S&P Global Platts

Insight

December 2021

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Global Energy Awards

Russia's big hydrogen ambitions | Surging container freight rates | North Sea's crude quality shift | OPEC+ post-pandemic balancing act

Tech & data:
driving the energy transition

Insight

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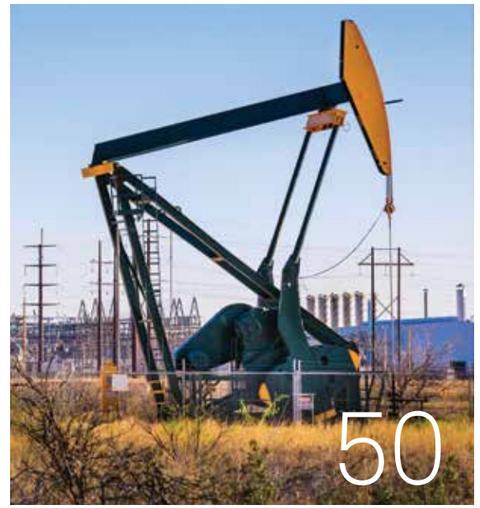

Editor's Note

Barbara Lorenzo Caluag

Editor

As we were putting this edition of Insight magazine to bed, climate policy leaders from across the world were busy hammering out the agreement dubbed the Glasgow Climate Pact. The transition to cleaner fuels has preoccupied every corner of the energy sector for several years, but for the first time, we saw a global pledge to cut fossil fuel subsidies and speed up emissions reduction plans, albeit with the "phase out" of coal power softened to a "phase down".

While the global economy remains heavily dependent on – and invested in – fossil fuels, investments in energy transition are also gathering pace. S&P Global Platts President Saugata Saha discusses the role that technology will play in bridging the gap between traditional and new fuels (page 8). The role of markets is also crucial, enabling emissions reduction and avoidance, along with other environmental, social and governance attributes, to be accurately valued and incentivizing investments in the right direction to meet climate goals.

When it comes to emissions, carbon intensity is becoming of particular interest to the market. Arsalan Syed and Paula VanLaningham look at the emerging trend for crude oil trades to take into account carbon emissions, and explain how Platts has started to provide insights into carbon intensity and the calculations behind this attribute (page 50).

This edition also ranges over the implications of the changes in North Sea crude oil quality (page 46), and how the relationship between members of the OPEC+ alliance is affecting the balance of a market that continues to suffer from the effects of the coronavirus.

Staying with the theme of coronavirus impacts, George Griffiths charts the dramatic journey of the container markets since early 2020, from the pandemic's outbreak to the delays caused by the stuck Ever Given ship in the Suez Canal (page 26).

After another grueling year for many in the energy sector, it is important to take stock and celebrate the positive achievements in the sector. From driving value and excelling in strategic investments, to serving communities and the environment, we celebrate the successes of companies and individuals through the S&P Global Platts Global Energy Awards from page 74. It gives us great pride to be working with an exceptional industry that is facing challenge after challenge head on.

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Explore Insight

Our website spglobal.com/platts contains an extensive selection of free news, videos, podcasts and special reports about energy and commodities. Here's a small selection of recent highlights

Interactive
Oil Security Sentinel

A deep-dive into the factors that have helped insulate oil markets from the rise of supply disruptions in the Middle East and beyond.

Year ahead
Commodities 2022

Analysis and features from Platts content and pricing teams on the factors that will shape and drive markets in the year ahead.

Podcast
Platts Future Energy

This series provides insights on energy transition, tomorrow's fuels and energy sources, and the implications for commodity markets, from oil to power to metals. Also available on your favorite podcast apps.

Big picture
Platts Infographics

In a collection of visualization projects, Platts' wealth of data does the storytelling to illustrate some of the most significant developments in commodity markets.

Data and technology will fuel the energy transition

Data and technology have the potential to bridge the gap between old and new fuels, accelerating energy transition, writes S&P Global Platts President Saugata Saha

World leaders are doubling down on an energy transition that will rely more heavily on renewable sources of energy as we move closer to key climate commitments.

Investment in the energy transition is well underway, with daily news reports announcing new projects for wind, solar, hydro-generation, battery and other storage technologies, hydrogen, bio-based fuels, and carbon capture and storage.

The reality for energy markets is that the global economy is still largely dependent on oil and natural gas as primary energy sources; renewables need to scale significantly to replace them.

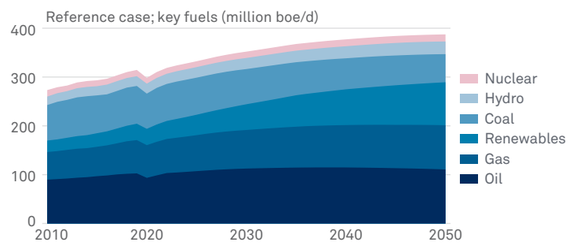
Analysts at S&P Global Platts forecast in their baseline scenario that, despite global efforts to reduce greenhouse gas emissions (GHGs), global oil demand will continue to grow slowly throughout this decade and then plateau just below 115 million b/d of oil between the late 2030s and first half of the 2040s.

In the face of forecast oil demand growth, an increased global focus on environmental, social and governance (ESG) factors is encouraging oil and gas market participants to produce, invest in, and trade in energy resources with lower associated emissions. Market demand is growing for "low-carbon" oil and gas supplies, which are fossil fuel resources produced with a lower rate of GHG emissions.

Markets, in turn, play a key role in facilitating the valuation, trade, and delivery of these lower-carbon resources. New technologies and trading tools offer the energy sector different options to address emissions from current, transition, and future energy sources, and to do so much more quickly and with less risk.

Meanwhile, the data sets generated by tracking and monitoring energy sources and their emissions and other ESG attributes are growing in size and number. In this new context, it is not only the tools for handling the data that are important but the quality and reliability of the data itself. Assigning market value correctly and incentivizing the right investments and shifts in the energy system depend on it.

S&P Global Platts forecast global energy demand



Source: S&P Global Platts Analytics Global Integrated Energy Model

Carbon intensity and crude trading

Carbon intensity (CI) is one metric the market has started to employ to measure GHG emissions from specific types of crude oil production. Oil produced with a lower amount of GHG emissions per barrel of oil has a lower CI than crudes produced with higher emissions. Therefore, fewer voluntary carbon credits would be required to offset emissions of lower-CI crudes.

As demand grows for low-carbon oil, CI measurements like those calculated by S&P Global Platts Analytics could impact the traded price of oil, particularly in terms of differentials between crude grades and lower-carbon varieties of the same grade of crude. The market could apply CI as an attribute of the crude, like sulfur.

Just as higher sulfur content devalues crude, the market could equally come to devalue crude produced at a relatively high rate of emissions. In the not-too-distant future, the market for low-carbon oil could mature and price in upstream CI, with crudes of lower CI trading at a premium to those of higher CI.

Having ascertained the CI for individual production fields, there is scope for more in-depth analysis of the implications – including price impacts.

Impacts to the global supply curve will be quantifiable, as well, by incorporating the cost of addressing or offsetting emissions in the cost of production. In a market seeking low-carbon oil and limiting capital and market demand for high-carbon production, fields with high CI production would see carbon-inclusive production costs rise.

