
Finally, long before US West Coast air quality dropped to worst in the world thanks to forest fires, companies were coming under pressure to adopt clean and green fuels. Amazon, for example, just secured up to 6 million gallons of an SAF blend for its cargo planes in the next year as part of its target to achieve net-zero carbon by 2040.

In the US and Canada, the aviation industry in 2019 accounted for around 5%, or nearly 300 million metric tons, of total energy CO2 emissions annually, according to Platts Analytics, equivalent to 250 kg of CO2 emitted per thousand passengers carried.

The tricky part is avoiding food-versus-fuel fights over feedstock, or stigmas attached to the harvesting of sources like palm oil, which is more popularly used in Asia.

Airlines are also conscious of investors' commitments to sustainability as shareholders and debtholders are considering ESG scores as well as return on investment.

Federal, state incentives support SAF production



Note: Credit prices correct as of November 16, 2020
Source: S&P Global Platts

Even with all the hurdles, IATA believes 1 billion passengers will have flown on an SAF-blend flight by 2025 and penetration should approach a tipping point of 2% of jet fuel.

A second US fuels manager said airlines are now truly serious about meeting environmental goals through SAF. He said San Francisco and Los Angeles airports are soaking up most of the supply, but he is seeing storage interest in states outside California for alternative fuels to meet emission goals. "SAF is really the next IMO 2020, the next thing to talk about," he said.

So secure your storage, and read the warnings chart. Even in the most challenging year in modern airline history, it's time to at least prepare for SAF takeoff. ■

Go deeper

Learn more about S&P Global Platts Sustainable Aviation Fuel (SAF) assessments and methodology at spglobal.com/saf

US refiners embrace renewable fuel

Faced with the massive downturn in demand for gasoline, diesel and jet fuel resulting from lack of personal mobility during the coronavirus pandemic, some US refiners are looking to repurpose their refineries to make renewable diesel and sustainable aviation fuel.

Despite the many millions spent over the years lobbying Capitol Hill against the Renewable Fuel Standards, some US refiners have made an about face.

Driven by excess refining capacity and incentivized by government subsidies – an economic lifeline amid weak margins – refiners like Phillips 66, Marathon and HollyFrontier are moving quickly to turn their oil refineries into renewable fuel facilities.

It was Charles Darwin who said "It's not the strongest of the species that survives but the most adaptable to change," and that adage is proving true for refiners who jumped early on the renewables bandwagon.

Valero, a first mover in the renewables space, formed Diamond Green Diesel with feedstock purveyor Darling Ingredients, reported October 22 increased third-quarter sales and earnings from renewable diesel, cushioning the loss from its traditional refining operations.

As more refiners latch onto the renewable bandwagon, renewable diesel and SAF production will grow, with nearly 20 US renewable diesel projects in the planning stage -- including Phillips 66's plan to convert its San Francisco refinery to the world's largest renewables fuel plant.

With 2020 demand for gasoline, diesel and jet lagging 2019 levels by 12% – and not expected to recover until at least 2022, refiners see an opportunity to bolster sagging bottom lines by taking advantage of the federal Blenders Tax Credit, California's Low Carbon Fuel Standard credit and RINs credits.

Renewable diesel supplied about 25% of California's 2020 diesel demand, and as other states consider regulatory changes to meet climate goals, demand for renewable diesel and sustainable aviation fuel will continue to rise.

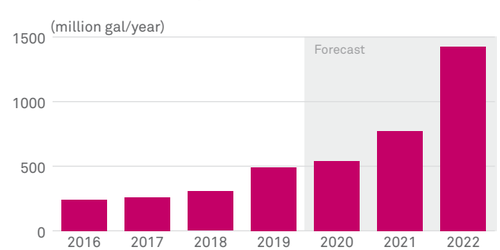
Considering LCFS transportation cap-and-trade initiatives, and Canada's 2022 roll out of the federal Clean Fuel Standard, S&P Global Platts Analytics forecasts renewable diesel demand to reach almost 1.2 billion gallons of diesel equivalent by 2025.

In California, layering of credits has created economically attractive possibilities to make renewable diesel and sustainable aviation fuel.

Platts has observed growing interest in renewable fuels across the transportation markets in part driven by the transition to lower carbon fuels. Markets in many of these commodities have not yet reached sufficient volumes to support spot price assessments. Platts has analyzed the costs involved and is now publishing calculated values that represent a cost-based price for renewable diesel.

By Janet McGurty, senior writer, oil news

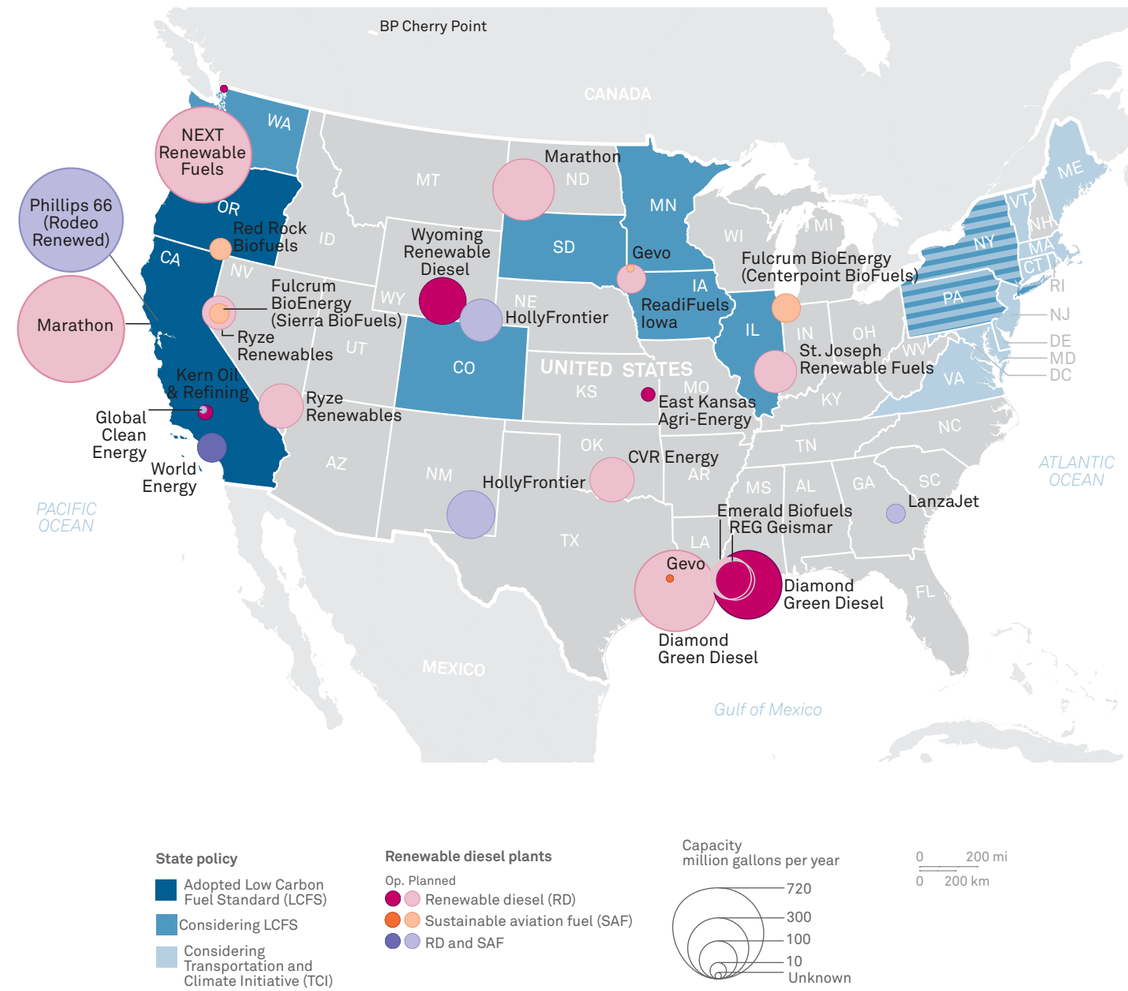
US renewable diesel production set to soar



Source: S&P Global Platts, S&P Global Platts Analytics, EPA, company filings

Renewable distillate supply to soar as states target climate goals

Carbon reduction targets are driving investments in US renewable diesel and sustainable aviation fuel plants, including accelerated plans by US refiners to reconfigure excess capacity to take advantage of various incentives.



Insight from Washington

By Meghan Gordon

In California, greenhouse gas emissions produced by this year's record-breaking wildfire season have climbed past the industrial, power and residential emissions categories and could even overtake transportation as the top polluter, according to estimates by S&P Global Platts Analytics.

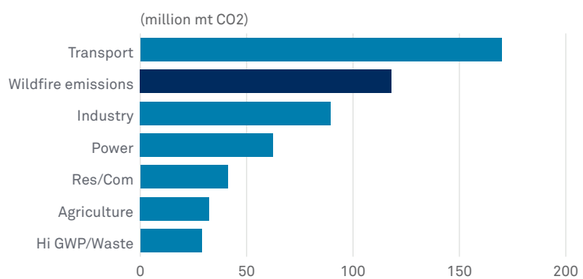
The scale and devastation of the California wildfires have also added urgency to the state government's climate priorities, with the latest measure targeting that top emitter, cars.

Governor Gavin Newsom pointed to the fires when announcing an ambitious new target to phase out new sales of gasoline-powered cars within 15 years.

Newsom directed the California Air Resources Board to develop increasing percentage standards that result in zero-emission vehicles reaching 100% of new passenger car sales by 2035. A separate target would require the medium and heavy-duty fleet reach zero emissions by 2045.

California CO2 emissions

2020 wildfire emissions likely surpass all other sources



Note: Data for non-fire emissions from 2017

Source: S&P Global Platts Analytics

While adding to the urgency of reducing emissions, the wildfire season also exposes one of many challenges to the rapid electrification of transportation. California power companies at times this year turned to rolling blackouts to mitigate wildfire risks to lines and meet surging demand during record heat.

> "If these vehicles want to plug into the grid, you have to shore up the grid too and make sure the grid is as low carbon as possible"
>
> **Jennifer McIsaac, S&P Global Platts Analytics**

"If these vehicles want to plug into the grid, you have to shore up the grid too and make sure the grid is as low carbon as possible," said Jennifer McIsaac, emissions and clean energy analyst for S&P Global Platts Analytics.

Zero-emission vehicles currently represent less than 10% of California new passenger car sales, but the state did have a pathway for reaching its previous target of 5 million vehicles by 2030, McIsaac said.

"Moving to 100% of passenger car sales by 2035 goes pretty far beyond what we had been assuming," she said. "Making the goal and then meeting the goal are two different things."

So how likely is California to meet this 100% ZEV target by 2035?

McIsaac said reaching the target will depend in part on whether the state can continue chipping away at costs to consumers through rebates funded by cap-and-trade revenue, because electric vehicles are not expected to be cost-competitive until later in the decade. Consumer preference, range anxiety, charging infrastructure and fleet turnover will also be challenges, she said.

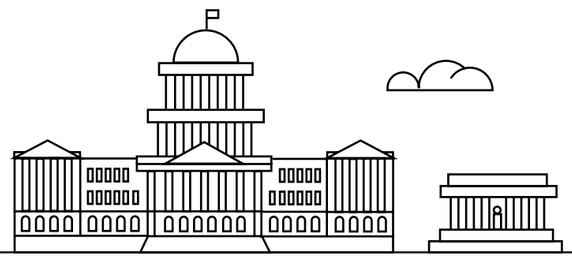
Current assumptions about a 12-year fleet turnover could stretch longer if the coronavirus pandemic leads drivers to hold onto their cars longer because of tighter budgets, McIsaac said.

Election impacts

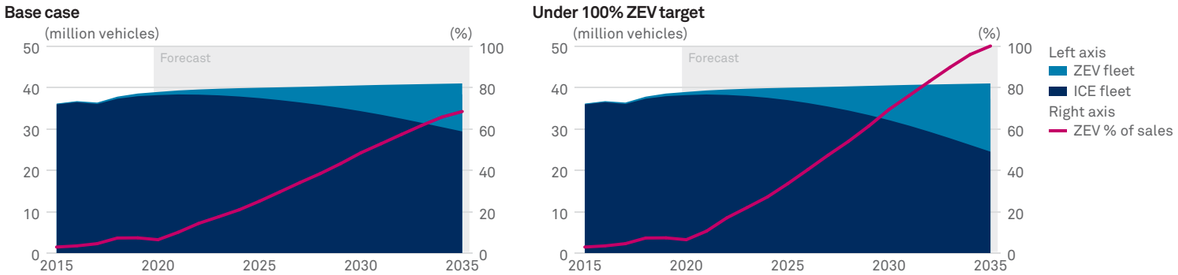
The policy cleared a more immediate hurdle with Democratic presidential candidate Joe Biden's win in November. The clean car goal and other California climate policies had a lot riding on the US presidential election.

The state's Air Resources Board spent the Trump presidency fighting with the US Environmental Protection Agency about its rollback of Obama-era tailpipe standards. These were set to increase average fuel economy of the US passenger vehicle fleet by 5% annually from 2021 to 2026. But the Trump administration slashed these targets to a 1.5% annual increase.

Trump's EPA also moved to revoke California's long-held waiver to set tougher air quality standards than the national limits, a policy and legal fight that



California's 100% zero-emission vehicle target would reduce ICE fleet by nearly 5 million by 2035



Source: S&P Global Platts Analytics

would have continued and potentially heated up in a second Trump term.

The incoming Biden administration, however, means a smoother ride for California's clean car goals in the near term.

Rapidan Energy Group analyst Sam Reynolds said two factors are central to the question of whether California can realistically meet the 2035 target.

First, the 100% ZEV goal administered by CARB is a mandate on manufacturers to produce and sell electric vehicles, not a mandate on consumers to buy them.

"This means that the question of whether California will hit this new target is really about enforcement," Reynolds said. "Will the California government enforce this requirement on vehicle producers in 2035? If there's a change of heart from state leadership from now until then, we could see the goal rolled back."

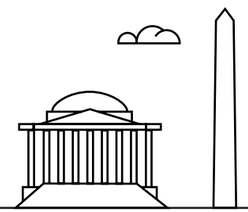
But Reynolds said CARB has consistently been one of the most progressive state agencies in the country on the issue of electric vehicle adoption. And expected steep reductions in battery prices and buildouts of charging infrastructure will only increase the government's willingness to enforce the target, he predicts.

Compliance credits

Reynolds said the second factor that will determine if the state reaches the target is that "there's a difference between compliance with the mandate and actually putting plug-in electric vehicles on the road."

Automakers receive a set number of credits for each car sold, determined by drive train, battery range and other factors, with most ZEVs receiving more than one credit, he said.

"So this means to hit the 100% target, manufacturers might not literally have to sell 100% electric vehicles – they only have to submit credits equal to the number of vehicles they sold that year," Reynolds said. ■



Insight Conversation: Hussain Sultan Al Junaidy

The founder and former CEO of Emirates National Oil Company spoke with S&P Global Platts' head of news for EMEA, Andy Critchlow, and Middle East oil pricing editor, Tahani Karrar, about his career and the development of Dubai's oil sector

Group CEO of ENOC until 2007, Hussain Sultan Al Junaidy founded the company in 1975.

He maintains a link with the oil industry through a number of oil-related companies including oil trading companies Neptune Energy Trading and Dominion Petroservices where he is chairman.

In a wide-ranging interview, Al Junaidy looked back at the history of Dubai's oil sector and ENOC itself. He also shared his outlook for Middle East oil demand post-coronavirus and the continued push towards diversification and self-sufficiency in the United Arab Emirates.

Oil was first discovered in Dubai in 1966, and by 1969 Dubai started to export oil. What was the industry like in those days and how did you get into the oil business?

I'm a chartered civil engineer, I graduated from Glasgow University and trained in the UK. I was headhunted by Caltex, which is now Chevron, and I started working for Caltex in 1966. Caltex trained me well, I think, for the job that they wanted me to do. And the job was to open Caltex in the then Trucial States, starting in Dubai.

In 1969, Caltex were in Bahrain, they had a joint venture with the Bahrain government and jointly owned the Bapco [Bahrain Petroleum Co.] refinery in Bahrain, which was and still is one of the largest in the region. But they had no marketing facility, they had nothing at all south of Bahrain. So they wanted to start a total marketing setup in Dubai and they asked me to help them do it. There was nothing in Dubai at that time, the so-called service stations in Dubai were then one pump, probably maximum two pumps, out in the open, and a small shack behind it, where some poor guy sat with no air conditioning.

When I started building the first service stations, Caltex service stations, they were the most modern you would see anywhere. They compare with the service stations you see today with beautiful two-pump islands and a whole canopy over the pump islands, a convenience store, and also each station had a car wash and a lube oil bay.

Then, after setting up six stations in Dubai, I went to Abu Dhabi in late 1969 to do the same thing as in Dubai. But unfortunately, in 1973 they were nationalized by ADNOC in Abu Dhabi. I was then sent to the United States with Caltex to train at their headquarters in New York and also to study at the University of Pittsburgh, Graduate School of Business, and returning to Dubai as CEO in 1975.

How did the discovery and subsequent export of oil change Dubai and the United Arab Emirates?

Dubai started booming after 1969 as offshore oil started to be exported and revenues started to come in from the new oil production. Money started coming in and the oil price shot up in 1972, and the whole Gulf, particularly Dubai, started to boom. Sheikh Rashid wanted gas because people had now started to live in Dubai and a lot of people wanted gas cylinders.

There is no gas in Dubai so they used to load up all these cylinders on dhows, take them to Bahrain or Ras Tanura, fill up there and bring them back to sell in Dubai. This took time and you had delays, and sometimes they would even run dry. So we went to Bapco and arranged for pressurized gas to be supplied through a new pipeline to their loading jetties.

My team and I quickly built a small bottling plant along the Creek, with only 200 tons at that time, and I bought a small LTG tanker, a second-hand one, but in good condition, from Europe. I got it here quickly and started the first company, called Emirates Gas.