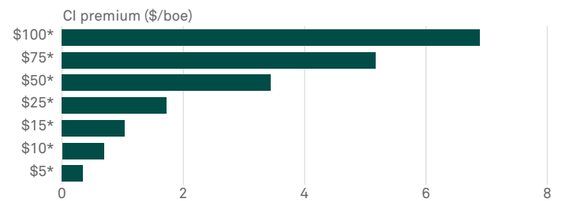
Targeting cleaner gas supply

There is growing awareness of the role of methane in global warming, with more than 100 signatories to a pledge to reduce emissions of the GHG. Methane, the main component of natural gas, has global warming potential around 85 times that of CO2 over a 20-year period.

The recent launch by Platts of methane performance certificate (MPC) price assessments now enables trading of lower-emission natural gas production in the US. Importantly, the certificates use dynamic sets of measured data monitored and audited by an independent third party, moving away from predecessor standards based on self-reported data.

MPCs are the beginning of a journey to reduce methane intensity along the entire value chain.

CI premium increases as carbon credit price rises



*Carbon credit price ($/mtCO2e)

Note: Carbon intensity calculation is based on Kirkuk field with a carbon intensity of 68.90 KgCO2e/boe for October 2021

Source: S&P Global Platts

The data sets generated by tracking and monitoring energy sources and their emissions and other ESG attributes are growing in size and number

Broader standards for natural gas are also emerging in the US, encompassing not only methane but other ESG attributes. And amid growing interest among both consumers and end-users, several midstream operators announced recently that they would start dedicating physical pipeline capacity for certified gas.

Armed with more reliable and comprehensive information about the carbon footprint and methane emissions of specific crude and natural gas resources, market participants will be able to identify and use the lowest emitting assets.

A host of new standards and price indicators for sustainable and renewable fuels, voluntary carbon credits, and carbon-credit pricing and allowance assessments now exist, enabling the renewables and sustainable fuels markets to be monetized more easily.

Digital innovation in energy trading

All this new data requires new technologies and faster delivery mechanisms to ensure the market can adequately respond. Desktop and application programming interface (API) delivery of core energy

Technologies like artificial intelligence and blockchain can help improve processes and speed of trading in commodity and energy markets

data enables traders to not only see the value of transition commodities, but to trade them with the best information in real time.

APIs allow data to be accessed, integrated and queried in the way that best suits the user to power digital transformation – and unlock new value. They are one of a number of delivery channels employed by Platts, which also offers its pricing data, news, and analytics via the Platts Dimensions Pro desktop platform and mobile application.

In combination with such data delivery systems, technologies like artificial intelligence (AI) and blockchain can help improve processes and speed of trading in commodity and energy markets. They also enable companies to model the complex global integrated energy system and navigate the flood of data generated by increased monitoring of commodity and energy supply chains.

The same technologies have great potential to support trading of assets critical to the energy transition, increase transparency and facilitate emissions reductions in supply chains through more efficient use of resources.

For example, in the maritime sector, numerous digital initiatives are emerging to track fuels and traffic and monitor GHG emissions, while blockchain can also ensure traceability in the supply chain for key energy transition raw materials such as battery metals.

AI is also being leveraged in the voluntary carbon market, bringing much-needed transparency. In partnership with Viridios, Platts launched six AI-driven Carbon Credit 'CARBEX' Indices as well as their respective monthly averages. Viridios' AI software is trained using Platts commodity data, in addition to Viridios' own extensive database of carbon credit transaction data. The software generates values for a range of carbon credits, based on historic relationships between a broad data set of carbon credit transactions and related commodity prices.

These market developments signal that we are at a new juncture in the energy transition. Fossil fuels continue to be a mainstay of many economies, while renewable energy sources are growing at a rapid pace and "non-physical" commodities like carbon credits and other environmental attributes are creating fresh opportunities and challenges.

From enabling trade of environmental attributes, to analyzing and relating multiple factors that impact value, technology will play an ever-greater role in valuing the commodities and energy products that will drive decarbonization.

Without high-quality, timely data that is easily accessible and analyzable, technology will be insufficient, and this will remain a core concern of the energy sector for years to come. In the short and long term, energy transition will be fueled by information. ■

The cost of energy transition

Energy transition benchmarks have surged in 2021 and prices are expected to remain highly volatile. James Burgess and Henry Edwardes-Evans highlight the importance of transparency in this evolving market

Commodity price benchmarks did not feature prominently at the UN Climate Change Conference, or COP26, in Glasgow in November. But their role in providing transparency about the cost of the energy transition – where price volatility looks set to be an enduring feature – will be vital.

A basket of 10 energy transition-related price benchmarks assessed by S&P Global Platts has more than quadrupled in value between January 1 and November 19 due to a range of drivers.

The increase has been driven by a particularly strong inflation in the value of CORSIA-eligible carbon credits, as well as firm gains in battery metals and European guarantees of origin, recycled plastics and electrolysis-derived hydrogen.

The drivers behind the price gains are a mix of rapidly re-opening economies, booming demand and supply bottlenecks. In wind and solar project development, for instance, S&P Global Platts Analytics expects up to a 10% uptick in capital costs due to bullish raw material demand.

"Due to the magnitude of the required changes to the energy system as nations strive to achieve deep decarbonization targets, a high degree of volatility in prices is virtually assured," said Platts Analytics head of scenario planning Dan Klein.

"The intermittent nature of renewables means that the reduction to fossil fuel demand will not always be smooth," he added.

This has political implications, with some countries starting to query the pace and extent of climate action.

In Europe, Poland, the Czech Republic and Hungary have all called for a revision of the EU's "Fit for 55" climate package in light of soaring gas prices, which have had knock-on effects on power and carbon costs.

A majority of EU states argue, however, that an accelerated rollout of renewables helps build resilience to global price shocks and will deliver significant economies of scale.

Proving this, via transparency in power purchase agreements and the capture prices that underpin them, will be crucial in building trust that the transition is good for consumers as well as asset owners.

Selected Platts energy transition assessments

Platts Assessment	2021 average price	YTD change*
Platts CEC (CORSIA-eligible carbon credit)	$3.634/mtCO2e	981.00%
Post-Consumer PET bottle bales Curbside Material FOB Chicago	18.72 cts/lb	163.00%
Lithium Spodumene 6% FOB Australia	$1,341/mt	478.00%
Lithium Carbonate DDP China Yuan/mt Wkly	Yuan123,569/mt	230.00%
Recycled-PET flakes FD	$1,239/mt	95.00%
Nordic Hydro Guarantees of Origin Year Ahead	Eur0.754MWh	349.00%
EU Wind Guarantees of Origin Year Ahead	Eur0.763/MWh	331.00%
Hydrogen Netherlands SMR with CCS	Eur2.99/kg	226.00%
Nordic Hydro Guarantees of Origin Current Year	Eur0.464/MWh	196.00%
UK Hydrogen Alkaline Electrolysis	GBP7.17/kg	291.00%

*January 1-November 19, 2021; Source: S&P Global Platts

Building trust in VCMs

Nowhere is the need for transparency more relevant than in voluntary carbon markets (VCMs), where a key agreement on accounting and verification rules was reached at the COP26 that is likely to unlock billions of dollars of investment in carbon reduction projects around the world.

Clarity on the Article 6 "Paris rulebook" will help boost confidence in VCMs and drive new sources of demand for carbon credits from sectors covering the 78% of global emissions not covered by compliance markets.

Even ahead of COP26, VCMs were gaining traction in some landmark deals.

In early 2021, oil producer Occidental sold the first "carbon neutral" crude cargo, shipping 2 million barrels to Indian refiner Reliance, offsetting the emissions generated across the full life cycle of the cargo with voluntary carbon credits certified by the Verified Carbon Standard.

With a growing number of major global corporate names committing to net-zero emissions by 2050, carbon credit prices have shown a clear rising trend in 2021.

Platts assessed CORSIA-eligible carbon (CEC) credits at $8.50/mt CO2 equivalent November 16, compared with just 80 cents/mt when the assessment was launched on January 4, 2021.

Meanwhile nature-based credits (Platts CNC), linked to projects which reduce emissions from land-use projects, were assessed at $13.25/mt November 16, compared with $4.70/mt when the assessment was launched on July 12, 2021.

Emerging H2 markets

There is the same need for robust market mechanisms and price discovery in emerging low- and zero-carbon hydrogen markets.

With a growing number of major global corporate names committing to net-zero emissions by 2050, carbon credit prices have shown a clear rising trend in 2021

In its recent hydrogen business model consultation, the UK government proposed working with price reporting agencies to explore the development of market benchmarks for low-carbon hydrogen.

"A liquid market benchmark price would provide the clearest indication of the market value of hydrogen," the Department for Business, Energy and Industrial Strategy said in the consultation document.

Ahead of liquidity, price references for early contracts would likely cite other competing fuels, with transparency in the early phases still a key attribute.

Without clear frameworks from regulators, and a broad build-out of new renewables, high and volatile feedstock power and gas prices could send discouraging signals to potential hydrogen project investors.

“Energy markets have already invested in multiple hydrogen projects around the world and are primed to add more,” said Platts Head of Energy Transition Pricing Alan Hayes.

“Clear regulation that can set a path to the deployment of hydrogen across the energy and transport sectors, providing a real boost to further investment,” he said.

Meanwhile, bilateral contracts could help develop international hydrogen and ammonia trade, while commodity traders could bring more liquidity as the market develops, the IEA has said.

Platts hydrogen price assessments show northwest European and Japanese markets as price takers in these negotiations, with Australia one of several lower-cost renewable hydrogen production sources well placed to develop future exports.

The spread between alkaline electrolysis assessments (including capex) November 15 showed European prices (Netherlands, $12.33/kg) over five times those in Australia (Western Australia, $2.24/kg). The comparable assessment for Japan was $9.51/kg.

Now that the initial hard work of hammering out an agreement at COP26 is done, the markets that will deliver the clean transition will come increasingly into focus. ■

COP26: Key takeaways

Limiting global warming to below 2 degrees Celsius this century requires a massive increase in climate action.

Here’s a rundown of the results after two weeks of intense debates and negotiations at the UN Climate Change Conference, or COP26.

The Glasgow Climate Pact includes:

- A call to rapidly scale up deployment of clean power generation and energy efficiency, including accelerating efforts towards the phase-down of unabated coal power and phase-out of inefficient fossil fuel subsidies

- Decisions to establish a work program to urgently scale up mitigation ambition and implementation this decade, and to convene an annual high-level ministerial round table on pre-2030 ambition, starting 2022

- A request for parties without Paris-aligned 2030 emissions targets or commitments to update plans before COP27 in 2022, and for all parties to submit more ambitious targets in 2023 rather than 2025

- A recognition that limiting global warming to 1.5°C “requires rapid, deep and sustained reductions in global greenhouse gas emissions,” including reducing global carbon dioxide emissions by 45% by 2030 relative to the 2010 level

Agreement on Article 6 – paving the way to more robust, transparent carbon markets – includes:

- A framework for cooperation to reduce emissions through internationally transferred mitigation outcomes (ITMOs)

- A two-part accounting of credits, with one centralized system open to both public and private sectors, and one bilateral system allowing countries to trade ITMOs towards their nationally determined contributions

- The rules allow a country hosting an abatement project to decide if the reductions will be counted towards its own target or sold elsewhere. The country must notify a UN supervisory board accordingly

- Some 120 million Clean Development Mechanism credits registered after January 1, 2013, are permitted to be carried forward but their use is restricted to the first cycle of national commitments

- Project developers are required to deposit 5% of credits generated into an adaptation fund. Another 2% of credits will be automatically cancelled to reduce supply. These contributions apply only to the centralized system

Declarations published during the talks include:

- A commitment by 44 countries to phase out domestic coal power production, in the 2030s for developed countries and 2040s for developing countries. The world’s top three coal power emitters did not sign: China, India and the US

- A pledge by 23 countries including the US, Spain, UK, Sweden and Netherlands to halt public financing for unabated overseas fossil fuel projects by the end of 2022. Neither Japan nor China are signatories

- A pledge by 100 countries led by the US and EU to reduce methane emissions by 30% by 2030, targeting the fossil fuel industry in the first instance

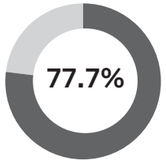
- New commitments to the Glasgow Financial Alliance for Net-zero (GFANZ) amounting to $130 trillion of private capital aimed at reaching net-zero emissions by 2050

- An $8.5 billion Just Energy Transition Partnership with South Africa involving funds from France, Germany, UK, the US and the Asian Development Bank

- A pledge by 100 countries to halt and reverse forest loss and land degradation by 2030 through the Glasgow Leaders’ Declaration on Forests and Land Use, collectively representing more than 85% of forests globally, backed by $12 billion

The surging cost of energy transition

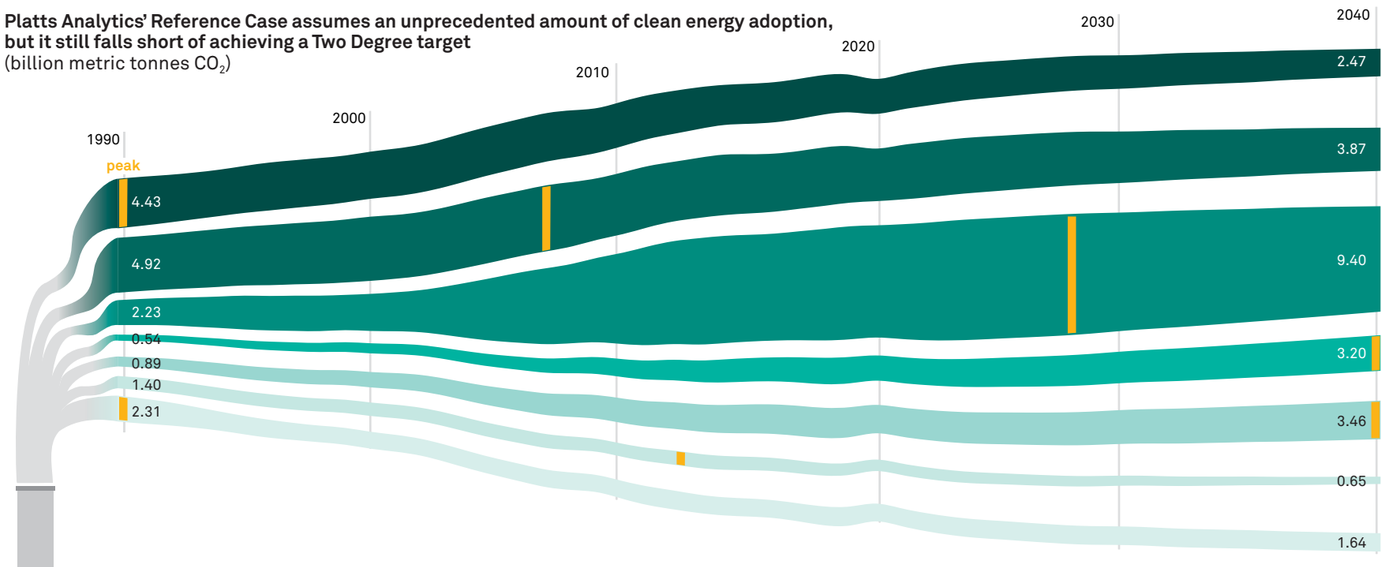
Demand for carbon credits and rapidly reopening economies have seen a surge in the value of a basket of energy transition price assessments in 2021. A deal on climate change to limit global warming will increase demand for a range of low-carbon resources from hydrogen through to battery metals used in EVs, bringing the cost of energy transition into sharper focus.