From 1975-1982, we were supplying the entire requirements of LPG, for the whole of what became the UAE, no longer the Trucial states, but also in the Sultanate of Oman. And that was one of our most successful companies ever.

We also formed a joint venture with an Indian company to manufacture LPG cylinders, structural steelwork and storage tanks, and also formed the Dubai Maritime Transport Company to own the LPG tankers.

ENOC is one of the largest independent refiners in the Gulf region today, and a pillar of Dubai's economy. What made you decide to start a company like ENOC?

In 1980, we started Emirates Bunkering and Bitumen Company, EBBCO, which started selling bitumen for the first time in the UAE and also bunker fuels and diesel. From then onwards, it just went one company after another.

EBBCO was 60% Dubai government and 40% Caltex. We later invested, built and ran service stations.

Caltex was at that time in the lube business and also in aviation at the airport, but my companies couldn't be part of their operations so I said, "Listen, you want to join me, but you won't let me join you? Then I'm going to go on my own." They said, "Are you serious?" And I said, "Of course I'm serious." And that's how I started. In 1993, I formed the holding company, ENOC, Emirates National Oil Company.

EBBCO changed from Emirates Bunkering and Bitumen company to EPPCO, Emirates Petroleum Products Company. And we started to go into everything humanly possible downstream. We formed Horizon Terminals Limited, now a major company, and our first oil storage was built in Jebel Ali. Later we expanded by bringing in shareholders, who were the first users of the terminal, such as oil traders and oil companies. We said to them, "Instead of leasing apartments why don't you lease storage tanks?" And that's what they did.

When I decided to call it a day, in about 2007, ENOC had grown to over 32 companies.

Why did you decide to shift ENOC's focus from downstream, to also include upstream?

We wanted ENOC to become a fully-integrated oil company. We needed to buy an upstream company and by chance we found Dragon Oil, which is listed on the London Stock Exchange but established in Dublin. It had a small oil production in the Eastern part of the Caspian, in Turkmenistan. The technical report said that the P2 reserves of the country had 650 million barrels of oil reserves and 3 Tcf of gas.

After the Soviet Union collapsed, Dragon Oil's production was only 6,500 b/d, [and] declining. The oil price was $11 a barrel, but it was a calculated risk. By 2005, it was already producing 45,000 b/d and more, and the oil price started going up. The production and market value of Dragon Oil kept rising and the market value reached over GBP3.5 billion.

> I'm not sure whether Fujairah will benefit from an even bigger refinery... demand has gone down, for products, for everything

There has been a gradual decline in Dubai's oil production over the years. Why is that in your opinion?

Dubai's oil production started in 1969, and at that time everyone knew that the offshore wells would be depleted soon. Production started at up to 400,000 b/d and then started with the decline. Dubai never relied on the money coming from the oil, it decided a long time ago that it should diversify from oil and go into other things, such as trading, business and tourism.

I think that serves Dubai right because you look at what happened to the oil pricing over the years. I mean, the oil price has been under pressure for some time, for a variety of reasons. Also, the minute shale price came in at $60 a barrel, shale became a big competitor. And of course, think of the other alternatives that came in into the market, whether it is solar, wind or nuclear – which has started already in the UAE and has already been connected to the grid.

How has coronavirus impacted the oil industry in the Gulf? Do you see a recovery in sight?

When the coronavirus came in, that was a shock because everything closed down. The global economy nearly shut down for a while and there was less demand for not only the gasoline but for everything. People soon realized that the days of oil dependence are soon over and most of the countries in the Gulf are now suffering.

Many countries are now borrowing money. We are lucky in the UAE – Abu Dhabi, which contains 95% or more of the country's oil and 92% of the gas, has invested its money very wisely.

I think in 20 or 30 years we are really going to see less and less dependence on oil and more on the alternatives of oil – look at gasoline now, we have electric cars everywhere. We're living in a world where everything is changing fast.

What do you think needs to happen for Fujairah to become an even bigger oil trading and bunkering hub?

Fujairah is a small emirate but it has developed in a big way like all the other emirates. The good thing about the emirates is we always compete with each other. I think Fujairah deserves everything really, and Abu Dhabi has supported Fujairah in a big way.

I'm not sure whether Fujairah will benefit from an even bigger refinery... demand has gone down, for products, for everything. And there are more refineries in Saudi and everywhere, existing refineries are also expanding. Even the condensate refinery in ENOC has upgraded to increase its production to over 200,000 barrels a day.

Which industries do you see Dubai focusing on post-oil and why?

I think what Dubai will probably focus on is developing more industries here locally – even producing food supply here. We are not talking about just vegetables and fruits but also fish and livestock. Dubai is now doing wonderful things in terms of being self-sufficient as far as food supplies. Coronavirus is forcing policymakers to rethink how they trade and how much they rely on other countries for food security. What is needed is to be really self-reliant.

Recently, an announcement was made about gas development in Dubai, on the border of Jebel Ali and Abu Dhabi. What do you think the potential for that is?

That was announced jointly by Abu Dhabi and Dubai, and we expect that the field will be developed jointly. We're waiting to hear more, it's just a matter of time, as it takes time to develop a field. ■

Hussain Sultan Al Junaidy spoke with S&P Global Platts on August 8.

Insight from Dubai

By Dania Saadi

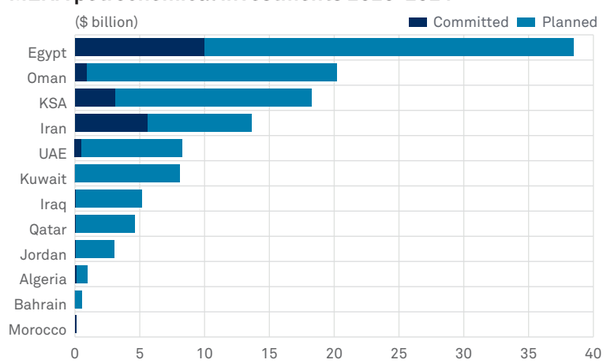
Despite global oil demand plunging an unprecedented 8% this year and drastic OPEC+ cuts, Middle Eastern energy producers are still counting on higher petrochemicals production to temper a bleak outlook for peak oil consumption that has spooked crude markets.

Even before the coronavirus pandemic, producers had little choice but to focus on petrochemicals, as the sector will account for 60% of global oil demand in the next decade due to rising consumption of plastics, according to the International Energy Agency.

In the last decade, road transport fuels represented 60% of oil demand. Probably for the first time, the IEA in this year's annual World Energy Outlook indicated oil demand may plateau from 2030.

The IEA's view on petrochemicals growth resonates with that of the multilateral energy sector lender, Arab Petroleum Investments Corp. In its 2020-2024 gas and petrochemicals outlook published Oct. 12, Apicorp raised its forecast for planned petrochemical projects during the period by $4 billion from its previous estimate to $95 billion.

MENA petrochemical investments 2020-2024



Source: Arab Petroleum Investments Corporation, Gas & Petrochemicals Investment Outlook 2020-2024

"By the end of this decade, most of the growth in oil demand will come from the petrochemicals sector," Apicorp said. "The 2020 crisis and the delayed economic recovery might underscore this trend."

Egypt, Iran and Saudi Arabia are the top three countries in the Middle East and North Africa in terms of committed petrochemicals investments, it added.

But the road to the predicted petrochemicals bonanza is pockmarked with financial constraints, geopolitical threats and competition among producers to supply a market grappling with peak demand scenarios and a pandemic that has no end.

Nevertheless, changing global oil consumption habits have led Middle Eastern oil producers to focus on integrating their large-scale refineries, with petrochemical facilities as a first step.

Asia and the Middle East, which accounted for two-thirds of global refining investment over the past five years and for more than 80% of refining capacity currently under construction, will emerge by 2030 as the largest global refining centers, overtaking traditional ones, according to the IEA.

Aramco's refinery blues

As the world's top oil exporter, Saudi Arabia wants to a piece of this refining pie.

In Saudi Arabia, the 400,000 b/d Jizan, or Jazan, refinery in the south is linked to a petrochemical facility. The start-up of the refinery, which was supposed to take place last year, has been postponed to this year.

Changing global oil consumption habits have led Middle Eastern oil producers to focus on integrating their large-scale refineries, with petrochemical facilities as a first step

The Jizan refinery is located in a region that suffers from sporadic missile and drone attacks from Iranian-aligned Houthi rebels in neighboring Yemen that are intercepted by Saudi defense, posing a potential threat to the facility's existence, let alone supply agreements.

A piece of Aramco's downstream puzzle, Jizan will help the state producer reach 6.8 million b/d in gross refining capacity by the end of 2020. Aramco's refining business consumed 39.5% of the company's crude production in the first nine months of this year. But the business is a loss-making venture. Downstream EBIT in the first nine months of 2020 swung to a loss of Riyals 23.3 billion ($6.2 billion) from a profit of Riyals 4.87 billion a year earlier. Aramco blamed the dismal results on "the macroeconomic difficulties brought on by the COVID-19 pandemic."

Although Aramco has promised a staggering $75 billion dividend this year to investors, it still has to prop up its existing refining and petrochemical projects. Aramco and Japan's Sumitomo Chemical will lend $2 billion to Rabigh Refining and Petrochemical Company, or Petro Rabigh, the Saudi joint venture that is facing a capital shortfall due to the pandemic and periodic maintenance.

Despite being in the red, Aramco's downstream business wants to expand globally as well. A 300,000 b/d refining and petrochemical joint venture project with state-owned Petronas in Malaysia was supposed to be up and running last year but has also been delayed to a 2020 start-up.

But the biggest setback to Aramco's petrochemical ambitions is its reassessment of a new $20 billion oil-to-chemicals project, a joint venture with Saudi Industries Corp., or SABIC, which the national oil producer acquired this year for $69 billion. The two companies are now studying the integration of Saudi Aramco's existing refineries in Yanbu with a mixed feed steam cracker and downstream olefin derivative units, as an alternative to building a new plant.

The acquisition of 70% of SABIC was supposed to set Aramco on a path to become a petrochemical behemoth with combined production of 90 million mt/year.

Elsewhere in the Gulf, delays are besetting other refining and petrochemical projects. Kuwait's 615,000 b/d Al Zour refining and petrochemical project is a decade late due to the country's complex local challenges.

In the UAE, Abu Dhabi National Oil Co.'s strategy to attract $45 billion in investments to its downstream sector in partnership with international oil companies has yet to yield big tickets deals. The company's push to double its refining capacity and triple its petrochemical production capacity has no set timeframe.

In Egypt, the ministry of petroleum and mineral resources is focusing on two integrated projects. One is an $8.5 billion complex in Al Alamein in the Western Desert that includes a 2.5 million mt/year crude and condensate refinery. The project, which is expected to be completed by 2024, will meet local petrochemical demand and could also export products.

Another $6.2 billion project in the Suez Canal Economic Zone is expected to produce up to 1.9 million mt/year of petrochemicals and up to 900,000 mt/year of refined products. The project would import crude to process into petrochemical and refined products.

The two complexes are part of 11 projects that are on the cards, costing $19 billion in total. Egypt, which wants to wean itself off refined products imports by 2023, consumed 30.2 million tons per year of oil products in 2019, nearly a third of that coming from imports at a cost of $6.8 billion, according to the petroleum ministry. But financing for these large-scale projects may be a hurdle, given the country's reliance on foreign debt.

In Iran, the government is even more keen to boost its petrochemical profile because its energy industry is buckling under the weight of US sanctions, re-imposed in 2018. Iran increased its petrochemical output by 8% in the seven months ending October in its fiscal year that started in March 2020.

Petrochemicals revenue could help compensate from losses arising from lower crude sales, which have plunged since the re-imposition of sanctions. Iran, which produced 66 million mt/year in its last fiscal year, wants to reach 100 million mt/year by March 2022, generating $25 billion in revenues, and even hit 133 million mt/year by March 2025.

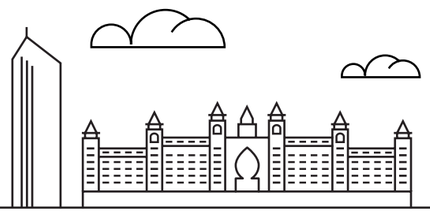
However, production from the Middle East will be competing with Asian output in the coming years, as both regions vie to become petrochemical giants at a time when peak oil demand is predicted to be just around the corner. And amid the ongoing coronavirus pandemic, finances will continue to be slim, jeopardizing the grand plans of both regions when they most need a boost. ■

Saudi Arabia's refining and petrochemicals ventures through the years

1933	Oil concession agreement signed between Saudi Arabia and Standard Oil Company of California (SOCAL)
1945	Aramco's first refinery, Ras Tanura, comes on stream in Saudi Arabia
1983	Yanbu Refinery begins operations in Saudi Arabia
1984	SAMREF joint venture refinery with ExxonMobil begins operations in Saudi Arabia
1985	SASREF joint venture refinery with Shell inaugurated in Saudi Arabia
1989	Aramco and Texaco ink deal for refining and marketing joint venture Star Enterprises, in US
1991	Aramco buys 35% stake in South Korea's SsangYong Oil Refining Co. (renamed S-Oil in 2000)
1996	Aramco buys 50% of Greek refiner Motor Oil (Hellas) Corinth Refineries
2004	Aramco acquires 15% stake in Japan's Showa Shell Sekiyu
2009	Petro Rabigh, refining and petrochemical joint venture with Sumitomo, begins operations in Saudi Arabia
	Fujian Refining and Petrochemical Co. (FREP), joint venture between Aramco, ExxonMobil and Fujian Petrochemical Co., begins operations in China
2011	Sadara petrochemical joint venture with Dow Chemical formed in Saudi Arabia
2014	Two refineries, SATORP joint venture with Total and YASREF joint venture with Sinopec, come online in Saudi Arabia
2017	Aramco becomes sole owner of Motiva, former joint venture with Texaco and Shell previously known as Star Enterprises
2018	Refining and petrochemical joint venture with Petronas, PRefChem, in Malaysia is formed
2019	Aramco buys 17% of South Korea's Hyundai Oilbank
2020	Saudi Aramco acquires a 70% stake in petrochemical maker Saudi Basic Industries Corp. (SABIC)
	Jazan refinery in Saudi Arabia and PrefChem in Malaysia due to commence operations

Source: Saudi Aramco

Although Aramco has promised a staggering $75 billion dividend this year to investors, it still has to prop up its existing refining and petrochemical projects



Carbon commitment

The EU carbon market is on the edge of a transformation, with new rules due to reduce the supply of emissions allowances from 2021. Frank Watson delves into the bloc's evolving policy, which could pave the way for faster transition to clean energy and industries

Europe's flagship Emissions Trading System is about to shift into a higher gear when a fourth trading phase starts in January.

The 16-year old carbon market has begun to play a more significant role in decarbonizing Europe's economy in recent years, helping prompt a shift from emissions-intensive coal to natural gas and renewable sources for electricity generation.

But the system has failed, in its current form, to cut carbon emissions in the industrial sectors at anything approaching the same degree. That may start to change during the next 10-year trading phase, as the market's rules begin to tighten the supply of allowances available to those sectors.

"Industrial sectors like steel, cement and refining have typically received more allowances for free than their actual compliance needs," said Jeff Berman, director of emissions and clean energy at S&P Global Platts Analytics.

"However, free allocations are declining in Phase 4 and these sectors have historically had a difficult time in cutting their emissions. This means that these entities could soon be in a position where they will need to regularly buy allowances for compliance," he said.

The EU ETS is a major engine of the energy transition in Europe, and the carbon price signal it generates will be critically important for investments in clean energy and industrial processes. Those investments will help determine the EU's success in reaching its longer-term target to reach net-zero emissions by 2050.

"Higher reduction targets means lower EU ETS supply, which all else equal can lead to higher carbon prices," said Berman.

"We will also need a sense of how the Commission might revise mechanisms like the Market Stability Reserve in order to account for stronger climate ambition," he said.

"We are also looking for what types of incentives and policies the EU and member states will put in place outside of the EU ETS to encourage the energy transition, as that can deeply impact EUA prices," said Berman.

"For example, national governments offered considerable assistance through feed-in tariffs and government auctions to encourage wind and solar development in the last 10-15 years, meaning that the EU ETS had to do less of the heavy lifting. We could see a similar situation as the EU moves to encourage hydrogen development," he said.

Tighter caps

Most of the regulatory changes coming in Phase 4 were agreed years ago under a revision to the EU ETS Directive, but critical changes are coming that are yet to be nailed down – perhaps most importantly the rate of decline in the annual caps on carbon emissions that will drive the pace of emissions reductions out to 2030.

The European Commission in September unveiled its proposal to increase the EU's 2030 emissions reduction target to at least 55% below 1990 levels, from the previous 40%. This would translate into a sharper annual reduction in the carbon caps – the so-called Linear Reduction Factor.

The LRF was 1.74% per year from 2013-2020, and is already set to increase to 2.2% per year from 2021-2030 under the 40% emissions goal. Under a revamped 55% target, this figure will need to increase further, and may be as high as 5% per year, depending on when the steeper rate will apply.

Some analysts have said they expect a lower rate of just over 3% per year, but starting sooner than 2025, to avoid a sharp increase later in the decade.

Other important changes include rules on free allocation of carbon allowances, and a review of the Market Stability Reserve – a mechanism to keep surplus allowances out of the market, effectively tightening supply available to Europe's industrial companies.

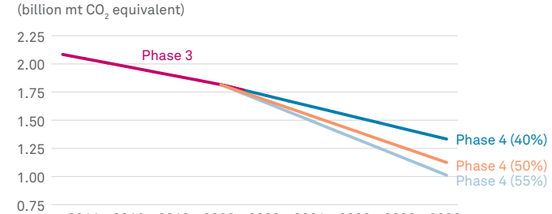
EU to revamp EU emissions trading system post-2020

The EU ETS is a major policy tool designed to deliver a large part of the EU's transition to a low-carbon economy by 2050. Important changes are coming after 2020. These include a tougher emissions reduction target for 2030, more targeted free allocation for industrial sectors, and potential to expand the market to cover new sectors such as shipping.