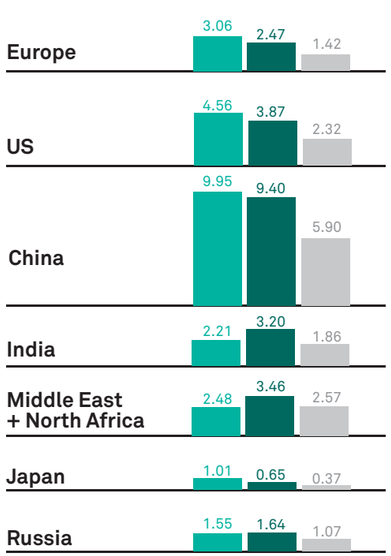
World emissions in 2020
Seven countries and regions made up more than three-quarters of global CO2 emissions from fossil fuel combustion last year.

> "There is a wide array of decarbonization solutions that could be scaled up to meet the climate challenge, ranging from hydrogen, energy storage, electric vehicles, and nature-based solutions."
> — Dan Klein, Head of Scenario Planning, Platts Analytics

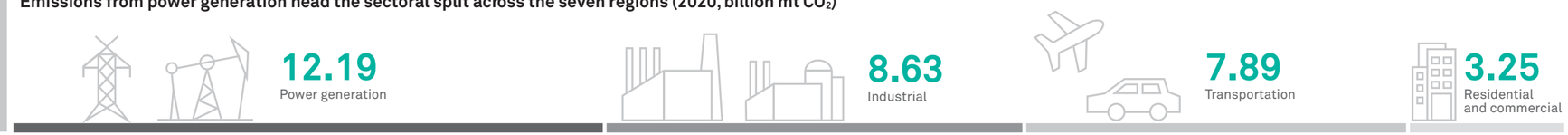
Platts Analytics' Reference Case assumes an unprecedented amount of clean energy adoption, but it still falls short of achieving a Two Degree target
(billion metric tonnes CO_2)



2020, 2040 Reference vs 2040 Two Degrees Case (billion mt CO_2)



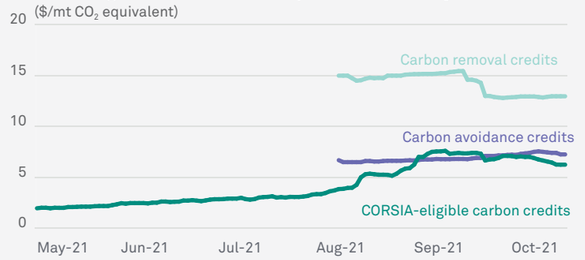
Emissions from power generation head the sectoral split across the seven regions (2020, billion mt CO_2)



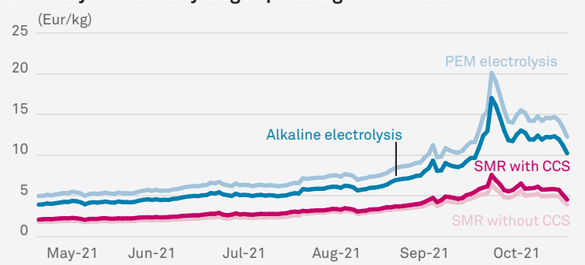
Per capita emissions in the US were over three times the global average last year (mt CO_2/yr, Reference Case unless stated otherwise)

Source: S&P Global Platts Analytics, S&P Global Platts, United Nations, Statista

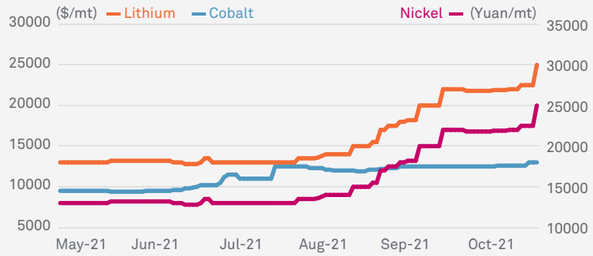
CORSIA-eligible carbon credits up 262% since May 2021



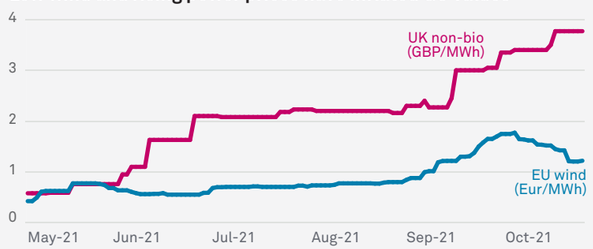
Electrolysis-based hydrogen premia grow over SMR+CCS



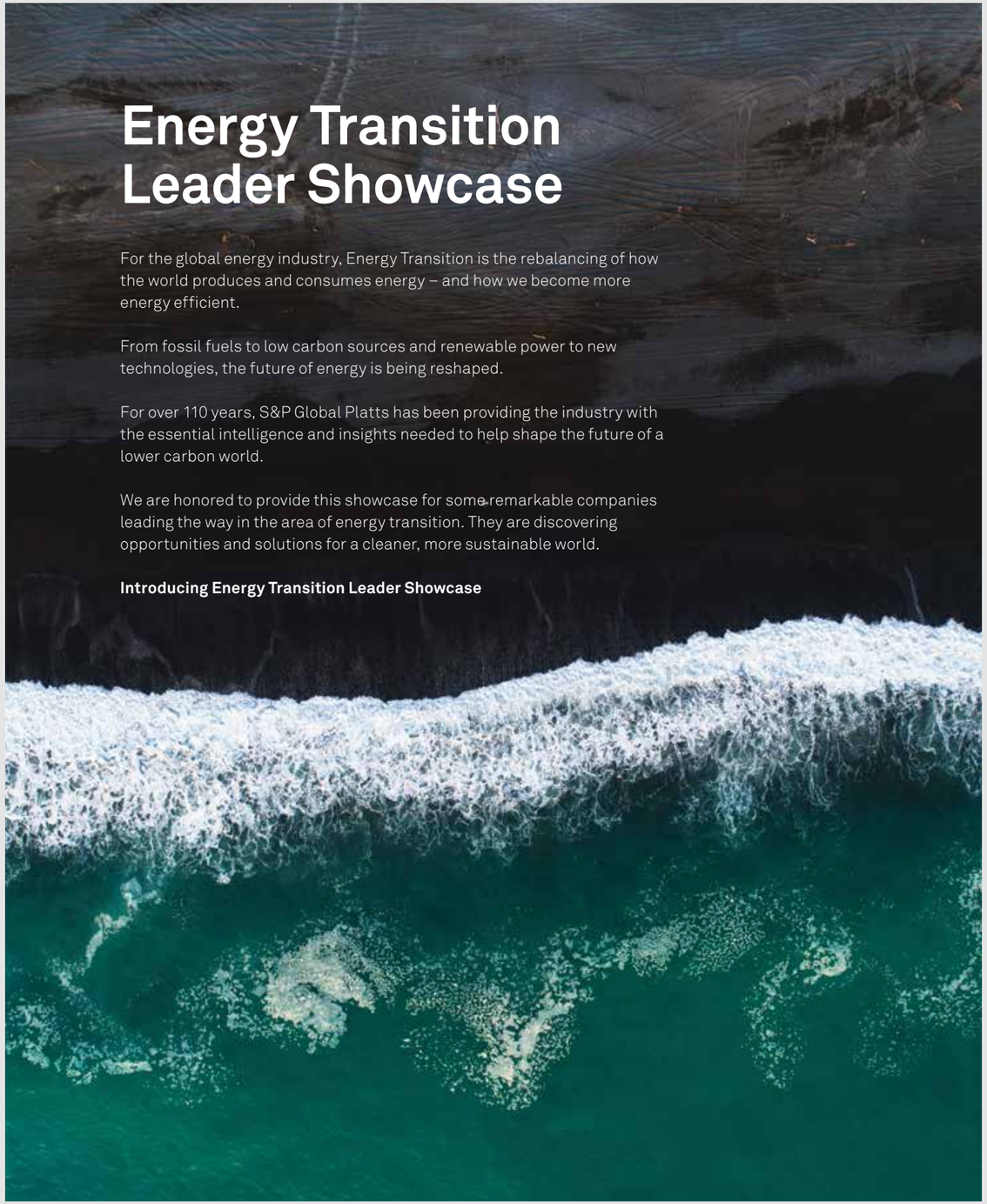
Lithium prices climb 92% since May 2021



Low wind and rising power prices have inflated GO values



Developed by Henry Edwardes-Evans and Frank Watson, designed by Reynaldo Dizon



Energy Transition Leader Showcase

For the global energy industry, Energy Transition is the rebalancing of how the world produces and consumes energy – and how we become more energy efficient.

From fossil fuels to low carbon sources and renewable power to new technologies, the future of energy is being reshaped.

For over 110 years, S&P Global Platts has been providing the industry with the essential intelligence and insights needed to help shape the future of a lower carbon world.

We are honored to provide this showcase for some remarkable companies leading the way in the area of energy transition. They are discovering opportunities and solutions for a cleaner, more sustainable world.

Introducing Energy Transition Leader Showcase

Advancing the Future of Energy

Innovation has made Valero Energy Corporation (NYSE: VLO) a leader in its industry for an energy transition.

San Antonio-based Valero, the world's largest independent refiner, has been advancing the future of energy for more than a decade. With a premier refining portfolio that is resilient even in a carbon-constrained scenario, the company is leveraging its operational expertise and liquid-fuels platform to responsibly and economically expand its renewable fuels businesses. As the world's second largest producer of renewable transportation fuels (renewable diesel and ethanol), Valero is managing its business to responsibly meet the world's growing demand for affordable and reliable energy while addressing climate change risk.

Valero has invested more than $3 billion since 2009 in its renewable fuels businesses. The company was the first refiner to enter large-scale production of ethanol. In 2020, Valero announced board approval of Texas's first renewable diesel plant with expected completion in the first half of 2023. In 2021, through its joint-venture Diamond Green Diesel (DGD), Valero successfully completed an expansion project bringing DGD's annual renewable diesel production capacity to 690 million gallons per year. When its Texas-based renewable diesel plant comes online, DGD expects to increase its renewable diesel production capacity to 1.2 billion gallons annually, with 50 million gallons annually of renewable naphtha.

Also, in 2021, Valero announced a partnership with BlackRock and Navigator Energy Services to capture and store carbon dioxide (CO2) from its ethanol plants, aiming to produce a lower carbon intensity ethanol to be marketed in low-carbon fuel markets. Through this partnership, Valero plans to connect eight of its ethanol plants to a large-scale carbon sequestration project that would span more than 1,200 miles across five states in the US Midwest.

Valero continues to look at ways to lower the carbon intensity of all its products, including carbon sequestration, renewable hydrogen, and sustainable aviation fuel, among others. The company has a comprehensive roadmap to reduce emissions with innovative projects that are already in execution and are consistent with its strategy. These projects reduce the carbon intensity of Valero's liquid transportation fuels while generating an attractive rate of return for its owners. Recognizing the world wants lower-carbon fuels, Valero is on track to reduce and offset 63% of refining Scope 1 and 2 greenhouse gas (GHG) emissions by 2025, and is targeting a 100% reduction by 2035.

Low-carbon fuels will be part of the energy mix going forward. This expectation, coupled with Valero's engineering innovations, sound execution, and demonstrated discipline in capital allocation, drives its ongoing commitment to produce affordable, reliable, and sustainable energy for future generations.

Growth through **innovation** in renewables

- Increasing **Renewable Diesel** production
- Advancing **Renewable Naphtha** production
- Developing **Sustainable Aviation Fuel (SAF)**
- Developing **Renewable Hydrogen**
- Evaluating additional **Carbon Sequestration** opportunities

Williams Sets Pace as ESG Midstream Leader

At Williams, we understand the direct link between sustainable business operations, corporate stewardship and long-term financial success. By integrating environmental, social and governance (ESG) practices throughout the company and into our everyday operations, we hold ourselves accountable through transparent interactions with customers, employees and shareholders.

As the first North American midstream company to establish comprehensive and actionable climate targets, Williams is committed to addressing climate change in a pragmatic and economically feasible manner to successfully leverage our natural gas-focused business to reduce emissions and build a clean energy economy. We set a near-term goal of a 56% reduction in greenhouse gas emissions by 2030 as part of our climate commitment, which aligns with the country's Nationally Determined Contribution target of a 50-52% emissions reduction by 2030.

We believe that no energy infrastructure system is better positioned to facilitate the meaningful introduction of renewables both into the existing natural gas mix and dedicated point-to-point solutions. Importantly, natural gas-powered generation of electricity brings reliability to the US electric power grid and allows for growth in renewable forms of energy.

With top quartile ESG results for our industry, Williams takes a leading stance on critical topics. As a member of the Interstate Natural Gas Association of America (INGAA) board, we helped outline the organization's initial climate commitment. We also led the formation of an industry group called Natural Allies to promote the benefits of clean and affordable natural gas.

Future Innovations and Technologies

Our nationwide infrastructure footprint is well-suited to support the growth of responsibly sourced natural gas, renewable natural gas, clean hydrogen and carbon capture. Williams is currently pursuing and executing several exciting opportunities across these fronts.