	Phase 3 2013–2020	**Phase 4** 2021–2030	
EU emissions reduction target Economy-wide emissions, against 1990 baseline	20% reduction	40% reduction 55% reduction	EC in September proposed increasing the EU 2030 target to at least **55%** below 1990 levels, from the previous 40%.
Linear reduction factor Rate of decline to annual carbon cap	1.74%	2.2% >5%	LRF may increase to over **5%** per year, depending on political decisions, to reflect the EC's proposed higher 55% emissions reduction target for 2030.
Market stability reserve Annual intake rate, % of supply	24%	12%	Intake rate falls back to **12%** from 2024. MSR parameters subject to review in 2021.
Free allocation allowances freely given to industrial sectors	**100% of benchmark allocation** for sectors at risk of carbon leakage	**100% of benchmark allocation** for sectors at **highest risk** of carbon leakage **30% for less exposed sectors**	Sectors on carbon leakage list cut from 179 in Phase 3 to 63 in Phase 4. **30%** allocation to be phased out after 2026, and to zero by 2030.
Sectors covered Sectors included under the EU ETS	Power generation Metals Chemicals Refining Other heavy industries Intra-EU aviation	All current sectors plus **Possible expansion to shipping from 2022 at earliest**	Formal proposal expected in 2021 to include CO2 emissions from shipping.
Participation Countries participating in the EU ETS	**28 EU member states** plus **Norway**, **Iceland**, and **Liechtenstein** **Switzerland** linked in 2020	**UK** to leave EU ETS 31 Dec 2020, and to create **domestic ETS or carbon tax from 2021** EU ETS MRV* requirements continue for UK-based installations	UK government seeking to maintain continuity on carbon pricing post-EU ETS, to extent possible.

EU Emissions Trading System, annual carbon caps**

(billion mt CO_2 equivalent)



Phase 3 saw the beginning of a significant shift from coal to natural gas for electricity generation, and the rise of renewable energy

Phase 4 will see those trends continue, and for the first time, the EU ETS may begin to drive a significant carbon reduction from the non-power industrial sectors.

*Monitoring, Reporting and Verification. **Caps are illustrative only. Figures include UK, which will leave EU ETS Jan. 1, 2021. Caps may be adjusted after 2022 to allow time to agree stronger EU emissions reduction target for 2030.
Source: European Commission, S&P Global Platts Analytics

Under the EU ETS, carbon allowances are provided to industry according to a balance of 57% auctioning and 43% free allocation.

Free allocation of carbon allowances will continue after 2020, but will only be available to a much more targeted set of industrial sectors.

Free allocation will be available to sectors on the so-called carbon leakage list – a group of sectors and sub-sectors deemed at highest risk of relocating to avoid EU carbon costs. The list has been cut down from about 180 sectors in the period 2015-2020 to about 60 sectors from 2021-2030.

Companies in sectors on the list will continue to receive 100% free allocation according to their specific industry product benchmark, while those not on the list will receive 30% of the benchmark value, declining after 2025 to reach zero in 2030.

The sector benchmarks are based on the performance of the 10% most efficient installations in each sector, meaning only the most efficient plants will have their carbon needs fully met through free allocation.

More flexible rules have also been set to better align the level of free allocation with actual production levels. This is expected to mean allocations to individual installations may be adjusted annually to reflect increases or decreases in production.

This more targeted approach to free allocation suggests more industrial sectors will have to pay for their CO2 emissions after 2020, creating a greater incentive to switch to lower-carbon processes or close down or reduce running times at older, less efficient plants.

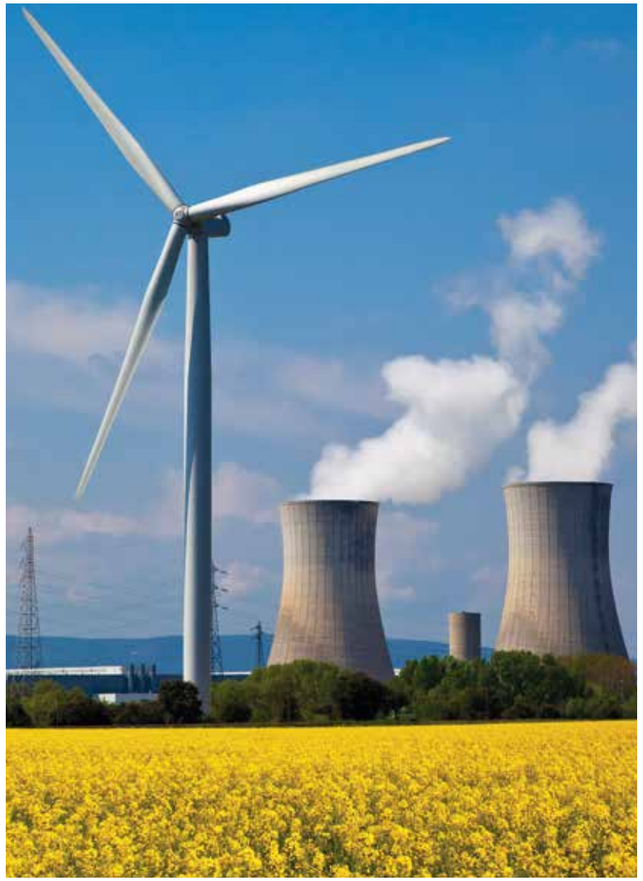
MSR review

The Market Stability Reserve – a major change in the functioning of the EU ETS – was brought into operation in January 2019 and works by removing 24% of the supply of carbon allowances in circulation each year.

The MSR's intake rate will continue at 24% until after 2023 when the rate will fall back to 12% per year, under current legislation.

However, the MSR is up for review in 2021 and its parameters may be adjusted if the mechanism is seen to be falling short of delivering its objective to return the EU ETS to a functioning balance between supply and demand.

For example, EU lawmakers could decide to extend the 24% annual withdrawal rate after 2023, cutting more quickly the supply of allowances available to market participants and limiting the downside for carbon prices in Europe, or potentially driving them to fresh highs.



they look for ways to deliver on the bloc's goals to decarbonize the economy by mid-century.

The system currently covers just over 40% of Europe's economy-wide CO2 emissions, and includes power generation, intra-EU flights, and heavy industries ranging from refining to production of metals, chemicals, cement, ceramics, bricks, glass and a host of other manufacturing activities.

The European Parliament in September voted to expand the system to include CO2 emissions from shipping, and the European Commission is expected to unveil a formal legislative proposal for this in June 2021.

Industrial emissions

The EU ETS has successfully started a process where natural gas and renewables have squeezed emissions-intensive coal out of the power mix in Europe, aided by low gas prices as well as unilateral political decisions by some EU member states to phase out coal-fired power plants.

The coming decade will be a test of whether the system can begin to replicate this success in the non-power emissions-intensive sectors, where emissions reductions have been more elusive to date.

The combination of tighter carbon caps to 2030, a smaller functioning surplus of overall allowances and more targeted free allocation for industry may allow the system to start to move the needle on CO2 emissions from the non-power industrial sectors in the fourth trading phase.

Switzerland links, UK leaves

The EU carbon market's fourth trading phase starting January 2021 will also see the UK leave the EU ETS as a result of its departure from the EU.

The UK has said it wants to maintain carbon pricing continuity for UK-based businesses and has said it is aiming to put in place a domestic UK ETS, or a carbon tax if a market is delayed. Recent speculation has suggested the UK may be leaning toward a carbon tax, although the official government position has been for both options to remain on the table.

The MSR is up for review in 2021 and its parameters may be adjusted if it is seen to be falling short of delivering its objective

The UK already has the expertise in place to run a domestic carbon market, having done so in the years up to the EU ETS starting in 2005, and will maintain the EU ETS CO2 emissions monitoring, reporting and verification requirements in the UK after 2020 to facilitate a domestic market.

"What is clear is that the UK government remains committed to carbon pricing in some form," said Berman at Platts Analytics.

The UK will be the first country to leave the 31-member trading system, while non-EU country Switzerland linked its domestic carbon market to the EU ETS in January 2020.

Overall, the regulatory changes coming after 2020 point to carbon prices holding their recent values, and potentially breaking higher into fresh territory, as the overall supply tightens and EU regulators look to the carbon market to deliver emissions reductions in new sectors on the long road to net-zero in 2050. ■

Go deeper

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Insight from Brussels

Siobhan Hall

How do you destroy enough oil and gas demand to meet your climate goals while protecting jobs, growth and energy security?

This is the task the European Commission has set itself in its efforts to ensure the European Union becomes climate-neutral by 2050.

It's an ambitious goal with consequences far beyond the EU's borders. In 2019 the 27 EU countries' imports of natural gas and LNG amounted to about 233 million mt of oil equivalent, while oil and oil products reached about 473 million mtoe, making the bloc the world's largest fossil fuel importer.

The EC is busy working on vast swathes of legislation to change market rules and conditions to further favor renewables and energy efficiency, as well as decarbonized gases such as hydrogen.

The market will have to wait until June 2021 for the detailed proposals, but the EC revealed some of its ideas in the EU methane emissions strategy and EU buildings renovation strategy it published in October.

These included that it plans to explore all options to reduce leaks of methane, a powerful greenhouse gas, including possible binding minimum performance standards for fossil energy used in the EU. Most leaks happen before the natural gas, LNG and oil reaches the EU, so a new EU policy on methane emissions could have far-reaching impacts on global markets.

"Minimum methane emission standards, targets or other such incentives based on robust scientific analysis can play an effective role to ensure methane emission reductions in the EU and globally," the EC said.

Any such legislation would be based on an impact assessment that would look at the independent verification and compliance checks needed to enforce it, and its potential contribution to cutting global methane emissions. Enforcement will be a major challenge, as the current satellite data is not precise enough to enable accurate, independent monitoring, according to EU sources.

In the meantime, the EC plans to talk to producer countries – including Russia and the US – about best practices for cutting methane emissions, hoping to leverage the EU's position as a major consumer. It also hopes to get a UN accord on cutting methane emissions to 2030 at the UN General Assembly in New York in September 2021.

The EC has already started work on setting up an independent international methane emissions observatory, working with the United Nations Environmental Program, the Climate and Clean Air Coalition, and the International Energy Agency.

This observatory would collect, reconcile, verify and publish data on global man-made methane emissions, building on existing voluntary initiatives such as the UNEP Oil and Gas Methane Partnership, the EC said. The initial focus would be on oil and fossil gas sectors, and the EC wants to extend it to coal, waste and agriculture once more reliable monitoring is possible.

The EC also wants this observatory to compile and publish a methane supply index at EU and international level, enabling fossil energy buyers to compare different sources.

The EC would propose using a default value within the EU for fossil energy volumes, including imports, not covered by an "adequate" monitoring, reporting and verification system, in order to encourage accurate measurements.

The EC would use this default value as needed until "a compulsory measurement, reporting and verification framework for all energy-related methane emissions" was implemented.

Cutting energy use

The EC also set out ideas in its EU buildings renovation strategy on how to cut energy use in the sector by 14% or 53 million mtoe to 321 million mtoe by 2030, compared with 2015.

That drop is more than the total final energy use of the Netherlands in 2018, the EU's sixth largest final energy market that year (excluding the UK).

The plans would hit fossil fuel demand hardest as they accounted for 76.5% of heating energy in EU buildings in 2017. The goal is to decarbonize buildings, exploiting local renewables potential and reducing the EU's dependence on imported fossil fuels, the EC said.

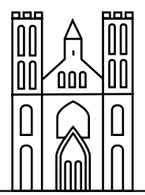
The EC is mulling strengthening the EU's 2030 renewables target for heating and cooling in revised legislation next year, to align it with its proposed target for the EU to cut CO2 emissions by at least 55% on 1990 levels by 2030.

The current non-binding renewables target encourages EU countries to increase the share of renewables in their heating and cooling sectors by 1.3% a year. The EC had originally proposed a binding 1%/year share increase for the 2018 update to the EU renewable energy directive, but national governments rejected this.

The EC is also looking at requiring buildings to use at least a certain minimum level of renewables, and promoting using decarbonized gases. It has estimated renewables and waste heat will have to account for 38-42% of EU energy use in buildings by 2030 to meet the 55% CO2 cut goal.

The EC's fight against fossil fuels continued in November with the publication of the EU offshore renewable energy strategy. Large-scale offshore wind could improve the economics for green hydrogen to displace natural gas. In December the EC's sustainable, smart mobility strategy is due to be published, which could also help reduce or displace fossil fuel use.

Whether the EC's ideas are implemented in the end depends on the European Parliament and the EU's 27 national governments, who will decide on the formal legislative proposals. But the strategies give a flavor of what the EC might propose, giving the market time to prepare for various outcomes. ■



The “U” factor

Six years after Ukraine began to leverage natural gas reverse flows on its western border to reduce its dependence on Russian supply, the country is having an unexpectedly large impact on European gas trade and pricing. By Silvia Favasuli and Gary Hornby

Russia's 2014 annexation of Crimea caused the Ukrainian government to take a historic decision: it would no longer buy gas from Russia and would instead try to import what it needed from its western neighbors.

Immediately after, representatives of the Ukrainian transport system operator, then named Uktransgaz, its Slovakian counterpart and the European Commission, met to study how to enable physical reverse gas flows from Slovakia to Ukraine; and they found a way. Poland and Hungary would follow, enabling reverse flows on their border.

Ukraine's state-owned oil and gas company, Naftogaz, was so proud of this that for at least two years it kept a webpage with a timer counting the minutes spent with no direct imports of Russian gas.

What then sounded like a bold decision, and a very politically motivated one, has become one of the main triggers of structural change across Europe's gas markets in recent years.

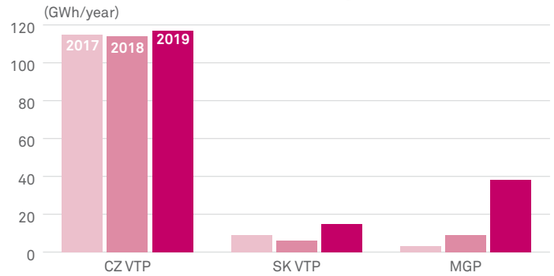
As Poland is also preparing to halt direct imports of Russian gas from 2022, looking at the impact of the "U" factor will not just provide a better understanding of current price movements across Europe, but may also help predict what will happen as more Eastern European countries move away from a heavy dependence on Russian gas.

New hubs in the East

Data from Ukrainian transmission system operator GTSOU shows that during January-September 2020, the country imported about 15 Bcm from Slovakia, Hungary and Poland combined. Slovakia was the biggest contributor, with 9.7 Bcm shipped, a third more than a year earlier.

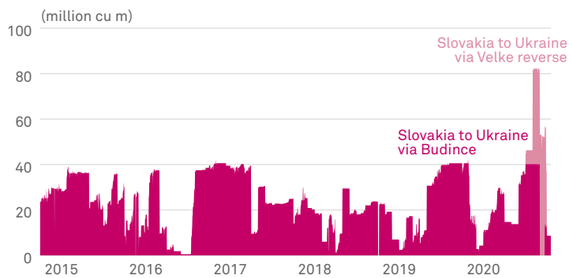
The government's decision to make Ukraine's huge and largely underused gas storage facilities available to foreign traders has been a major factor in the rise in imports.

Traded volume, Eastern European gas hubs



Source: ACER calculation based on REMIT data, Trayport and hub operators

Slovakia to Ukraine gas flows



Source: S&P Global Platts Analytics

Since 2017, foreign traders have been permitted to store their volumes of gas for up to 1,095 days – about three years – without paying value-added tax or customs duties. Stored gas can be sold to another non-resident and exported outside of Ukraine, also without levies. Taxes are paid only when stored volumes are sold to Ukrainian companies and imported into Ukraine.

In 2020, GTSOU was unbundled from parent company Naftogaz, and short-haul transport tariffs were introduced, making it even easier and cheaper for foreign traders to use Ukraine's gas infrastructure.

Ukraine received even more gas via its western borders from July to September 2020, when Slovakia's Eustream agreed to enable virtual reverse flows at Velke Kapusany. The entry point is on the Slovakia-Ukraine border and has historically been used to deliver long-term Russian gas volumes to Central Europe and Italy.

Eustream made 60 million cu m/day of virtual gas transport capacity available from Slovakia to Ukraine during the whole third quarter of 2020.

Over a period of years, access to both Ukrainian storage and inbound transport capacity resulted in large gas flows transiting Slovakia, the Czech Republic and Hungary destined for Ukraine. This in turn created the conditions for the growth of gas hubs in Central and Eastern Europe such as the Czech and Slovakian VTPs, and Hungary's MGP.

CEGH's volatility

One of the first and most important manifestations of the rise in flows and liquidity was at the CEGH gas hub, which used to be perceived as rather quiet or even boring.

Registered participants at the CEGH gas hub numbered 242 in May 2019, a 50% increase in five years. Traders were attracted by the Austrian hub's increasing volatility, fueled by the rising volumes being moved

The government's decision to make Ukraine's huge and largely underused gas storage facilities available to foreign traders has been a major factor in the rise in imports

from Slovakia, Poland and Hungary to Ukraine. This happened as those operating at these eastern gas hubs traded on the spreads between each hub and the Austrian CEGH.

Along with the instability of the CEGH spot price, the spread to the Dutch TTF, the European reference hub, became one of the most volatile in the region. And "high volatility equals opportunity," as one Italian trader put it.

During the summer of 2020, Italian traders active on the Italian PSV and at the Austrian CEGH lost one of their traditional plays, exploiting arbitrage opportunities offered by the typical premium of the Italian PSV contracts to the CEGH equivalent.

Italy's PSV spot contracts were normally at a discount to the CEGH equivalent only rarely and during weekends. But for the first time in history, Italy's PSV spot contract was at a consistent discount to the CEGH equivalent for weeks at a time and most of the summer.

This change was mostly triggered by strong gas demand in Central and Eastern Europe and Ukraine. In oversupplied mainland Europe, where storage facilities were already nearing their limits halfway through the injection season, traders were keen to purchase gas at CEE hubs and ship it to Ukraine's emptier storage facilities.