Williams was awarded a $1 million grant to fund a feasibility study to evaluate the creation of a green hydrogen hub near our assets in southwestern Wyoming. We are also working with an international renewable energy developer to evaluate a large-scale co-development of wind energy, electrolysis and synthetic gas-via-methanation in Wyoming.

We are executing multiple solar projects along our footprint as part of a broader initiative to power our assets with solar energy. In addition, renewable natural gas continues to grow with the addition of new interconnects onto our system so methane from landfills and livestock farms can be captured and used instead of escaping into the atmosphere.

Collaboration Key to Low Carbon Future

Williams believes that working together with like-minded businesses and organizations is critical to accelerating the innovation and technology to build the next generation of clean energy solutions.

We are partnering with Greentown Labs of Houston, the city's first-ever clean energy-focused startup incubator, to support cleantech entrepreneurship. We also announced a collaboration with Microsoft to explore ways to transform one of the nation's largest energy infrastructure networks through digital technology and innovation.

We belong to the Clean Hydrogen Future Coalition to advance clean hydrogen as a key pathway to achieving global decarbonization and US energy competitiveness. We are also members of RNG Coalition for sustainable development, deployment and utilization of renewable natural gas.

As we work to balance sustainability and climate goals with growing energy demand, Williams is playing a leading role in a clean energy future by leveraging our infrastructure, our expertise and our strategic relationships to develop pragmatic solutions to today's energy challenges. With our ongoing focus on sustainable operations, we will continue to meet the clean energy demand for generations to come.

The meteoric rise of container freight

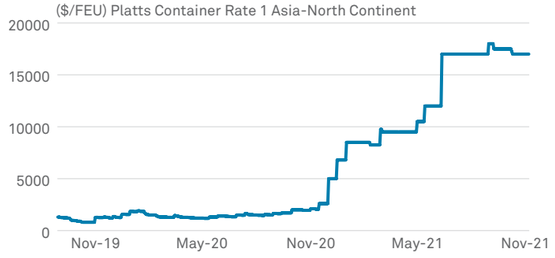
As supply chain problems piled up in 2021, container rates emerged from the shadows to become a fixture of mainstream news. George Griffiths looks at the global drivers behind skyrocketing freight prices

From the first lockdown in China in January 2020 to the blockage of the Suez Canal in March this year and a large coronavirus outbreak at Yantian port in May, the container markets have faced outsized challenges over the past two years.

Container liners and shippers alike have adopted the maxim “expect the unexpected,” and it is this sentiment that continues to dominate the global container freight market during a period of unprecedented volatility.

Successive jumps in the benchmark Platts Container Rate 1, which represents the North Asia-to-North Continent route, correlate with a number of major events and give a sense of the tumult in the sector as the pandemic has progressed. Here’s how it all unfolded.

Container rates see unprecedented rise during pandemic



Source: S&P Global Platts

January 2, 2020
$1,850/FEU

To fully grasp the scale of container freight’s rise not just in terms of rates, but also in terms of notoriety, it’s worth going back to the start of 2020, when the industry faced the implementation of the IMO 2020 regulation limiting sulfur in marine fuels. At that time, the biggest question was how container liners would adjust to passing the costs for the new fuels to their customers through complex Bunker Adjustment Factor mechanisms.

Those concerns were soon to be overtaken by pandemic-induced shocks to the market. The first sign of upheaval came when the Chinese market simply didn’t return post-Lunar New Year in February 2020 as expected. This meant export volumes from Asia fell significantly. Some vessels were leaving Chinese ports for their Asia-Europe runs at under 10% of capacity, levels at which carriers were losing significant sums of money.

March 2, 2020
$1,300/FEU

Carriers pulled together, bolstered by alliances built over the previous years, to pull capacity from the market. Void sailings became the norm and rates stabilized, but demand continued to fall. Countries across Europe and North America, both key destinations for Asian exports, started to impose coronavirus-related lockdowns.

As such, demand was sluggish through the middle of 2020. Shops closed and demand for clothing suffered, with only the top half of the global population visible on video calls. The only saving grace for the liners was demand for personal protective equipment such as masks and gloves, home working equipment and DIY materials, and falling fuel costs as global demand for petroleum products continued to tumble.

June 1, 2020
$1,400/FEU

With many offices closed, people were not only working *from* home but working *on* their homes: if you are spending all your time there, you might as well spruce the place up a bit. The trend was a global one, and volumes of DIY material skyrocketed, replacing conventional shipped goods, but only in part.

The container market was at this point making do with the scraps of its former prosperity. Volumes and revenues were down, and large-scale laying-off of port staff and cancelled sailings became the norm. But only until lockdowns started to ease – then container rates began to move.

September 1, 2020
$1,650/FEU

Demand flooded back. Depleted stocks at warehouses around the world needed filling and suddenly a market that had been quietly slumbering through much of the year roared back into life, filling orders left, right and center.

The Ever Given on March 26, 2021, stuck in the Suez Canal.

The newfound demand brought logistical issues. Ports that had laid off staff did not rehire them in time. Many warehouses and distribution centers inland were operating on significantly reduced headcounts. Many haulers were self-isolating having contracted the virus. Suddenly, the time it took for a container to be unloaded at port, taken inland, emptied and returned to port spiked. This increase averaged around seven days at major ports pre-pandemic, but at the time of writing in November, in some ports this had risen to upward of four weeks on average.

As a result, equipment shortages at key exporting hubs and bottlenecks at other ports emerged. The number of containers in circulation at sea decreased, causing rates to rise. This also coincided with pre-Christmas volumes and, for Asia-to-Europe trade, pre-Brexit stockpiling.

December 1, 2020
$5,000/FEU

With the decision on the UK’s future trading relationship with Europe still in question in December 2020, shippers across the continent started to import goods to try to fill warehouses ahead of potential disruption.

Carriers saw their performance fall significantly at the start of the year, and to get sailings, and thus performance, back on track, a few began to employ void sailings in May and June

This resulted in lengthy delays at ports with low staffing levels, such as Felixstowe in the UK, further tying up boxes and leaving bottlenecks at ports with containers sitting quayside, resulting in difficulties unloading and loading the next container ships. Cargo became delayed, taking more containers out of circulation, and pushing rates up further.

January 4, 2021
$8,500/FEU

With further issues appearing on the horizon, some liners began to cease bookings for loaded containers on backhaul routes from the UK and Europe to Asia, opting to take only empty containers back for a faster turnaround in Asia. Their hope was that some of the

exporting demand could be eased in the short-term before the situation continued to worsen.

By this point, container rates to Europe were at record highs and began to mark a fundamental shift in the way the market operates, with arbitrages for lower-value goods starting to close as the freight element began to rise.

March 23, 2021
$9,500/FEU

Container shipping had already endured more than its share of challenges in the first 12 months of the pandemic, but it was a single event in March 2021 that really thrust the sector into the global spotlight and made it a household talking point. One of the largest container ships in the world, the Ever Given, ran aground in the Suez Canal, making headlines around the world and prompting logistical headaches, alongside widely shared jokes and memes from both within and outside the shipping community, as a digger struggled to free the 400 m-long ship from the bank.

Expectations that the blockage of the Suez Canal would cause significant problems in the container shipping space did not materialize. While some liners diverted around the Cape of Good Hope, and others opted to join the queue at the Suez, rates saw very little movement. In fact, for some European ports, the event had an upside, providing an opportunity to clear out some of the quayside bottlenecks.