High gas demand in the region meant that for several weeks in a row, Slovakia and Hungary became the two most expensive gas hubs in Europe, displacing the usual contenders, Italy and Spain.

The Austrian CEGH spot contract, which also provides the basis for Slovakian and Hungarian gas prices, also spiked and rose above its Italian equivalent.

The phenomenon was only a seasonal one, and things returned to normal as soon as the injection season ended. But it showed the full extent of the impact Ukraine's flows can have on even well-established hubs.

TTF price spikes

The impact of gas flows being drawn toward Ukraine went beyond volatility of local prices, and in a reversal of roles, hit one of Europe's most liquid hubs. A surge in demand for virtual reverse flows at the Slovakia-Ukraine border led to unprecedented price spikes on the Dutch TTF hub.

Velke Kapusany is the historical entry point on the Slovakia-Ukraine border for Russian gas destined for Central and Eastern Europe and Italy. Firm capacity is only available in the Ukraine-Slovakia direction. But gas can move virtually from Slovakia to Ukraine when interruptible reverse flow is offered by Slovakia's grid operator, Eustream.

When shippers book some of the virtual transport capacity from Slovakia to Ukraine, the volume is simply netted off physical flows from Ukraine to Slovakia.

For example, if on a given day 100 million cu m of gas are nominated to move physically from Ukraine to Slovakia via Velke Kapusany and 10 million cu m of gas are nominated for virtual reverse flow, only 90 million cu m of gas will physically enter Slovakia on that day.

So when Velke Kapusany reverse flow nominations for Monday Aug. 3 jumped almost sevenfold from he previous Friday to 44 million cu m, traders suddenly realized that of the 110 million cu m expected to enter Slovakia in forward physical mode, only 66 million cu m would actually arrive, a major and unexpected supply cut.

Traders were probably caught by surprise as Q3 2020 was the first time that so much reverse flow capacity was being made available at the Velke Kapusany reverse flow. Previous occasions involved less than 10 million cu m.

The impact of this supply cut was felt across the whole of Europe. On Aug. 3 the day-ahead price on the key TTF hub jumped Eur1.30/MWh or 25%. The corresponding contract on the German NetConnect hub rose by 95 euro cent/MWh (17.75%).

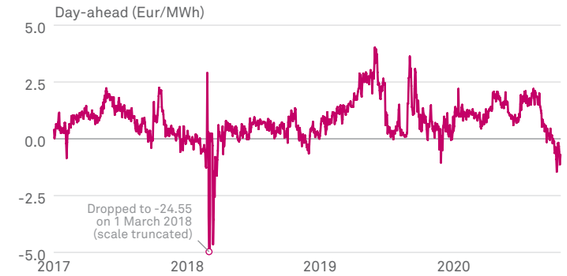
The TTF price spiked again on Sept. 1 when Velke Kapusany reverse flow nominations jumped to 55.5 million cu m from the 42 million cu m/d average in August.

Once again, strong demand for gas destined for Ukraine's storage facilities affected Europe's continental hubs.

West-East price spreads shrink

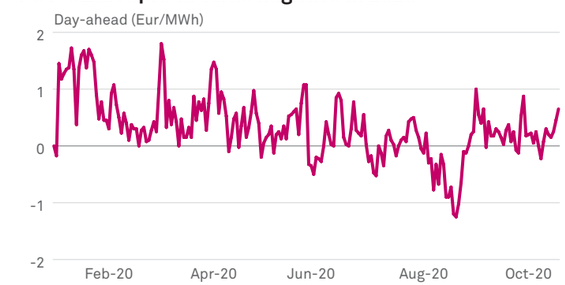
In addition to the seasonal and storage-related shifts, Ukraine is triggering a medium-to-long-term change across Europe's gas markets, one with much greater economic and geopolitical consequences than those seen so far.

CEGH-TTF spread more volatile since 2019



Source: S&P Global Platts

PSV-CEGH spread turns negative in 2020



Source: S&P Global Platts

Although Eastern and Southern European countries remain heavily reliant on Russian long-term contracted gas, the development of new gas hubs in this region, triggered by Ukraine, is slowly contributing to the diversification of regional sources of supply.

This, over time, translates in lower gas prices and a reduced spread between prices in the West and East.

According to data recently published by the European Union Agency for the Cooperation of Energy regulators (ACER), the spread between TTF and Eastern European hub prices has been narrowing over the past few years mostly due to rising traded volumes and liquidity in the latter.

However, this trend was reversed in 2019, when gas prices across Europe saw a big drop of more than Eur3/MWh year on year in most EU member states.

This was mostly due to record LNG deliveries, above-average winter temperatures and well-stocked gas storage facilities.

Still, prices did not fall equally across the EU member states and members of the Energy Community, an organization aiming to extend the EU internal energy market to Southeast Europe and beyond.

For example, the estimated average hub procurement price for gas in the Czech Republic during 2018 was Eur21.070/MWh. This represented a Eur0.220/MWh premium to the Dutch TTF 2018 hub procurement price, much lower than the premium in 2017, of Eur0.640/MWh.

But in 2019 the Czech premium to the Dutch 2019 hub procurement price rose to Eur0.990/MWh because of uneven price falls across the two hubs.

According to ACER, access to a variety of sources of gas and LNG as well as the presence of well-functioning gas hubs remain key elements for reducing price differentials.

While a new LNG terminal in Croatia is expected to increase the diversity of supply sources in Eastern and Southern Europe from January 2021, the increase of gas volumes moved from West to East is expected to continue to boost gas hub development in the region and reduce the price gap between Western and Eastern Europe. That would reinforce Ukraine’s active role in shaping the European gas market. ■

The 2020 Energy Transition Award: utilities double down on carbon reduction

By Drew Fryer and Rahul Mishra, S&P Global Trucost

The Energy Transition Award was developed to recognize the leadership of power companies in the transition to a low-carbon, sustainable economy.

This will be the third year in which it is awarded, as part of the 22nd annual S&P Global Platts Global Energy Awards.

The award recognizes companies at the forefront of the transformation of the energy system that is now underway globally: those power utilities that are leading the way in reporting and reducing greenhouse gas (GHG) impacts, publishing robust targets to improve performance, aligning with global energy transition commitments and demonstrating leadership in innovative ways.

The global power industry is the largest contributor to GHG emissions globally, responsible for approximately one-quarter of global emissions according to the Intergovernmental Panel on Climate Change (IPCC).[1] The IPCC has also stated that "virtually full" decarbonisation of the power sector by around 2050 is necessary to meet the Paris Agreement's target of capping global temperature increase at 1.5°C, and also to meet the less ambitious 2°C target .[2]

The year 2020 and the coronavirus pandemic have presented a whirlwind of challenges for all industries, with the power sector not spared from the tumult. But there are green shoots for those with a focus on the transition to low carbon energy.

As of end-June 2020, the International Energy Agency reported that OECD renewable electricity production was up by 7.7% compared to the same period in 2019. Wind generation increased by a remarkable

1 Intergovernmental Panel on Climate Change (IPCC), 2014: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_full.pdf (page 9

2 IPCC Special Report, Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development, 2020 https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf

Award criteria

Shortlisted companies:

Power utilities were ranked on a series of 12 quantitative criteria measuring their readiness for a low carbon energy transition.

Award winner:

In addition to the below criteria, companies' public reporting will be evaluated for signals of innovation and transformative change aligned with global decarbonization needs, and assessed for alignment with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD[1]), including climate-related:

- Governance structures
- Strategy
- Risk management
- Scenario analysis

Indicator	Type	Focus
Comprehensive public reporting of greenhouse gas emissions	GHG	Disclosure
Reduction in GHG, (6 year % change)	GHG	Recent trajectory
GHG intensity of power generation (tCO2e/MWh)	GHG intensity	Point in time
Reduction in GHG intensity of power generation, (6 year % change)	GHG intensity	Recent trajectory
Zero and near zero GHG power share in 2016 (% of MWh from renewable & nuclear power)	Green-brown share	Point in time
Growth in zero and near zero GHG power share, (6 year % change)	Green-brown share	Recent trajectory
Growth in renewables power share ex. nydro, (6 year % change)	Green-brown share	Recent trajectory
Publication of targets to reduce GHG	GHG reduction targets	Forward looking idicator
Targets implied GHG reduction by 2025 (% p.a.)	GHG reduction targets	Forward looking indicator
Verified science-based target or commitment (Science Based Targets Initiative)	2°C alignment assessment	Forward looking indicator
Paris alignment (Alignment of GHG pathway with limiting warming to below 2°C using the sectoral decarbonization approach)	2°C alignment assessment	Forward looking indicator
Carbon earnings at risk (Unpriced carbon cost as % of EBIT and EBITDA – high scenario – 2030)	Financial impact	Forward looking indicator

1 The TCFD is a body set up by the G10 Financial Stability Board to develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to investors, lenders, insurers, and other stakeholders. https://www.fsb-tcfd.org/

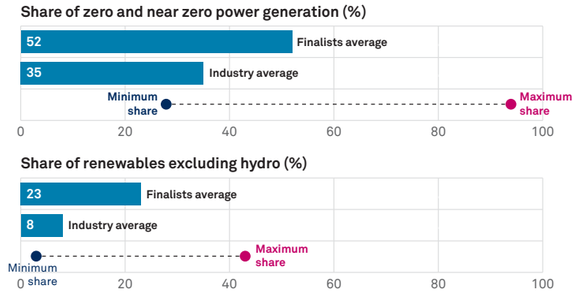
13.6% and solar by 18.8% compared to the first half of 2019. Meanwhile conventional thermal production fell by 9.5%.[3]

In a year heavily disrupted by the coronavirus pandemic, the energy transition is continuing unabated, and power companies cannot afford to stand still.

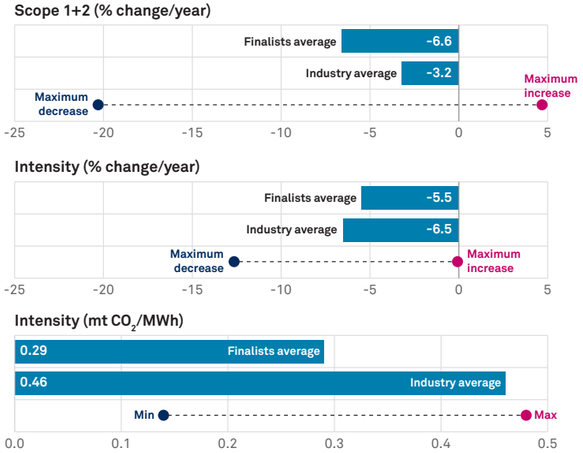
At the same time, an increasing number of countries, as well as private sector actors including investors and corporations, are reiterating their commitment to limit climate change by announcing longer-term targets including net zero emissions ambitions. Countries including China, Japan and South Korea all announced net zero emissions pledges in the second half of 2020, bringing their level of ambition in line with the carbon-neutral target already announced by the European Union.

Investors are also increasingly announcing commitments to net zero portfolios over the medium to long term. The Net Zero Asset Owner Alliance, a group of 30 of the world's largest investors with over $5 trillion in assets under management, has recently led the way, introducing a concrete target-setting protocol, and complementing the work of others such as the IIGCC's Paris Aligned Investing Initiative. Company commitments to net zero emissions are also beginning to expand from a low bar. According to the Science Based Targets Initiative, almost 350 companies have had targets validated as consistent with 1.5°C or well below 2°C thresholds broadly consistent with a zero emissions future, though only ten of these are from the power utility industry.[4]

Clean energy share of power generation



Greenhouse gas emissions performance



Award criteria

No nominations were accepted for this award. The shortlisted finalists were identified by S&P Global Trucost, by assessing the public disclosure of global power companies included in the S&P Global LargeMidCap Index[5], captured by Trucost's annual research engagement program[6]. Consideration was given to a range of factors. Not only to how companies are performing today, but also their performance over the past six years, as well as forward-looking indicators of future performance in the energy transition.

Forward-looking indicators used include published goals to address future climate impacts, calculations of alignment of their emissions trajectory with Paris Agreement goals to limit warming to 1.5-2°C, and potential future earnings at risk from carbon pricing. Each company was ranked across 12 indicators of energy transition, feeding into an overall ranking for each company. This overall ranking determined the 10 shortlisted finalists for the Energy Transition Award.

3 International Energy Agency (IEA), Monthly OECD Electricity Statistics, June 2020 https://iea.blob.core.windows.net/assets/7e9080f5-9bd5-4d4f-8928-aaec94b5fae2/mes.pdf?utm_campaign=IEA%20newsletters&utm_source=SendGrid&utm_medium=Email

4 At end October 2020: https://sciencebasedtargets.org/companies-taking-action/

5 Data as of end August 2020: https://us.spindices.com/indices/equity/sp-global-largemidcap-usd

6 https://eu.spindices.com/documents/additional-material/the-trucost-research-process.pdf

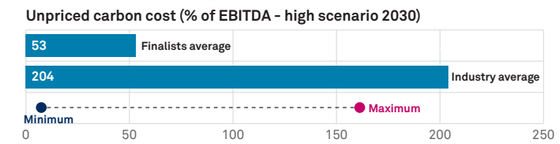
2020 Award finalists

The ten shortlisted finalists for the 2020 Energy Transition Award are:

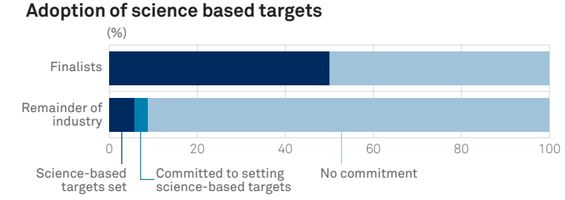
- Contact Energy
- CPFL Energia
- Dominion Energy
- Enel
- EDP
- ENGIE
- NextEra Energy
- Sempra Energy
- SSE
- Xcel Energy

These 10 finalists represent a mix of regions: four from North America, four from Europe, one from South America, and one from the Asia-Pacific region. It is also a mix of repeat finalists and new finalists, including the first ever finalist from Brazil in the three years to date since the initiation of the Energy Transition Award. Within their industry, these ten companies are all exceptionally well-positioned relative to peers given the pace of the energy transition underway. ■

Trucost carbon earnings at risk



Adoption of science based targets



Highlights from shortlisted finalists

Contact Energy produces more than 80% of its power from zero or near zero emissions sources, including almost 40% from non-hydro renewables. It has reduced its emissions intensity by one-third over six years. Contact has set a science-based target to reduce emissions by 34% between 2018 and 2026, and has published TCFD-aligned reporting, including commissioned modelling of potential physical and transition risks and opportunities from two IPCC scenarios.

CPFL Energia produces over 95% of its electricity from renewable sources, primarily hydropower and wind. Its move to full ownership of CPFL Renováveis has meant an earlier 7.5% share of thermal power generation has now fallen to under 2%. It aims to reduce its carbon intensity by 10% by 2024 while continuing to produce at least 95% of its power generated from renewables over that period.

Dominion Energy recently committed to achieve net zero carbon and methane emissions in its electricity and gas operations by 2050. In 2020, it also announced the planned divestment of its gas transmission and storage operations to focus on electric utility operations, for which it plans to generate 70% of power from zero emissions sources by 2035. It is developing the largest offshore wind farm in the Americas.

EDP is a significant developer of renewable energy globally and derives around 40% of its power from renewable sources, up from one-third five years earlier. In 2019 it set updated decarbonisation targets, including to reduce specific emissions by 75% by 2030 relative to 2015, validated as a science-based target, and representing a large uptick in ambition level from its prior target to reduce emissions by 55% over the same period. It has also announced a target to achieve carbon neutrality before 2050.

Enel committed to a new, more ambitious science-based target in 2019 to reduce emissions by 70% per kWh by 2030, compared with 2017, and had already committed in 2015 to achieving zero emissions by 2050. Nearly 50% of its power generated is from zero and near zero emitting sources. It states that it expects to manage 60 GW of renewable capacity by 2022, up 14 GW from 2018, and to reduce coal power generation by three-quarters over the same period.

ENGIE attained a validated science-based target in 2019, featuring a 52% reduction in emissions per kWh between 2017 and 2030, as a step toward a target of full carbon neutrality. It also expects the share of renewable energy in its electricity mix to increase to 58% in 2030. It continues a planned exit from coal-fired power, which fell to 4% of generation in 2019, and helped drive a six-year fall in absolute emissions of over 50%.

NextEra Energy has signed contracts to build approximately 12,000 MW of additional wind, solar and battery storage projects as of the close of 2019. It has announced a target to reduce its emissions per unit of generation by 67% by 2025 from a 2005 baseline, equivalent to a 40% reduction in absolute emissions despite an expected doubling of generation over the period. Today already, more than 50% of its generation is from zero and near zero emitting sources.

Sempra Energy exhibits strong rates of improvement within its industry. It sharply increased zero and near zero power from 15% to almost 50% of its total generated over the six-year period examined, the majority of that in renewables, while having a generation portfolio with no coal fired power assets. Its emissions per unit of power generated fell by one-third.

SSE shut its last coal-fired generator in 2020 and set new, more ambitious emissions reduction targets, including to reduce the emissions intensity from power generation by 60% between 2018 and 2030, now validated as a science-based target and an increase from a previous 50% ambition level. It has commenced reporting against TCFD guidelines. Over the six-year period examined, SSE reduced its absolute emissions by almost 60% and its emissions intensity by 45%.

Xcel Energy reduced its emissions intensity by 20% and its absolute emissions by 10% over the past six years. It has announced a vision to provide 100% carbon-free electricity by 2050, and an interim goal to reduce carbon emissions 80% between 2005 and 2030. Construction is underway to increase its wind generation capacity fivefold over the five years ended 2021. It has also published TCFD-aligned reporting, analysis against 1.5° and 2°C scenarios, and it ties executive compensation to achievement of its emissions intensity target.

2020 S&P Global Platts Global Energy Awards

Resilient. Innovative. Determined.

By Murray Fisher

The S&P Global Platts Global Energy Awards program honors the organizations and individuals dedicated to excellence in the energy industry.

In a year like no other, marked by radical uncertainty, the 22nd presentation of the awards is especially significant as a way of recognizing outstanding achievement

This year's group of winners did not back down. They reorganized around obstacles, developed groundbreaking technology, completed transformative deals and maintained focus on long-term sustainability. The awards drew a record 300 nominations from 43 countries. Even in a global pandemic, our industry works to lift each other up.

Judging was conducted by an impartial panel of international energy experts with backgrounds in regulation, policymaking, corporate leadership, trading and strategic consulting. S&P Global Platts commends the Global Energy Awards winners for demonstrating their ability to innovate, resolve and move our industry forward.

Judging Panel

Charles E. Bayless
Former CEO, Illinova Corporation

Paul Browning
Former Manager, International Crude Trading; VP & Director, ExxonMobil Sales and Supply

Gregory H. Laughlin
Former Member, United States House of Representatives

François-Xavier Saint-Macary
Chairman and Co-founder, Ingenesis

Clare Spottiswoode
CBE, Former United Kingdom Gas Regulator

Flora Zhao
Former President, Gas Asia, BP IST

ENERGY COMPANY OF THE YEAR

ENGIE
France

Even in a tumultuous year, ENGIE delivers: the company has claimed various Global Energy Awards in each of the past five years, and previously reigned as Energy Company of the Year in 2017. The winner of this year's Midstream award again earns the program's highest honor – the company was selected by the judging panel from all Global Energy Awards nominees in recognition of all-around distinction in executing a total energy strategy.

Judges described this perennial winner as "situated at the forefront of the renewables transition", with "a focus on expansion and growth". The panel cited its joint venture pursuing green financing options for four solar and two wind farms in Mexico; its partnership with climate change investor Hannon Armstrong in a 2.3 GW US renewables portfolio; and its acquisition of three European companies from the EFFY Group, specialists in energy performance consulting.

"They keep on investing and backing small companies to help move the industry forward," said judges, referencing the company's recent investments in areas ranging from digital transformation to renewable hydrogen.

Judges congratulate this Energy Company of the Year for exhibiting "top-notch technical performance" and for inspiring its peers in traversing the energy transition.

CHIEF EXECUTIVE OF THE YEAR

Jeffrey W. Martin
Sempra Energy
United States of America

Sempra Energy's Jeffrey Martin is a "standout" as the judges' choice: as CEO since 2018, "it hasn't taken him long to do a lot for the company", they observed.

Sempra Energy serves over 35 million consumers worldwide. Martin has ascended through leadership positions there since 2004, and as CEO, he has concentrated on the goal of becoming North America's premier energy infrastructure company. Martin led a sweeping reorganization of the company's portfolio, including the sales of its US renewables business and and non-utility natural gas storage assets. Under Martin's stewardship, Sempra also divested its South American assets, a move that earned the company 2020 Strategic Deal of the Year honors. These sales together generated $8.3 billion in total gross proceeds.

Under Martin's "clear thinking and articulate" leadership, Sempra Energy has shown "genuine effort" in "the most attractive markets in North America," including California, Texas, Mexico and the LNG export market. Judges also appreciated his external leadership, including service as governor of the Oil & Gas and Electricity communities for the World Economic Forum.

Judges applaud Martin as a "visionary" for moving Sempra Energy forward in the face of adversity.

CHIEF TRAILBLAZER OF THE YEAR

Jillian Evanko,
Chart Industries
United States of America

Honoring the CEO of a company with assets under $10 billion, this year's Chief Trailblazer award recognizes an "exceptional individual" who "accomplished her green initiatives" while notching up a strong financial performance. Jillian Evanko leads Chart Industries, a producer of cryogenic equipment used throughout the liquid gas supply chain and in other industries.

Evanko joined Chart Industries in 2017, moving into the CEO position the following year. She has since made "extensive progress", repositioning the global company as a leader in the clean energy transition by expanding its presence in LNG, hydrogen, biogas/biomethane, carbon capture and other renewable fueling sources while exiting non-core product lines. Evanko also spearheaded initiatives to reduce the publicly traded company's earnings volatility, including a focus on long-term partnerships and expansion into repair and service offerings.

Evanko's efforts have resulted in an "impressive financial performance" – the company recorded revenues of approximately $1.3 billion in 2019, exhibiting "striking growth" as it transforms from a traditional oilfield service provider into a business at the forefront of the move to cleaner energy.

2020 S&P Global Platts Global Energy Awards

LIFETIME ACHIEVEMENT AWARD

Dawood Al-Dawood
Saudi Aramco
Saudi Arabia

Dawood Al-Dawood celebrates more than 37 years in management and technology positions within the energy industry. This "reasoned, well-educated and confident" leader is currently vice president of Northern Area oil operations at Saudi Aramco, this year's Upstream category winner.

Al-Dawood is known for his "decisive nature", a skill developed early in his career as a foreman on drilling rigs. He is often called upon to negotiate major company commercial deals and joint ventures, and is a familiar figure on the boards of Saudi Aramco subsidiaries and affiliates. "He's smart in the way he works with his clients and employees," noted a judge.

The panel praised Al-Dawood's involvement in the development of Manifa, the world's fifth-largest oil field at the time, which set records for extended reach wells while protecting the fragile marine environment. He has also founded the nonprofit Saudi Arabian Drilling Academy, a collaboration among 34 companies developed to meet the oil and gas industry's rising need for skilled talent.

Judges applaud Al-Dawood for having "impressive, proactive impact" on his industry today as well as on future lifetime achievers.

RISING STAR AWARD: INDIVIDUAL

Colette D. Honorable
Reed Smith
United States of America

Colette D. Honorable, a highly regarded policymaker in domestic and international energy sectors, wowed judges with a Rising Star nomination that already shows great strides towards shaping the industry. Honorable is a partner in the global Energy and Natural Resources Group at Reed Smith, LLP, and previously served as Commissioner at the Federal Energy Regulatory Commission from 2014-2017.

Judges appreciated that beyond her already "stellar career" providing legal and strategic advice to clients including Fortune 500 companies, "she's connected into the think-tank circle," as she elevates global conversations on clean energy and global warming. Honorable serves as a Nonresident Senior Fellow with the Brookings Institution's Energy and Climate Initiative, and as a Senior Fellow with the Bipartisan Policy Center, serving on the Global Advisory Board for the Energy Futures Initiative.

Honorable is also a champion of diversity and inclusion in energy and law, and is a longstanding member of the Women's Council on Energy and the Environment, which named her 2019's "Woman of the Year". "She's a superstar now, and her influence will continue to rise," noted the panel.

RISING STAR AWARD: COMPANY

Aurora Solar
United States of America

"Solar used to be designed on a one-off basis, but Aurora Solar's software changes all that," remarked a judge. Founded in 2013, the company aims to save installers time and money by enabling them to create accurate solar designs remotely.

The company's cloud software, Aurora, "employs remote capability to determine site characteristics" so designers of residential and commercial solar projects have a faster, more efficient way to determine how many solar panels will fit on a roof, forecast energy production, calculate electricity bill savings and generate sales proposals.

Judges were impressed by the more than 3.5 million solar projects this powerful software has been used to design. Aurora Solar is already "widely known in the industry", with clients ranging from independent local installers, to several of the largest solar installers in the US. Judges hail this Rising Star's rapid progress and feel the company is "well positioned to grow in the industry."

DEAL OF THE YEAR: FINANCIAL

Guggenheim Securities
United States of America

The winning Financial Deal of the Year "opens the door for more transactions" during a time when "energy companies need creativity, especially on the fossil fuel side", judges said. The complex securitized financing arrangement, completed by Diversified Gas & Oil (DGOC), was structured and executed by Guggenheim Securities, the investment banking and capital markets business of Guggenheim Partners.

This winning deal involved securitization of DGOC's oil and gas wells. It transferred a working interest portion of all of DGOC's producing assets into a bankruptcy-remote special purpose vehicle which, in turn, issued asset backed securities to investors. This transaction's structure allowed diversification of the debt capital structure while enhancing liquidity. The arrangement, which applied structured finance principles that are used in other sectors, was "groundbreaking" for the energy sector; judges feel it offers independent oil and gas companies alternatives to traditional financing sources.

The judges commend Guggenheim Securities for establishing a "new and creative market" through securitization of assets in the oil and gas industry, and sense the promising concept "just may take off."

2020 S&P Global Platts Global Energy Awards

DEAL OF THE YEAR: STRATEGIC

Sempra Energy
United States of America

Energy infrastructure firm Sempra Energy, under CEO of the Year Jeffrey Martin's leadership, accomplished the sale of South American businesses as part of efforts to "refocus and concentrate on what they do best". Judges respected the sale's "strategy, scale and scope" and appreciated that despite the economic environment, Sempra found qualified buyers and "got a great price".

In 2019, Sempra announced its intention to divest its equity interests in its South American businesses, including the largest electric company in Peru and the third-largest distributor of electricity in Chile. It completed the sale of its Peruvian assets to China Yangtze Power International in 2020, generating approximately $3.55 billion in total cash proceeds. Shortly thereafter, it completed the sale of its Chilean businesses to State Grid International Development Limited, generating approximately $2.23 billion in total cash proceeds.

Proceeds from the sales will help fund the company's $32 billion five-year capital plan centered around its three US utility businesses, a "huge strategic move." Judges applaud the dexterity of the deal team for overcoming countless obstacles to achieve transaction closing.

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AWARD OF EXCELLENCE: UPSTREAM TRANSFORMATION

Saudi Aramco
Saudi Arabia

Saudi Arabia's National Oil Company, Saudi Aramco, delivered a "big-picture nomination" describing a "massive megaproject" that judges called a "standout among its many operations." The Manifa project, one of the world's largest producing oil fields, is located in a shallow, delicate marine environment, home to more than 85 different species of fish and 50 species of coral. At Manifa, Aramco demonstrated the company's belief that sustainability makes good business sense.

The company sought "inventive and responsible" solutions to developing the oil field, including conversion of more than 70% of the offshore field into an onshore field through the construction of 27 manmade islands, which were used as onshore drill sites in order to avoid disturbing marine life. Aramco accomplished its conservation efforts while achieving technical complexity: more than two-thirds of its 350 wells are classified as extended-reach.

As the company plans to increase production capacity in 2020 in response to market conditions, judges offer their congratulations to Aramco for its demonstrated commitment to environmental stewardship and operational field excellence.

AWARD OF EXCELLENCE: MIDSTREAM

ENGIE
France

While Energy Company of the Year ENGIE displayed "strength in many areas" during this year's awards, its Midstream nomination prevailed in this very competitive category. The company operates as a global energy player in electricity, natural gas and energy services with a leading risk management and trading business. "ENGIE's strategy towards renewables is evident" in its coverage of what it calls "the full energy mix": thermal and renewable power, biomass, environmental products, natural gas and LNG.

While judges felt ENGIE displays vital "continuity of what they've been doing in the past,", the company is also boldly "entering emerging markets, finding new flexibility, and doing so successfully." Its recent business expansions include Europe, where its Romanian activity encompasses midstream, trading and origination in import, export and local gas; and APAC, where its Singapore platform has become the hub of its global LNG midstream business.

The panel salutes ENGIE for "staying ahead of the competition" while exhibiting a "collaborative nature in local markets", observing, "they just keep getting better and better."

AWARD OF EXCELLENCE: DOWNSTREAM

ENN Energy Holdings
China

Judges found a lot to like at ENN Energy. This year's winner in a perennially competitive category is among the largest clean energy distributors in China; it invests in, constructs, operates, and manages gas pipelines, and sells and distributes piped and bottled gas as China's largest private city gas distributor.

At the heart of ENN Energy's downstream success is "digitalization in all aspects of its business" from both consumer and industrial standpoints, something the company calls "a very disruptive and good force." Employing a customer-oriented strategy, the company closely examines data related to customers' energy consumption patterns and provides customized solutions. It offers a flexible pricing policy tied to alternative energy sources as well as energy-saving retrofitting services, and has also launched smart products including gas meters and automatic shut-off valves to promote the safe use of its gas.

The panel congratulates ENN Energy for demonstrating continued growth, evolution and adaptation: "They've come a long way."

2020 S&P Global Platts Global Energy Awards

AWARD OF EXCELLENCE: LNG

JERA Global Markets
Singapore

LNG champion JERA Global Markets (JERAGM) is a utility-backed seaborne energy trader specializing in LNG, coal and freight. Judges hailed its performance in a "complex and very strategic" part of the energy market: LNG trading.

JERAGM launched its LNG business in 2019 following the merging of JERA, the world's largest buyer of LNG, and wholesale energy market specialist EDF Trading. The merger expanded the firm's global energy trading platform to include LNG supply, offtake and financial risk management. The new LNG team manages the flexibility of over 35 million tons of supply annually, with access to both the European and North American gas markets. Judges agreed that JERAGM's LNG trading operations give them "flexibility in unstable markets."

JERAGM reports it is the first major utility-owned trader in Asia to embrace the business model of utility-owned energy trading in LNG – an established practice in Europe and North America. Judges commend the company for "going beyond national borders and breaking away from its traditional business model in a way that optimizes its entire system."

AWARD OF EXCELLENCE: POWER

Greenlight Planet
United States of America

Greenlight Planet "has really made a difference with their approach to renewables; electricity means that kids who live off-grid can learn to read," reflected a judge in assessing this year's "courageous and transformational" Power winner, which won out this contended category.

Greenlight Planet is a "for-profit social business" with an ambitious mission: to bring more power to off-grid customers. The company designs, distributes, and finances solar home energy for an underserved market: the 1.3 billion global consumers for whom the traditional electrical grid is unavailable or too expensive. To address the issue of affordability for its customers, the company embedded unique technology into its solar home solutions that enables customers to pay in installments – a move that significantly boosted its sales in Nigeria.

The company is now the largest direct-to-consumer, pay-as-you-go solar energy company in the world, providing solar-energy products to rural consumers in more than 60 countries. Judges see "enormous potential" in Greenlight Planet's approach: "It's a great company doing great things."

GRID EDGE AWARD

Kiwi Power
United Kingdom

Action in the Grid Edge category paused briefly at a three-way tie as judges sought to identify the company that is most effectively advancing the electric grid to link utilities and customers. Kiwi Power triumphed, showing judges it is "taking the necessary steps" to unlock value in distributed energy resources and "put more renewables on the grid."

Kiwi Power began in 2009 with energy storage projects in the UK and has evolved through the energy value chain. It is now one of the few Virtual Power Plant companies to deliver both hardware and software solutions. The company enables electricity suppliers, energy storage and renewables asset owners, distribution grid operators and independent aggregators to maximize the value of energy assets, secure new revenue streams, and supply cleaner and more affordable power. It currently manages over one gigawatt of distributed energy resources in more than 10 countries.

Judges liked Kiwi Power's "wide variety of customers" and applaud its recent expansion into North America with Energy Company of the Year ENGIE as its first client.

CORPORATE SOCIAL RESPONSIBILITY AWARD: TARGETED PROGRAM

Grupo Energia Bogotá
Colombia

Electric and gas utilities company Grupo Energia Bogotá operates in Peru, Guatemala, Brazil and Colombia, where some territories are recovering from half a century of armed conflict. Judges honored this CSR winner for a targeted program with a noble goal: "cleaning up land mines to protect children" and enabling citizens to live peacefully once again.

While building an electrical transmission project through previously war-torn territory, Grupo Energia Bogotá cleaned up 11 municipalities in southwestern Colombia through its Energy for Peace program. In partnership with the Colombian army and the NGO Halo Trust, the company worked to safely search, locate and destroy explosive devices, including antipersonnel mines and remains of war.

Grupo Energia Bogotá has now cleared 200 km (124 miles) along the project's path, enabling citizens of the communities to access health and education, resume agricultural activities and move freely through the area. Judges value the company's commitment to creating positive transformation and "do what they can to create peace in their part of the world."

CORPORATE SOCIAL RESPONSIBILITY AWARD: DIVERSIFIED PROGRAM

ReNew Power
India

The Rising Star Company of 2019 returns this year with a "robust and well thought-through" diversified CSR program. As India's largest renewable power producer, ReNew Power builds, owns and operates utility-scale wind and solar energy projects, and distributed solar energy projects. The clean energy provider aims to go beyond standard CSR obligations through its ReNew India Initiative.

The initiative's broad scope includes providing access to electricity for the 47% of rural government schools without access; addressing women's issues exacerbated by climate change; and solving the acute water shortages faced by more than 600 million Indians. Since the program's 2011 inception, ReNew has electrified 61 schools, directly impacting the lives of 25,000 students; mentored more than 800 rural women towards becoming entrepreneurs; and provided access to clean drinking water to over 15,000 villagers. In total, the company estimates its social responsibility programs have positively impacted more than half a million lives to date.

Judges hail the "extensive nature" and "broad-ranging scope" of ReNew's CSR initiatives as it works towards its goal of building climate-resilient communities.

SUSTAINED EXCELLENCE: GREEN INITIATIVES

Wells Fargo & Company
United States of America

The award for Sustained Excellence in Green Initiatives recognizes a heavy energy consumer that is demonstrating an ongoing commitment to energy efficiency. Financial services firm Wells Fargo & Company aims to accelerate the transition to a low carbon economy and reduce the impacts of climate change on its customers; to do so, it set ambitious sustainability goals and has worked methodically to achieve them.

Judges recognized that the company has "only bought renewable-generated electricity" since 2017, primarily through the purchase of Renewable Energy Credits; it is currently a top-ten green power user in the US. The firm is now transitioning to a higher mix of long-term renewable energy contracts and increasing on-site generation. The company also reduced its water consumption by 61% from a 2008 baseline, waste by 46% from a 2010 baseline, greenhouse gas emissions by 52% from a 2008 baseline, and achieved carbon neutrality for the 2019 fiscal year.

Wells Fargo has "really stepped up with putting money behind renewables and energy efficiency", admired a judge; the panel anticipates that other large energy buyers will soon follow in its footsteps.