May 4, 2021
$10,500/FEU

The Ever Given was finally freed after six-and-a-half days of disruption, but equipment shortages in the market were still causing issues. Carriers saw their performance, the number of vessels that arrive at port within the specified timescale, fall significantly at the start of the year. To get sailings, and thus performance, back on track, a few began to employ void sailings in May and June, despite already strong demand and logistical issues.

The number of void sailings saw a sharp increase. Between May 17 and June 20, 25 ex-Shanghai sailings were voided, which equalled a 15%-25% decrease in trans-Pacific capacity per week in the second half of May. This came at a time when space on ships for Asia to Europe was almost non-existent for up to eight weeks out.

June 1, 2021
$12,000/FEU

A large-scale coronavirus outbreak at the Port of Yantian in China, the world's fourth-largest container port, resulted in significantly delayed operations. Shipping liners opted to take Yantian out of their

schedules for around six weeks, and around 160,000 FEUs were tied up waiting to be exported, further tightening an already bullish market.

In an attempt to avoid the delays at Yantian, shipping liners changed their schedules to pick up cargoes from other ports. But global shipping was never easy: on June 3, the OOCL Durban collided with a stationary vessel and a gantry crane at the Port of Kaohsiung in Taiwan, further exacerbating issues in the region, causing more delays. More containers were taken out of circulation, albeit temporarily, and this prompted another bull run for freight rates.

June 15, 2021
$17,000/FEU

By mid-June, when the latest round of General Rate Increases came into force, container rates had risen to $17,000/FEU for all-inclusive spot freight from North Asia to Europe, more than 12 times the $1,375/FEU recorded a year earlier.

September 1, 2021
$18,000/FEU

Container rates continued to rise amid ongoing logistics issues affecting ports and carriers alike. Lack of truckers and shortage of railcars hit the main headlines around the world, with goods struggling to move away from ports, resulting in increasing wait times for ships at ports, longer queues, and further delays for importers around the world.

October 11, 2021
$17,000/FEU

Container rates saw their first significant downside of the year as the market rebalanced somewhat following the Golden Week holidays in China, which stymied some of the exporting demand from the North Asia region, easing the pressure on carriers, ports and freight forwarders around the world.

As a result of this historic rise in freight rates, many shippers have seen their arbitrages close, preventing them from importing goods into Europe from Asia due to the freight element alone.

Despite the falling demand into November, however, rates are expected to remain largely firm until Lunar New Year in February, with logistics issues continuing to plague ports around the world. Average delays for Asia to Europe sailings for those ships making the journey at mid-November was just over 18 days, according to Platts cFlow trade-flow analytics software.

Despite the largely flat expectations going forward, optimism still remains from the shipper side of the market that logistical issues will ease. "We have probably passed the worst of the storm now, it's going to be a long night but there is hope coming with the dawn," a UK-based freight forwarder told Platts. ■

OPEC+ in rough waters

OPEC+ relations have become fractious through the coronavirus pandemic, and the inequalities between richer and poorer members could increase. By Herman Wang

The boat had been chartered for a gala dinner cruise on the Danube River to commemorate the three-year anniversary of the alliance between OPEC, Russia and nine other key oil producers. But as it waited at the dock, the guests of honor were inside the OPEC secretariat in central Vienna, locked in a pitched and chaotic battle over how to divvy up production quotas.

It was December 5, 2019 – weeks before COVID-19 would enter the world's consciousness – and OPEC ministers had been quarreling all day. OPEC and its allies were planning to deepen their output cuts by almost half, to 1.7 million b/d, to head off what many forecasters had said would be a weak market ahead, with a potential global recession looming. But who should cut how much was proving contentious.

Before the meeting even started, Ecuador had already announced its intent to quit the organization.

Angola's delegation walked out of the meeting at one point, unwilling to shoulder an extra cut, sources involved in the talks said. Iraq was also playing hardball on accepting additional supply curbs.

Saudi Arabia, OPEC's de facto leader as its largest member by far, threatened to flood the market and tank oil prices if members did not commit to tighter compliance – an ultimatum that did not go over well, the sources said.

Oil prices whipsawed as each twist and turn in the negotiations was leaked – sometimes strategically – to the media. As the clock turned to 8 pm, then 9 pm and then 10 pm, a scheduled post-meeting news conference was called off. Around 11 pm, the ministers finally threw in the towel for the evening. The gala dinner boat cruise was also canceled – a sunk cost, as it were. Nobody was in a mood to celebrate, and there was still work to be done.

After some overnight diplomacy, with ministers holding bilateral and multilateral meetings in their hotels, the group, joined by Russia and the other allies, managed at long last to clinch an agreement the next day. The production cuts would indeed go to 1.7 million b/d, and to seal the deal, Saudi Arabia pledged an additional voluntary 400,000 b/d cut.

Ministers left Vienna relieved but still smarting from their battles, as the unity of OPEC had been shaken to its core.

Saudi energy minister Prince Abdulaziz bin Salman put on a brave face, telling reporters that however messy the process, the end-result would still ensure the OPEC+ alliance's stewardship of the market.

"In all our deliberations, we all try to figure out not only what to do, but what to do in a convincing way that ... not only assures the objective analysts, but also the cynical analysts, that we're doing our job properly," he said.

Rocking the boat

These days, like many offices around the world, the OPEC secretariat is a quieter place. The onset of the pandemic has forced the producer group's headquarters to close at times to comply with COVID-19 restrictions in the Austrian capital. Even now, only some of the staff have returned to working there.

The relative calm belies what has been one of OPEC's most tumultuous periods, as the bloc and its partners have lurched from existential crisis to existential crisis over the last two years, forced to convene nearly monthly – every time online – to try and control an oil market grappling with a pandemic that has upended the world.

That fractious December 2019 meeting was just a harbinger of what was to come.

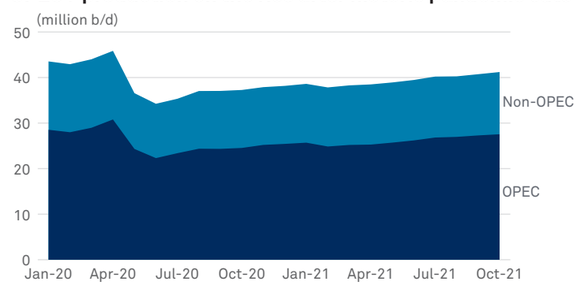
Three and a half weeks after the meeting, on the last day of 2019, Wuhan authorities alerted the world to a viral outbreak in the city. As COVID-19 infections exploded across the world, an early-March 2020 spat between Saudi Arabia and Russia on whether to expand the group's production cuts blew up into an all-out price war, with every country pumping at will.

Crude indexes went into freefall; NYMEX futures even went negative.

Chastened by the market meltdown, OPEC+ ministers reconvened in April 2020, and this time they agreed to slash an historic 9.7 million b/d of production – almost 10% of the pre-pandemic market.

The alliance has been gradually rolling back the cuts since the summer of 2020 as the global economy has emerged from the depths of the pandemic, but it has not been smooth sailing

OPEC+ production on the rise after historic pandemic cuts



Source: S&P Global Platts OPEC+ survey

The alliance has been gradually rolling back the cuts since the summer of 2020 as the global economy has emerged from the depths of the pandemic, but it has not been smooth sailing

Mexico quit the agreement that June. Quota compliance by the likes of Russia, Iraq, Kazakhstan and Nigeria has often been lackluster, drawing the ire of other members.