CONSTRUCTION PROJECT OF THE YEAR

Korea Midland Power
South Korea

When Korea Midland Power's Seoul electric power plant, located on the Han riverbank, was slated for closure in 2017, the state-run power generation firm explored its options. It considered rebuilding onsite or relocating, but could not find a suitable solution. The company ultimately made an "innovative and bold" move: it went underground.

According to the company, the Seoul Combined Cycle Power Plant is the world's first underground power plant to be built in an urban area. It is surrounded by a thick outer wall designed to prevent leakage and withstand earthquakes. The resulting operations produce 800MW of power, enough to support about half of the city's 3.7 million households. Above ground, Korea Midland Power is transforming the area into lush public parks and reimagining the closed power plants as cultural spaces open to citizens, a decision that is proving "very popular with the community."

The plant began production in 2019 and is slated for completion in 2020. Judges applaud Korea Midland Power for the complexity of this truly inventive project: "You have to be very creative to put something that big underground."

ENGINEERING SOLUTION OF THE YEAR

EDL
Australia

Sustainable distributed energy producer EDL owns and operates power stations in North America, Europe and Australia, but its winning engineering project struck judges for its remoteness: it sits "in the middle of nowhere, where mining operations are often located." The Agnew Hybrid Renewable Project, located at Gold Fields' Agnew Gold Mine in Western Australia, is the first in Australia to power a mine with wind-generated electricity.

EDL's remote energy business provides electricity to off-grid areas – the company works to move its customers towards more sustainable solutions. Fortunately, as a judge remarked, "there's very good wind and solar out there." EDL puts it to work through Australia's largest hybrid renewable microgrid, which commenced operation in 2020. The microgrid controls four energy components: wind, solar, battery and gas/diesel. With a total installed capacity of 56MW, the project claims to abate 46,400 tons of CO2 emissions annually.

Judges praise the project's advanced microgrid, which achieves 99.99% reliability thanks to battery stabilization, and compliment EDL's "remarkable accomplishment" thanks to its large scale and "hybrid approach."

COMMERCIAL TECHNOLOGY OF THE YEAR

Fluence
United States of America

"Energy storage is a fundamental component of energy transition," observed a judge; yet "doing it at a scale that makes economic sense for larger projects" can prove challenging. The winning Commercial Technology firm is an energy storage technology and services provider combining the benefits of mass production and customization, enabling its customers to efficiently and effectively decouple the supply of renewable energy from demand.

Fluence launched its sixth-generation technology stack to help solve the storage problem. This modular, configurable solution improves energy storage through three components: factory-built, highly modular storage technology; a fully integrated operating system; and digital intelligence to improve system decision-making, asset performance, and operating costs. The company likens its "platform" approach to that of car manufacturers using a standard chassis as the basis for multiple car models; its integrated hardware, software and digital intelligence layers are the basis for solutions that are standardized, yet flexible.

Judges concur that Fluence's solution has clear "commercial potential" and is "already making an impact" for its "geographically diverse" customers in 22 countries and territories worldwide.

EMERGING TECHNOLOGY OF THE YEAR

Star Scientific
Australia

Star Scientific scored a convincing win with technology that optimizes "the great things about hydrogen" and, according to the company, could be "the missing element in the hydrogen revolution." The firm has operated for nearly 25 years as a research company specializing in muon-catalyzed fusion, a type of cold fusion, with expertise in hydrogen. Three years ago, Star Scientific's experts discovered a heat-producing true catalyst: it is not consumed in the process and does not require energy to start and stop.

This unique catalyst, the Hydrogen Energy Release Optimizer (HERO), enables Star Scientific to use hydrogen and oxygen to create energy and water. It describes the process as "a complete zero-emission way to make high-intensity heat in a very fast time," reaching temperatures greater than 700 C in minutes. The company claims it is also "completely scalable, from a very small unit to massive power stations," making it a practical source of energy for industrial markets.

Judges believe that Star Scientific's solution "helps support the vast potential of hydrogen", the simplest and most abundant element in the universe, as a cleaner-burning fuel.

Andrés Gluski
President and Chief Executive Officer
The AES Corporation

The AES Corporation (NYSE: AES) is a Fortune 500 global energy company accelerating the future of energy. Together with our many stakeholders, we're improving lives by delivering greener, smarter energy solutions. Our diverse workforce is committed to continuous innovation and operational excellence, while partnering with our customers on their strategic energy transitions and continuing to meet their energy needs.

At AES, we understand that today's organizations want to ensure a better future and a greener world. AES recently introduced new product offerings to help customers build competitive advantages as leaders in their respective industries. Customers can take many paths toward reaching their energy goals. Together with AES, customers can achieve a higher standard of clean energy, drive impact through access and insights, secure their sustainable energy future and achieve scale benefits through shared platforms and applications. Bottom line, AES allows organizations to accelerate their clean energy transformations, make meaningful contributions toward a sustainable climate and build competitive advantages, accelerating a clean energy future.

Achieve a higher standard of clean energy
There are many paths customers can take toward 100% renewables. AES is one of the largest renewable solution providers and developers, bringing 2-3 GW in new wind, solar, hydropower and energy storage online every year. We introduced energy storage as a solution to usher in a new era of firm renewables, and through Fluence, our joint venture with Siemens, we built the world's leading platform. In Hawaii, we're working with Kauai Island Utility Cooperative to provide energy from a solar + storage solution that will help the state meet its commitment to be 100% powered by renewables by 2045. In Chile, we're working together to power our communities with more renewable energy by combining 50 MWh of energy storage with our Alto Maipo hydropower plant to create a first-of-its-kind virtual reservoir.

Drive impact through access and insights
A big piece of the clean energy equation for many of our customers is the effective use of data, artificial intelligence and other smart technologies to increase reliability and efficiency while reducing carbon emissions and lowering operational costs. We're leveraging digital technology to expedite the shift to renewables and the deployment of new energy solutions.

Secure your sustainable future
We're diversifying the energy matrix in countries that rely on conventional generation with cleaner energy, including Panama, Vietnam and the Dominican Republic. Since introducing natural gas in the Dominican Republic 20 years ago, we've saved customers more than half a billion dollars a year and avoided approximately four million tons of CO2 emissions annually. To accelerate this transformation, we came together with Energas through a new joint venture, EnaDom. Together, we've developed infrastructure solutions like the Eastern Gas Pipeline and a liquefied natural gas (LNG) terminal to bring LNG to other regions in the country. What's more, we're bringing the benefits of natural gas to neighboring countries by transforming the Dominican Republic into the main energy distribution center in the Caribbean. By 2022, we expect the Dominican Republic to operate on 70% natural gas.

Gain scale benefits through shared platforms and applications
When it comes to making the greatest impact to improving lives, we're better together. Our recent partnership with 5B will accelerate the broad adoption of solar energy by enabling customers to add solar resources at a pace that is three times faster while providing up to two times more energy within the same footprint of traditional solar facilities. We're already bringing 5B's innovative solution to Panama and Chile. Together with Uplight, the world's largest cloud-based energy efficiency provider, we're also transforming how utilities engage with customers by deploying industry-leading digital applications and engagement platforms.

George P. Sakellaris, P.E.
Senior Managing Director,
President and Chief Executive Officer
Ameresco

Ameresco (NYSE:AMRC) is a leading energy services company with a comprehensive portfolio of energy efficiency and renewable energy solutions. Our technical independence coupled with our advanced technology portfolio allows us to integrate best-in-class solutions for the unique needs of each customer.

We provide energy efficiency services, distributed energy generation, infrastructure upgrades, energy analytics and supply management, plant operations and maintenance services, all with practical financial solutions. Our team of technical experts deliver measurable cost savings through customized efficiency measures. Whether focused on securing infrastructure upgrades, meeting sustainability goals, or creating resiliency, our customers benefit from a single provider of comprehensive energy solutions.Drawing from decades of experience, Ameresco develops tailored energy projects for federal and local governments, education, healthcare, commercial, industrial, and public housing sectors across North America and the United Kingdom.

Comprehensive Portfolio
Our objective approach delivers the most advanced technologies to meet the unique needs of each customer. Our deep bench of technical expertise enables Ameresco to present a comprehensive portfolio of innovative energy and infrastructure solutions to our customers. The majority of our projects are budget-neutral, funded by energy cost savings.

We work with our customers to determine the best approach to upgrading their energy portfolio, ensuring the consideration of all solutions. This typically begins with energy analytics to identify areas of deferred maintenance and overall roadmap of energy and infrastructure upgrades. Then efficiency measures reduce demand, eliminate excess energy usage, and establish cost savings. Following demand reductions, we work with customers to right-fit distributed generation solutions to balance or offset reliance on the grid and increase benefits of renewable energy and advanced energy management. We also deliver energy supply management services to assist customers in managing the costs of their energy portfolio. Finally, we continuously add more value to the customer's energy portfolio with our expert operations & maintenance services.

The Ameresco Advanced Technology portfolio spans:
- Energy Efficiency
- Distributed Energy Generation, Battery Storage & Microgrids
- Infrastructure
- Energy Analytics & Supply
- Operations & Maintenance

Customer-Driven Mindset
Our customers come first. Our experts know that listening to our customers is crucial when designing custom solutions with the most advanced, innovative technologies. What's more? We guarantee results. We have a market reputation across North America & Europe for excellence in customer satisfaction. Putting our customers first has enabled Ameresco to provide best-in-class services and grow market leadership to become a leader in the energy solutions market.

Company History
Founded in 2000 by George Sakellaris, Ameresco has successfully completed energy saving, environmentally responsible projects with Federal, state and local governments, healthcare and educational institutions, housing authorities, and commercial and industrial customers.

As a pioneer in energy efficiency and an early champion of renewable energy, George's perspective for Ameresco has played a pivotal role in the green movement--so important to today's society--whereby more organizations in the public and private sectors adopt responsible, sustainable processes and business practices. His vision, foresight, integrity and commitment to doing well by doing good are reflected in the company's success in smart energy solutions, distributed energy assets, and turnkey operations and maintenance throughout the years.

Ameresco is a global, publicly traded energy efficiency and renewable energy leader with more than 1,100 employees providing local expertise in 70 offices throughout the United States, Canada, and the United Kingdom. It is also the only company of its kind to be technology and vendor-neutral, which means each customer served is matched with innovative energy solutions that meet their unique needs.

Baker Hughes

Lorenzo Simonelli
Chairman, President
and Chief Executive Officer
Baker Hughes

Baker Hughes (NYSE: BKR) is an energy technology company that provides solutions for energy and industrial customers worldwide. Built on a century of experience and with operations in over 120 countries, our innovative technologies and services are taking energy forward—making it safer, cleaner and more efficient for people and the planet.

Baker Hughes operates across four business segments – Oilfield Services, Oilfield Equipment, Turbomachinery and Process Solutions, and Digital Solutions – as the only fullstream technology company in the industry. We have the scope and scale, portfolio and expertise to drive better outcomes and optimize solutions across markets and industries and through cycles.

From the first rotary drill bit to the world's most extensive portfolio of highly efficient compressors and gas turbines, and from digital solutions that predict outcomes to modular deepwater technology that reduces product lifecycle costs, for more than a century our inventions have been revolutionizing the industry.

Industrial and digital technology leadership is core to who we are. We will continue to apply engineering, science and data to redefine what's possible and lead the industry by deploying technology and software that radically transforms productivity, reduces environmental impact and builds capabilities in new energy solutions.

Baker Hughes recognizes there is a transforming energy future—one where oil and gas will play an important but different role. As an energy technology company, we are committed to reducing the carbon intensity of our operations, applying proven low-carbon technology to help our customers meet their environmental goals, and innovating for the future of energy.

Our People, Planet, and Principles framework grounds and guides our responsibility to sustainable operations and enables us to accomplish our business priorities while doing our part to progress shared global goals and commitments.

This begins with sound governance, responsible and ethical business practices, safe operations, as well as fostering a diverse and inclusive culture in which employees collaborate without boundaries to solve tough challenges.

Visit us at bakerhughes.com.

Statistics:

Operate in 120+ countries worldwide with approximately 58,000 employees
In 2019, earned $23.8 billion in total revenue, invested $678 million in R&D, and received 2,700 patents
Have four innovation and technology centers and 13 product development centers globally
Achieved a 31% reduction in scope 1 and 2 carbon equivalent emissions across our global operations since 2012
Committed to 50% reduction in carbon equivalent emissions by 2030 and net zero carbon equivalent emissions by 2050

BrucePower™
Innovation at work

Mike Rencheck
President and Chief Executive Officer
Bruce Power

We are Bruce Power

Situated on the shore of Lake Huron, Bruce Power provides nuclear power to one in three homes, hospitals, schools and businesses in Ontario and medical isotopes across the globe to keep medical equipment sterilized and assist in fighting disease.

Established in 2001, Bruce Power is Canada's only private sector nuclear generator, annually producing 30 per cent of Ontario's power at 30 per cent less than the average cost to generate residential power.

Bruce Power is a Canadian-owned partnership of TC Energy, Ontario Municipal Employees Retirement Systems (OMERS), the Power Workers' Union and The Society of United Professionals. A majority of our employees are also owners of the business.

Bruce Power employs more than 4,000 people and, over the past 15 years, has been one of the largest investors in Ontario's electricity infrastructure, providing billions in private dollars to the Bruce Power site.

Ontario's Long-Term Energy Plan is counting on Bruce Power to provide a reliable and carbon-free source of affordable energy through 2064. To do so, Bruce Power has signed a long-term agreement with the province to refurbish six of its eight units, investing $13 billion private dollars into these publicly owned assets. Bruce Power's Life-Extension Program will create and sustain 22,000 jobs annually while injecting $4 billion into Ontario's economy each year.

Since 2016, more than 60 supplier partners have opened offices or manufacturing facilities in our neighbouring counties as the majority of these organizations play a role in Bruce Power's Life-Extension Program. Bruce Power is working alongside local municipalities to transform the area into a nuclear energy-inspired economic hub and sustain the company as a world leader in the nuclear sector.

While our CANDU reactors continue to produce affordable and clean electricity, the development of small modular reactors (SMRs) is among the innovative initiatives in our vision for the future. SMRs have an important role to play in the fight against climate change. Canada's innovative nuclear industry is poised to be a leader in the world's supply of small modular reactors.

Bruce Power is dedicated to being an active community partner and we donate more than $2 million every year to community charities and organizations. We give back and lift up. Help and cheer on to support the great work that is being done to improve lives, protect the environment, celebrate culture, encourage education and build healthy communities.

Statistics:

Bruce Power generates 30% of Ontario's electricity at less than 30% of the average cost to generate residential power
Operates 8 CANDU nuclear reactors
Provides 6,400 megawatts of low-cost, reliable and carbon-free energy
Employs more than 4,000 people
Injects $4 billion into Ontario's economy annually
Creates and sustains 22,000 jobs across the province each year
$1.2 billion annual investment in Ontario labour income
Bruce Power produces Cobalt-60, which helps sterilize 40% of the world's single-use medical devices and equipment
70% of the power the province needed to shut down coal stations was provided by Bruce Power reactors
Bruce Power has provided front-line organizations across the province with 2 million pieces of personal protective equipment (PPE) over the course of the COVID-19 pandemic. This represents the largest announced private-sector donation of PPE in Canada

John Breckenridge
Senior Managing Director
Head of Clean Energy Infrastructure
Capital Dynamics

Capital Dynamics Clean Energy Infrastructure

Capital Dynamics is an independent global asset management firm focusing on private assets including private equity, private credit, and clean energy infrastructure.

Capital Dynamics Clean Energy Infrastructure (CEI) is one of the largest renewable energy investment platforms in the world with USD 6.5 billion AUM[1] and one of the longest track records in the industry. The CEI strategy was established to capture attractive investment opportunities in the largest sector of global infrastructure – proven renewable energy technologies, primarily in North America and Europe. The team seeks to add value in operational, construction-ready and late-stage development investment opportunities across solar, onshore wind, energy storage and related infrastructure with a focus on both utility-scale and distributed generation technologies. The platform's fully integrated asset management affiliate provides highly-specialized services to ensure optimal performance and value from projects.

The strategy currently manages 7.9 GWdc of contracted gross power generation across more than 150 projects in the United States and Europe [2] and is one of the top 3 global solar PV owners.[3] In the United States, the CEI team has continued to play a leading role in the storage sector with 2.9 GWh construction with an additional 8.0 GWh under development.

Since the CEI platform's inception in 2010, over 17 million metric tons of greenhouse gas emissions have been avoided as a result of the firm's renewable investments.[4] This is equivalent to the power needed to supply more than 3 million homes or passenger vehicles for one year.[5]

Significant and Innovative Projects in 2020

- Switch and Capital Dynamics continued to advance the Gigawatt Nevada initiative with the announcement of three groundbreakings in Nevada, including the largest behind-the-meter solar plus battery project in the world.
- Capital Dynamics acquired the Eland Solar & Storage Center, a 400 MWac PV plant with an integrated 300 MW/1,200 MWh battery energy storage system, from 8minute Solar Energy. This project represents one of the largest solar-plus storage equity transactions in the United States and is the second-largest solar-plus-storage project announced to date.
- Capital Dynamics successfully acquired a 353 MWdc portfolio of 16 operating solar projects from Coronal Energy, LLC. The transaction expands Capital Dynamics' utility-scale solar portfolio adding 16 high-quality, contracted operating assets located across North America.
- Capital Dynamics completed acquisition of the Puerto Real 1 Solar Project, expected to be amongst the largest solar facilities in Spain once operational.

Industry Recognition in 2020

- Highest rating (A+) from the Principles for Responsible Investment in the Direct Infrastructure category.
- Named a "Sector Leader" by GRESB (ESG benchmark for real assets) in the Renewables Power Generation category and in the Americas category, and was awarded a 5 Star Rating. Four of the Platform's projects were also rated 1st, 2nd, 3rd, and 4th in the U.S. solar power category.

1 Capital Dynamics, as of September 30, 2020. Includes assets in renewable energy projects managed by Capital Dynamics, including USD 4.1 billion assets under discretionary management and USD 2.4 billion tax equity assets. Tax equity is a financing solution for renewable energy projects.

2 Capital Dynamics, as of September 30, 2020. Includes operational assets, partially commissioned assets and contracted assets with PPAs secured.

3 Renewable Assets (Owners) League Tables. Bloomberg New Energy Finance as of September 30, 2020. Includes (i) assets with financing secured / under construction, (ii) partially commissioned assets, and (iii) commissioned assets projects globally, excluding China.

4 Environmental benefits are based on US Environmental Protection Agency Greenhouse Gas Equivalencies Calculator.

5 Environmental benefits are based on US Environmental Protection Agency Greenhouse Gas Equivalencies Calculator.

Brian Vaasjo
President and Chief
Executive Officer
Capital Power

Responsible Energy for Tomorrow

Capital Power (TSX: CPX) is a North American power producer headquartered in Edmonton, Alberta. We create responsible electricity solutions to power communities, businesses and critical services across Canada and the United States for generations to come.

Reducing emissions
We're innovating thermal generation to reduce emissions, increase efficiency, and implement viable carbon conversion and utilization technologies. Alongside our thermal assets, we're developing and operating a robust renewable portfolio of wind and solar assets to expand the capacity of clean energy in our grids. Together, our thermal and renewable assets represent approximately 6,500 MW of generation capacity that is well-positioned to support the low-carbon energy system required for our longevity as a global community. Essential today, essential for our future – we're laying the groundwork to meet our goal of being net carbon neutral before 2050.

Measuring and disclosing our performance
Capital Power is committed to growing our company to deliver long term value, protect our environment, and help our communities thrive. As a group of experts and innovators in our field, we're passionate about sustainability and seek opportunities to transform power generation and support the fight against climate change. We believe a holistic transformation of our energy system requires an "all-of-the-above" solution from our industry —one that expands our use of renewable energy, employs storage technologies to optimize those renewable sources and transitions to lower- and zero-carbon thermal generation with improved efficiency and minimal emissions. We report on our actions and performance, and continue to evaluate and evolve our climate- and ESG -related reporting to clearly demonstrate our vision, purpose, strategy, and value creation.

Innovating to net carbon neutral
Today, we're well on the path to advancing zero-carbon baseload generation options, including clean hydrogen and carbon conversion solutions, like our game-changing investment in the development and commercialization of C2CNT – a technology that captures carbon emissions from the air or flue gas and transforms them into carbon nanotubes that can be used as an additive to substantially increase the strength of materials such as concrete, steel, and aluminum. The use of carbon nanotubes in downstream industrial processes, such as cement production, reduces the amount of inputs and energy required, driving additional reductions in carbon dioxide emissions. We plan to adapt this technology to commercial scale at our forthcoming Genesee Carbon Conversion Centre (GC3), located onsite at our Genesee Generating Station in Canada.

Our power generation facilities are a hub of innovation and we are continuously learning, adapting, and developing to create clean, reliable and accessible electricity. At Capital Power, we care about our planet, our neighbors and our collective future. We're working to create a brighter world powered by responsible energy.

Statistics:

$2.52 billion market cap
6,500 MW of power generation capacity; 1,240 MW from renewables
28 power generation facilities
350 MW of renewable capacity in development
869 employees
44% women on Board of Directors
43% women on Executive Team
$9.32 million in community investment across Canada and the U.S.

Jill Evanko
President and
Chief Executive Officer
Chart Industries, Inc.

Chart Industries: Revolutionizing and Enabling the Energy Transition

Being at the forefront of the clean energy transition, Chart Industries, Inc. (NASDAQ: GTLS) is a leading provider of technology, highly engineered equipment and services related to liquefied natural gas (LNG), hydrogen, biogas and carbon capture amongst many other applications. Our unique product portfolio is used in every phase of the liquid gas supply chain, including upfront engineering, service and repair. More specifically, we manufacture bulk and packaged gas cryogenic solutions for the storage, distribution, vaporization, and application of industrial gases, LNG and hydrogen. Our more specialized products also serve unrelated industries like Food & Beverage, Water Treatment, Aerospace and Medical, to name a few.

Chart is a key player in the development of small-scale models and the associated infrastructure that is revolutionizing the energy landscape and further enabling the clean energy transition. We are bringing natural gas power to off-grid locations and providing an alternative transport fuel for trucks, ships and even railway locomotives. Our complete portfolio of mobile super vacuum insulated solutions make transportation by road, rail or sea a reality. Chart equipment essentially helps to create a virtual pipeline by delivering LNG and hydrogen to areas where no pipeline or gas grid exists.

Aside from our transport trailers and mobile regasification systems, we've developed cryogenic railcars that have been successfully carrying LNG for many years. Our patented vacuum technology ensures longest liquid hold times with minimal pressure increase and no loss of product. We also have multiple fixed fueling station designs currently in use in addition to skidded stations for more remote locations or unique applications. Recognizing that a permanent fueling station is not always an option, we developed the Orca™ MicroBulk Delivery System, a completely self-contained mobile fueling station. Whether by road, rail or sea, Chart offers a complete portfolio of mobile solutions to make these LNG and hydrogen distribution options a reality.

We have 50+ years of experience in the design and manufacture of hydrogen equipment solutions through our global manufacturing footprint. To date, we have produced 800+ hydrogen bulk storage tanks, offering customers storage capacity options in excess of 100,000 gallons. Aside from storage, our hydrogen capabilities span a wide variety of applications including fueling station, transport trailers and liquefaction.

Chart's vision is to be the global leader of engineered equipment, systems and aftermarket to the clean energy, industrial gas and diversified specialty markets. We want to be the supplier of choice due to our value to customers while also being the employer of choice because we are a safe, ethical, and rewarding workplace with high opportunity for individual and team growth.

Our goal is to remain at the forefront of the clean energy transition by providing technology, equipment and services related to LNG, hydrogen, biogas and carbon capture, amongst other applications that leverage our expertise and product suite. These include related products that serve the water treatment, food & beverage, aerospace, laser cutting, and critical care industries.

Last year alone, our products helped produce over 45 million tons of LNG to replace coal-fired power generation outside the U.S. while also reducing 120 million gallons of diesel used in power generation in the Caribbean and Europe. In the U.S., our equipment helped to reduce over 40 million tons of coal used in power generation. We also helped to reduce over 350 million liters of diesel used by over-the-road trucks. As a responsible corporate citizen with over 25 global locations, we are committed to excellence in environmental, social and corporate governance (ESG) issues both for our company as well as our customers.

For more information, please contact our Chief Commercial Officer, Joe Belling, at joe.belling@chartindustries.com.

Jack Fusco
President and
Chief Executive Officer
Cheniere Energy, Inc

Cheniere: we provide clean, secure and affordable energy to the world.

Around the globe, countries, communities and companies want many of the same things: to be productive, healthy and safe. At Cheniere, we provide clean, secure and affordable energy to the world — energy that can reduce carbon emissions, help lead to cleaner air, and light homes and power factories — all manufactured and transported by modern energy infrastructure run by a world-class workforce.

We began operations in 2016, and we're already the largest producer of LNG in the U.S. and the second largest LNG operator in the world. Our LNG has reached dozens of markets on five continents, and the demand for our fuel is expected to grow as countries around the world seek cleaner ways to power their economies. We're operating, constructing and developing two LNG facilities on the U.S. Gulf Coast. These facilities reliably and safely process billions of cubic feet of natural gas per day into LNG and load the liquid energy onto insulated ships that keep the product cold for their journeys around the world.

Statistics:

- Largest producer of LNG in the U.S.
- Second largest operator of LNG in the world
- Our operations have reached dozens of markets in five continents
- Safely process billions of cubic feet of natural gas per day into LNG

Paula Gold-Williams

President and
Chief Executive Officer
CPS Energy

CPS Energy is a globally recognized industry leader, powering the dreams of Greater San Antonio, Texas for more than 160 years. We've proudly served the community for more than half of its rich 300-year history, taking important steps along the way to meet the energy demands of our growing city. Headquartered in the heart of the Alamo City, we are the largest municipally owned electric and natural gas company in the United States.

Together, with our 3,100 employees, we align around our *Guiding Pillars* of *Reliability, Customer Affordability, Safety, Security, Environmental Responsibility,* and *Resiliency*, while remaining continually mindful of our underlying foundation of *Financial Stability*. Through our vertically-integrated business model, we service more than 1 million customers with residential bills ranking lowest when compared to the 20 largest U.S. cities.

We generate power for our community with one of the most diversified energy portfolios in the nation, including traditional fossil fuel sources and renewable sources such as wind, solar, and battery storage. We are among the top municipally owned wind energy buyers in the nation and San Antonio ranks number one in Texas and number 5 in the nation for solar generation.

Ranked as one of the best-managed and most economical utilities in the nation, CPS Energy continues to think globally and act locally to provide innovative and groundbreaking solutions for our community.

CPS Energy's innovative *Flexible Path℠* is a strategic approach to thoughtfully discover, explore, and implement new power generation and demand-side solutions over the next 20 years and beyond. The *Flexible Path℠* is CPS Energy's over-arching strategy to transform our utility to lower and non-emitting energy resources to become a utility of the future.

Our *FlexPOWER Bundle℠* is a historic initiative to add up to 900 MW of solar, 50 MW of battery storage, and 500 MW of firming capacity. CPS Energy strives to be the global pilot center for innovation and renewable solutions to power our City. We distributed our momentous RFI globally in over 10 languages and plan to do the same for our unprecedented RFP!

CPS Energy values partnerships to strengthen our renewable energy focused pathway and recently partnered with the region's mobility provider, VIA Metropolitan Transit by providing renewable natural gas (RNG) created by landfill biogas to VIA's fleet of over 500 buses, beginning in 2021. In addition, CPS Energy partnered with the City's public water utility for a pilot program to leverage community assets and maximize customer benefits while enabling our Smart City vision. CPS Energy's Advanced Metering Infrastructure (AMI) or Smart Grid infrastructure not only improved operational efficiencies but laid the foundation to a technologically enhanced infrastructure for the City of San Antonio.

These are just a few examples of CPS Energy's many synergistic partnerships towards innovation.

Sound financial management enables the utility to enjoy AA+, Aa1, and AA ratings from Fitch Ratings, Moody's Investors Service, Inc., and Standard and Poor's Rating Services, respectively.

Statistics:

Year Founded:	1860
Assets:	$11 billion
Payment Towards City's General Fund (since 1942): $8 billion	
Credit Rating:	AA+ Credit Rating
Employees:	More than 3,000
Customers:	More than 1 million
Service Territory:	Approximately 1,515 square miles to include 8 counties & 31 suburban cities
2020 Rankings:	No. 1 – Largest Municipally Owned Electric & Gas Utility in the U.S. No. 1 – Solar Energy Capacity in Texas within City Limits No. 2 – Wind Power Producer in Texas No. 5 – Solar Energy Capacity in the Nation No. 2 – Nationally Among MOUs for Total Solar, Owned, or Contracted

Edouard Neviaski

Chief Executive Officer
Global Energy Management
Business Unit
ENGIE

ENGIE is global reference in low-carbon energy and services. Our purpose is to act to accelerate the transition towards a carbon-neutral world, through reduced energy consumption and more environmentally-friendly solutions, reconciling economic performance with a positive impact on people and the planet. We rely on our key businesses (gas, renewable energy, services) to offer competitive solutions to our customers. With our 170,000 employees, our customers, partners and stakeholders, we are a community of Imaginative Builders, committed every day to more harmonious progress.

ENGIE is active across the entire energy value chain, connecting markets worldwide

Our expertise breadth enables us to be a one-stop shop with solutions meeting customers' increasingly sophisticated needs.

Operating at the heart of ENGIE, our global energy management solutions experts develop our midstream business worldwide, specializing in risk management and trading, with an expertise built over more than 20 years optimizing the Group's asset portfolio.

With a 1,400 staff developing this business in 16 offices worldwide, and 8 main spots (Paris, Brussels, Rome, Houston, Singapore, London, Madrid, Bucharest), we cover the full energy mix, serving clients across the value chain, from upstream producers to downstream prosumers. Our global reach and strong local presence enable us to offer diverse profiles customized services and help them make the most of rapid changes in mature or emerging markets. Our offer includes energy supply & global commodities; energy transition solutions; risk management and market access along with asset management for third parties.

We are growing into a reference global green midstreamer, linking clients wanting to lower their carbon footprint and source green energy to renewable asset owners. We provide green corporate PPAs, along with a full set of environmental products; global and local flexibility services; power optimization for renewable producers; local smart grids solutions.

Pursuing our ambition to energize a sustainable world, we continuously expand our business presence and diversify our service offer. We also develop a growing suite of e-services, including client platforms, web apps and blockchain-based solutions.

The Investment Services Provider status of our financial trading arm, ENGIE Global Markets, ensures stringent standards in risk control, client protection and business practices. Our clients benefit from the best of energy trading and financial expertise.

Statistics:

60 billion EUR revenues
96.8 GW installed power production capacity
26.9GW of installed renewable capacity including wind, solar, hydro, solar, biomass, biogas and biomethane
-59% CO2 emissions between 2015 and 2019
189m EUR invested in R&D
192m EUR invested in innovative start-ups
1bn EUR of green bonds issued
1st IPP worldwide
1st European gas infrastructure operator
1st globally in cold distribution networks

GUGGENHEIM

Matthew Brogdon
Senior Managing Director
Energy Investment Banking

Guggenheim Securities is the Investment Banking and Capital Markets Business of Guggenheim Partners.

Guggenheim Securities provides thoughtful and independent advice to public and private companies, governments, and other institutions. We are known for our extensive experience working on complex situations. Having successfully differentiated ourselves in the marketplace, we are known for our thought leadership, strong relationships, analytical approach, transactional experience, and trusted advice.

We anticipate trends and changes in competitive dynamics within industries, and proactively advise our clients on how to exploit these factors. In addition, we are highly experienced in meeting our clients' objectives by creating unique transaction structures to bridge buyer and seller concerns.

We have strong relationships with virtually all of the leading companies and investors within the industries in which we focus. Our broad network of relationships enables us to provide our clients with an informed perspective on industry and market trends, as well as thoughtful strategic ideas.

We substantiate our advice and theses through our rigorous analytical approach. Our analyses are anchored on macro, industry, and situation specific examinations. The advice we offer to clients incorporates a focus on value creation from both a company and shareholder perspective.

We have extensive transaction experience and have worked on major, industry shaping transactions. Over the last decade, our senior bankers have advised on trillions of dollars in announced transactions.

We have assembled a team of highly skilled, experienced and trusted advisors. We offer differentiated advice and add strategic value for our clients in both their executive suites and board rooms. We help clients maintain focus in high stakes situations and are willing to tell a client to walk away from a deal if we believe that is the best answer.

Our services fall into four broad categories:

Advisory
We serve as trusted advisor to our clients in connection with mergers, acquisitions, divestitures, restructurings, spin/split-offs, joint ventures, leveraged buyouts, capital raisings, recapitalizations, exchange offers, takeover defenses, special committee assignments, fairness opinions, and other special situations. Our senior professionals have advised on some of the largest and most complex transactions in their industries.

Financing
We help clients raise capital through public and private offerings of equity and equity-linked securities, debt, and structured products.

Sales and Trading
We provide a broad array of sales and trading services to institutional clients. Our experienced professionals deliver differentiated content and specialized execution. Our Corporate Access team works across Equities, Fixed Income, and Investment Banking to provide companies access to investors, and to sponsor thought deadership events and industry specific conferences.

Research
Our research team delivers differentiated insights on macroeconomic trends, industry-specific themes, and individual companies. Our analysts assess companies' entire capital structures to provide unique investment perspectives.

Jera Global Markets

Kazunori Kasai
Chief Executive Officer
JERA Global Markets

S&P Global Platts Excellence Award: JERA Global Markets

JERA Global Markets (JERAGM) is a leading utility-backed seaborne energy trader specialising in LNG, Coal and associated Freight, with a platform to trade across all key markets (North America, Europe, Middle East, Africa and Asia).

JERAGM is a joint venture (JV) between majority shareholder JERA Inc. (66%), the leading Japanese power producer and EDF Trading (33%), the trading arm of a leading European power producer Electricite de France (EDF).

Its business model is one of asset-backed trading. It is built upon its position as the exclusive optimiser of the fuel portfolios of JERA and EDF, which it leverages to develop physical flows of LNG and coal in all key regions of the world. To do so it seeks to develop and maintain a best-in-class trading platform, hiring skilled Front, Middle and Back office staff, and building a tailor-made infrastructure that support its trading activities creating a robust internal control framework and providing unique competitive advantages.

The JV was originally set-up in April 2008 and its activities were extended to include LNG in April 2019. JERAGM operates one of the largest seaborne energy portfolios in the world giving it access to an in-depth understanding of the way local, regional and international energy markets behave. These insights enable the company to help its customers increase security of supply, optimise their fuel supply portfolios and improve the risk management of their energy assets.

In only one year, JERAGM has positioned itself as a global leader in LNG asset-backed trading world. Starting with zero 'Master Agreements' required to trade physical LNG, it now has over sixty, covering the key LNG players worldwide. It has significantly contributed to increasing liquidity in the LNG market, on both a physical and financial basis, making a notable impact as a market-maker in the Pacific basin. Its activities are focused on the tradable horizon, from the spot market to 4-5 years ahead. It has developed structural offtake positions across the globe, most notably in the US (Freeport and Corpus Christi), Papua New Guinea (PNG) and Malaysia (Satu).

JERAGM's LNG team manages the flexibility of over 35 million tonnes of supply each year, with structural access to European, North American, Middle Eastern and Asian gas markets. Over the course of its first 12 months of operations, JERAGM traded c.500 cargoes with over 30 counterparties worldwide. It also traded c.240mbbl of oil, 1,100 TBtu of TTF and 900 TBtu of JKM, amongst other financial products. Its LNG Trading team is c50 staff strong, located in Singapore, London and Tokyo and able to trade in all key markets 24/7.

JERAGM's coal team manages around 50 million tonnes of supply each year and operates a major coal terminal in the Netherlands. It has developed long term supply contracts with power stations in Europe (mainly Germany and Poland), in the Middle East (Dubai), in India and in Japan. Its team of c50 traders and operators are able to source coal from all main producing countries (Australia, Indonesia, Russia, South Africa, US,...) and deliver it to its end customers either as a direct feed or as a blend depending on the quality requirements.

The headquarters of JERAGM is in Singapore, with offices located in the UK (London), Japan (Tokyo) and the US (Baltimore). Its total staff is of c200 skilled professionals.

PTTEP

Mr. Phongsthorn Thavisin
Chief Executive Officer
PTTEP

PTT Exploration and Production Public Company Limited (PTTEP) is the E&P flagship of PTT Group, Thailand's national oil company. Currently PTTEP has more than 40 projects globally. Our business is driven by the vision to become the "Energy Partner of Choice" through competitive performance and innovation for long-term value creation.

At PTTEP, we believe that, to achieve the ultimate goal in ensuring energy security and sustainable growth for all, collaboration is more vital than competition to create value for all of society, to improve the quality of life. In addition, PTTEP recognizes the importance of its commitment to adhere and to uphold good corporate governance and business ethics, which will result in growth, prosperity and dignity, and reinforce confidence among shareholders and stakeholders.

PTTEP's Sustainable Development Philosophy
To build and contribute to the drive towards sustainable development, PTTEP has established principles for sustainable business operations, that form the foundations to drive towards corporate sustainability. We aim to be a High Performance Organization (HPO) with robust structures and performances on Governance, Risk Management and Compliance (GRC) to achieve the goal of long-term Stakeholder Value Creation (SVC).

Technology Development
New technology is another key factor in the volatile energy business, PTTEP's vision for technology development is to become an energy technology partner, enhancing E&P business competitiveness and readiness for future energy transitions to ensure the company's sustainable growth. We develop technology through partnership with both Thai and international parties and institutions. Moreover, knowledge sharing is crucial, both within PTTEP and with partners across sectors. By encouraging collaboration, we bring together various expertise inside and outside the energy sectors to jointly develop technologies and innovation to enhance capabilities and achieve sustainable business objectives.

Driving Transformation
The petroleum exploration and production business will continue to face a number of challenges in the next few years, especially those brought by Disruptive Technology. In this time of sudden and rapid change, adaptability and an ability to transform will determine how a business can maintain its competitiveness.

PTTEP has adjusted our business strategy to anticipate advancing technologies and drive transformation. The first one is "Digital Transformation" to enhance competitiveness through technology such as Artificial Intelligence, Machine Learning and the Internet of Things (IoT). This will enable effective and quick informed decisions, increase exploration successes, and enhance the potential development capacity and production of more petroleum resources.

Another area is "Organization and New Normal Transformation" that will allow us to adopt a more streamlined structure and management process, empowering the capabilities of our people, and strengthening the corporate mindset and culture. So that PTTEP becomes an ever more agile organization with accelerated decision-making and responsiveness, to ensure continued reductions in costs and natural resources required for operations.

In addition to transformation, PTTEP is also exploring New Business opportunities alongside our core business to create future growth focusing on three new businesses the natural gas value chain such as gas turbine power plants (Gas to Power), LNG related businesses, and commercialization of technological innovation projects developed within PTTEP including Robotics and AI, Predictive Maintenance, and Renewable Energy. In 2019, PTTEP launched AI and Robotic Ventures (ARV).

ARV solutions build upon our specialized technologies in E&P which have been instrumental in enhancing our competitive capability. This expertise will be available to support other industries to boost their efficiency and business value.

We trust that these transformation strategies and our new businesses will drive the company to strong and sustainable growth and enable it to meet the challenges facing the oil and gas industry.

REPSOL

Josu Jon Imaz
Chief Executive Officer
Repsol

Repsol is a global multi-energy company with presence in 34 countries, operating along the whole value chain in oil, gas, and electricity. In 2019 it became the first company in the sector to set an ambition to become a net zero emissions company by 2050 through decarbonization and by increasing its renewable electricity generation capacity and developing mobility alternatives such as biofuels and hydrogen.

The company is moving aggressively into renewable electricity generation, both in large-scale facilities and distributed power installations for large businesses and domestic consumers, as well as nurturing its traditional fuels business through the implementation of circular economy biofuels inputs into its refining system that will form the basis of refineries of the future.

The company operates hydroelectric, cogeneration and combined-cycle gas plants for a total of 2,952 MW and will add a further 800MW of wind and solar projects over the course of the next year. In total, Repsol aims to reach a low-carbon generation capacity of 7,500 MW by 2025, with investments into this accelerated expansion representing a significant part of the company's total.

With over one million customers, Repsol is a growing player in the electricity and gas market in Spain, offering solutions based on digitalization and high value-added services like renewable self-generation. It is the only major retailer in Spain with the "A" Label, the highest certification granted by Spain's National Commission on Markets and Competition (CNMC) for supplying environmentally friendly electricity.

Repsol is a leader in developing new solutions for sustainable mobility. Its service stations have a multi-energy offering that includes ever more efficient fuels, 230 electric recharging points, and 745 AutoGas supply points. In total, the company has nearly 5,000 service stations in Spain, Portugal, Peru, Italy, and Mexico.

In its commitment to eco-fuels as an alternative to decarbonize mobility, Repsol promotes pioneering industrial projects like the construction in Spain of one of the largest plants in the world for net zero emissions synthetic fuels produced with renewable hydrogen and of the first plants in the country dedicated to the production of advanced biofuels using recycled raw materials.

Repsol is the largest Liquified Petrol Gas (LPG) market player in Spain, with four million customers, and is also one of the most prominent players in the Portuguese market.

The company produces some 655,000 barrels of oil equivalent per day and has one of Europe's most efficient refining systems. Its six refineries, five in Spain and one in Peru, have the capacity to produce over one million barrels of oil derivatives per day. The chemicals business has three complexes in Spain and Portugal and various subsidiaries that produce a wide range of high value-added products used to manufacture everyday objects that improve people's quality of life, well-being, and safety.

Repsol has aligned its strategy and investments with the climate change objectives in the Paris Agreement and mapped out a decarbonization path with intermediate targets for 2020 to 2040. This strategy has already been recognized by investors worldwide, including Transition Pathway Initiative (TPI) association and the Climate Action 100+ initiative.

Repsol is a benchmark in innovation to transform the energy sector, supported by technology, digitalization, and the circular economy. It develops its own technology solutions in the Repsol Technology Lab research center with more than 250 experts, 20 specialized laboratories, and close to 200 alliances with prestigious partners all over the world. Furthermore, the company has several investment funds for participating in start-ups to develop solutions in advanced mobility, new materials, and digital technologies.

Repsol employs 25,000 persons and its products are sold in over 90 countries.

S·POWER
An AES and AIMCo Company

Ryan Creamer
Chief Executive Officer
sPower

Headquartered in Salt Lake City, Utah, sPower is a leading independent power producer (IPP) that owns and operates a wind, solar, and storage portfolio of nearly 2,000 megawatts, with 15,000 megawatts of projects under development. sPower is owned by a joint venture partnership between The AES Corporation (NYSE: AES), a Fortune 500 global power company, and the Alberta Investment Management Corporation (AIMCo), one of Canada's largest and most diversified institutional investment managers.

sPower was formed in January 2012 by a proven management team with more than 30 years of experience in successfully creating energy and infrastructure projects. At first, the company was focused on acquiring small distributed generation projects. In the subsequent years, sPower has experienced rapid growth, developing and managing utility-scale solar projects as large as 500 megawatts.

In less than a decade, sPower has built a portfolio of more than 150 renewable generation systems across the U.S. and has produced enough electricity to sustainably power more than 1.5 million homes for one year.

Our vision is to be the nation's leading integrated renewable energy IPP. We do this by deploying creative development strategies, delivering best-in-class project execution and leveraging our team's experience to provide high-performing, valuable renewable energy solutions to our partners, while being a good corporate citizen in all aspects of our business. We set ourselves apart from our competitors by remaining the owner and operator throughout the project life, conducting operations and maintenance on projects in-house. Our owner/operator model guarantees quality of service and unrelenting performance while aligning our interests with the success of our landowners, the community, finance partners and the off-taker.

Statistics:

2,000 MW in Operating Assets
15,000 MW Development Pipeline
155+ Projects Owned and Operating
13 Billion + kWh Generated and Counting

SEMP Check®
PROVEN EXPERTISE

Archie Thompson
Founder, President and
Chief Executive Officer
SEMPCheck

SEMPCheck was the first company to commercially recognize the value multipliers in the life cycle of oil and natural gas assets by integrating the power of internet-based software with boots on the ground operating expertise. Over the past 20 years, our proprietary cloud-based risk management solutions and analytical tools have driven operational excellence targeted to reduce the risk of liabilities and catastrophic failure. We have an impressive and diverse client base of upstream, midstream, downstream and renewable energy companies.

SEMPCheck integrates its configurable cloud-based software applications with client internal quality control processes to provide process safety management, risk mitigation and critical equipment monitoring services. Our 30+ online software modules work in real time to help our clients maintain a safe workplace across all their assets and organizations while also protecting the environment. Our analytical tools can be customized to monitor and assess all of your key performance indicators with data captured by our applications and integrated with data from your other internal digital applications.

In addition to our software offerings, SEMPCheck offers a wide range of outsourcing services which include mobile infrared GasFindIR, other infrared camera inspections, facility compliance walkdowns, Pre-BSEE inspections and safety system witness testing. Outsourcing to SEMPCheck reduces the organizational burden of maintaining safe and compliant operations which better enables our clients to concentrate on their primary businesses of renewable energy generation and of finding, producing, processing and transporting oil and natural gas.

Our key multi-disciplined personnel have over three hundred years of combined experience in Process Safety Management Systems, Risk Mitigation and Critical Equipment Monitoring. In addition, our boots on the ground solutions provide our clients access to professional EH&S and regulatory compliance field specialists as well as ASNT certified infrared gas leak detection experts.

SEMPCheck's offerings are enhanced by our third-party alliances with existing providers of real-time amalgamation solutions which manage risks across all levels of our clients' organizations. These alliance offerings enable our clients to identify and monitor the current state of operational risk in their assets and human resources, providing actionable intelligence and facilitating organizational level collaboration.

Our risk barrier solutions are based upon the "Swiss Cheese" model of accident causation developed by James Reason to provide an excellent visual representation of how a high severity problem is comprised of a system of breakdowns within an organization.

SEMPCheck's by the numbers proven expertise is as follows:

- 20 Years supporting the oil, natural gas and renewable energy industries
- 300 Years of key personnel combined industry experience
- 545 e-Record inspections performed by regulatory agencies using SEMPCheck's proprietary products
- 15,144 Operational changes managed using SEMPCheck's Management of Change (MOC) product
- 74,243 Job Safety Analyses performed using SEMPCheck's Job Safety Analysis (JSA) product
- 103,524 Critical devices managed using SEMPCheck products
- 125,000 Devices and critical equipment scanned for integrity using our Infrared Cameras
- 918,708 e-Library files managed using SEMPCheck's e-Library product

Jeffrey Martin
Chairman and
Chief Executive Officer
Sempra Energy

Sempra Energy: Investing in North America's Energy Infrastructure

Sempra Energy's vision is clear: to deliver energy with purpose. Each day its 18,000 employees work tirelessly to deliver sustainable, resilient and affordable energy to power the lives of over 35 million consumers – and they do so with an unwavering commitment to do the right thing, champion people and shape the future.

Over the past two years, the company has advanced its mission to be North America's premier energy infrastructure company through a capital rotation program focused on realigning the company's asset portfolio to the most attractive markets in North America. Sempra Energy has now strengthened its leadership positions in three of the top 15 economies in the world – California, Texas and Mexico – and advanced its position in North America's growing liquefied natural gas (LNG) export market. Moreover, the company is focusing its role in the energy value chain on transmission and distribution investments that provide attractive risk-adjusted returns and higher value for stakeholders.

Sempra Energy believes the energy industry will experience significant disruption in the next 20 years and views this as an opportunity to help lead the global energy transition. By enabling access to safer and more reliable, lower-carbon energy solutions underpinned by robust transmission and distribution infrastructure, the company is expanding energy access around the globe. Through its infrastructure platforms in North America, including in LNG export infrastructure development, the company is helping to create jobs and economic growth in the U.S. and Mexico, while also improving trade balances and providing a cleaner fuel alternative to the world.

Sempra Energy has been consistently recognized for its leadership in diversity, inclusion and sustainability. The company is the only North American utility holding company named to the Dow Jones Sustainability World Index in the last three years. Sempra Energy has received numerous recognitions for its environmental, social and governance leadership, including: Forbes' America's Best Employers for Diversity; Forbes' and JUST Capital's JUST 100 list; Bloomberg's Gender-Equality Index; the Human Rights Council's Best Places to Work for LGBTQ Equality; and Newsweek's Best Corporate Citizens.

Sempra's family of companies include:

IEnova IEnova develops, builds and operates energy infrastructure in Mexico, and is one of the largest private energy companies in the country with operations in 17 of Mexico's 32 states.

Oncor Electric Delivery Company LLC Oncor operates the largest distribution and transmission system in Texas, providing safe and reliable service to approximately 10 million Texans.

PXiSE Energy Solutions PXiSE Energy Solutions is a market leader in renewable energy and DER integration, helping customers manage increasingly complex distributed energy grids to increase resilience, achieve carbon savings and reduce costs.

San Diego Gas & Electric SDG&E is an electric and natural gas utility that provides clean, safe and reliable energy to approximately 3.7 million consumers in San Diego and southern Orange Counties.

Sempra LNG Sempra LNG's mission is to be North America's premier LNG infrastructure company by providing sustainable, safe and reliable access to U.S. natural gas for global markets. Sempra LNG owns a 50.2% interest in Cameron LNG and is currently developing additional LNG export facilities on the Gulf Coast and Pacific Coast of North America.

Southern California Gas Company SoCalGas is the largest natural gas distribution utility in the U.S., providing safe, reliable, and increasingly renewable natural gas service to approximately 21.9 million consumers.

For more information on Sempra Energy, visit Sempra.com and follow @SempraEnergy on Twitter, LinkedIn and Instagram.

Andrew Horvath
Global Group Chairman
Star Scientific Ltd

About Star Scientific Limited

Founded in 1998 by Andrew Horvath, Star Scientific is a private research and development company located north of Sydney, Australia and south of the industrial port of Newcastle on the eastern seaboard. The company and its subsidiaries currently engage 25 staff in Australia and Europe, across science, engineering, corporate and finance divisions.

The core business of Star Scientific for two decades was research into Muon-catalysed fusion. During its research it discovered an anomaly, which it soon realised was a profound discovery - and named it the Hydrogen Energy Release Optimiser, or HERO®.

While hydrogen is enjoying significant global attention at present, and in particular "green" hydrogen developed from sustainable energy sources such as wind, solar and pumped hydro, there is a gap in the deployment of hydrogen for industrial purposes.

Contemporary thinking limits the application of hydrogen for industrial purposes to blending with other gases, combustion, via fuel cell technology or as industrial feedstock. All have their limitations for large-scale, continuous, ecologically sustainable, scalable application.

HERO® changes this. It is the missing link in the hydrogen supply chain, turning hydrogen into continuous industrial heat without combustion, allowing it to achieve its full potential.

HERO® is a catalyst usually applied to a substrate in the form of a coating. The heat is then transferred, primarily via conduction, through the substrate. The development of HERO® for commercial application is leading to significant advances in our understanding of substrate materials.

HERO® has been patented globally and has no competitor. It has created a new category in the hydrogen supply chain, that of a true catalyst. This means it is not used up in the catalytic process and can turn clean hydrogen into continuous industrial heat without combustion. Once the feed gases are removed it also quickly reverts to its inert state with zero combustion. Pure water, which can be re-used in the process of hydrogen generation, is the only other output.

Testing has proven HERO® can be run continuously without any detriment to the catalyst itself. It is also scalable, able to be deployed for small scale power solutions in remote locations or to be scaled up for large scale legacy industrial sites such as coal-fired power stations, where it can be retrofitted to ensure continuity and sustainable power generation.

The HERO® catalyst has been independently assessed and verified by Professor Scott Donne, Head of the School of Chemistry at the University of Newcastle.

The commercial roll-out of HERO® will be facilitated by two subsidiaries, Planet Power Systems, which will manufacture and maintain the HERO® units and Zurich-based Planet Power Finance, which will finance Star Scientific's investments in its vertically-integrated development of the green hydrogen chain.

The application of HERO® is global in scope. Star Scientific believes it is the missing element in the hydrogen revolution and is helping usher in a new industrial age that will make affordable, safe and reliable clean energy available to everyone. This will impact a variety of communities, from developing countries who do not have access to reliable power right through to larger economies who want to accelerate their energy transition.

The time for HERO® is now.

clariter

Ran J. Sharon
President and
Chief Executive Officer
Clariter

Since its formation in 2003, Clariter's patented technology has provided a new alternative for plastic recycling and a large-scale solution for the world's plastic waste problem.

While the industry currently turns plastic waste into plastic, energy, or fuel, Clariter's unique process transforms the majority of plastic waste streams, even those with the lowest value, into high-value, pure ready-to-use industrial products: oils, waxes, and solvents. These can be used as ingredients in over 1000+ end-products that clean the planet and create profitable business opportunities too.

"Our mission is to enable a clean slate for our B2B partners," says CEO Ran Sharon. "Without compromise on profitability or sustainability – Clariter unlocks the value of the Circular Economy."

Their technology is proven through a Research & Development Plant in Gliwice, Poland, and an Industrial-scale Plant in East London, South Africa. Proudly, Clariter is the first clean-tech company to get a free financial advisory agreement with the European Investment Bank. They are also named as one of "#1000 Solutions to Protect the Environment" by the Solar Impulse Foundation.

The jury selected Clariter for its contribution towards a paradigm shift in the downstream industry. Rather than pollute and deplete natural resources, they actively clean and protect the planet.