At various points, Russia and the UAE have pushed to accelerate the cuts' tapering, encountering stiff resistance from a cautious Saudi Arabia, which has sometimes resorted to unilateral extra cuts to keep propping up the market. A reluctant OPEC ally motivated more by geopolitical interests than straight oil price needs, Russia, particularly its largest oil company Rosneft, has constantly chafed at its production quotas.

As for the UAE, it has even internally debated whether OPEC membership remains in its long-term interests, sources have told S&P Global Platts. Emirati officials have since declared the country's commitment to the organization after it won a higher production quota that starts in mid-2022, following weeks of protracted and heated negotiations in July.

More recently, as a gas supply crunch has spilled over into the oil market, leading prices higher, the group has come under heavy pressure from key consumers - the US, India and Japan - to not overtighten supplies and derail the pandemic recovery. Their requests for more oil have been rebuffed so far.

Some OPEC+ meetings have dragged on for days, others have been abruptly canceled and rescheduled, as ministers clash over their competing priorities. Each time, however, the 23 OPEC+ countries have managed to eventually agree on how to set their production quotas, balancing various members' eagerness to chase market share with others' desire to support prices. They have largely successfully overseen an orderly return of crude production, while keeping just enough uncertainty in the market to keep US shale rivals at bay.

After the group's July meeting, Prince Abdulaziz said OPEC+ affairs always involve delicate diplomacy, which he called "an art" best left for closed-door discussions. But he also warned not to write off the alliance.

"I am a believer of OPEC+," he said. "OPEC+ is here to stay."

Platts Analytics estimates that by January, sustainable OPEC+ spare capacity will shrink to 2.1 million b/d

Global oil demand is now in a much better place, even with headwinds still lingering from the virus, along with some inflation fears. Most forecasters predict a return to pre-pandemic levels of some 100 million b/d at some point in 2022.

Accordingly, the OPEC+ alliance plans to hike production by 400,000 b/d each month, which should completely unwind the remainder of its historic output cut by late 2022. As it does so, gaps between its haves and have-nots are likely to be laid bare, as only those members holding spare production capacity will benefit from rising output quotas.

Internal disruptions, political disputes, underinvestment and US sanctions have all contributed to many countries' inability or unwillingness to drill new wells and invest in infrastructure to keep growing their crude flows.

Spare capacity in focus

S&P Global Platts Analytics estimates that by January, assuming the production increases are implemented, sustainable OPEC+ spare capacity will shrink to 2.1 million b/d, of which the overwhelming majority will be held by Saudi Arabia, Russia, the UAE and Kuwait. That will give those countries increasing leverage in OPEC+ decisions.

This is not a new phenomenon, as prior to OPEC's partnership with Russia and other allies that began in 2017, its production policy often consisted of Saudi Arabia and Gulf neighbors the UAE and Kuwait serving as the market's swing producers, while the rest of the bloc pumped as much as it could. But the situation has been worsened by the pandemic, with the price crash forcing the entire industry to retrench, leaving many countries' oil sectors significantly worse off than before.

Already, some OPEC+ countries, notably Angola and Malaysia, have regularly been unable to produce at their quotas.

Iran, whose oil output has been constrained by US sanctions, is also eyeing its eventual return to the market, but will find much greater competition as its OPEC+ counterparts raise their production. If Iran's new president, Ebrahim Raisi, can clinch an agreement with the US to relax sanctions, it may have to bargain hard with its previous buyers or entice new customers with price discounts.

"I believe that the era of easy oil marketing is over for Iran," said Fereydoun Barkeshli, who worked for decades in the Iranian oil sector and is president of the Vienna Energy Research Group.

It all will require more deft internal OPEC+ gamesmanship and statecraft, as the producer group seeks to maintain a tight ship while navigating the uncharted waters of the pandemic.

Gala dinners may not be waiting at the end, but the reward can be an oil market managed to their collective benefit. ■

Insight Conversation: Shrikant Madhav Vaidya, Indian Oil Corp.

The chairman of Indian Oil Corp. Ltd., India's largest domestic refiner, spoke to S&P Global Platts President Saugata Saha at the Platts Asia Pacific Petroleum Conference about the country's energy transition goals and his company's role in achieving these

India set ambitious climate goals at the UN's Climate Change Conference in Glasgow in November.

But even before the country's announcement about reducing carbon intensity and boosting renewables by 2030, India's biggest state-run refinery had been looking at ways to help the country's transition to cleaner fuels.

Shrikant Madhav Vaidya, chairman of Indian Oil Corp. Ltd., spoke to S&P Global Platts President Saugata Saha at the Platts Asia Pacific Petroleum Conference in September about the opportunities for India's energy industry as well as the realities of needing to keep energy accessible to fuel growth during the transition.

The Indian economy and people have shown remarkable resilience during the pandemic. We have seen how quickly things have got back on track and are looking up. Thinking about what's yet to come, what does the future of oil and refining look like in India as the world moves further toward decarbonization?

Today, India has a refining capacity of 250 million mt/year. Going by the most challenging scenario, we still need about 100 million mt more refining capacity by 2030.

Insight Conversation: Shrikant Madhav Vaidya, Indian Oil Corp.

In India, the per capita energy consumption is just one-third of the global average. Unlike the West or the European nations, we have very robust primary energy consumption growth, which has really plateaued in the US and Europe. Obviously we cannot be wishing away fossil fuels so early. They have a role to play in this fast-emerging economy of India.

The conventional fuels will have a place, but at the same time, looking at the way the energy transition should happen for a country like ours, we are also making enormous strides in gas, in biofuels and renewables, so that we are balancing it out and the country will have a bouquet of energy options to take from.

Indian Oil is an important part of the Indian energy infrastructure. What are some of your thoughts behind your medium- to long-term strategy?

We supply about 40% to 42% of the country's fossil fuel requirements in terms of transportation fuels and other fuels. The demand is there, so we have a two-pronged approach.

We cannot be looking away from the fact that the country needs the refining capacity to increase, so we've gone in for a number of brownfield expansions of all our current bigger refineries. Panipat refinery is 15 million mt, we are going to 25 million mt. Gujarat refinery is 13 million mt, we are going to 18 million mt. We are coming up with a greenfield project – CPCL, that is near Chennai. We are getting a 9 million mt refinery over there.

"We intend to take gas to about 15% of the energy pie, so the country is investing heavily in gas infrastructure"

We are trying to expand to the extent possible but considering the future – that there may be a dip in the fossil fuel demand, maybe two to three decades down the line – we have also very consciously made efforts to have more petrochemicals.

Today we have a very abysmal percentage of 4% to 4.5% as the petrochemical intensity [index] – that is how much crude we convert to petrochemicals. We are very conscious about this fact, that we need to go up because the country is also a big importer of petrochemicals. I mean, that also needs to stop. We have now taken up a target of going up to 15%, the petrochemical intensity, by 2030.

We are also adding more lube – it's also a big import item for the country. And the lube demand is also galloping because the automotive industry is booming.

One more reason for doing this is de-risking the very poor cracks. That is one part of the story of Indian Oil.

All our refinery expansions which have been announced, we are committed to having green power for that. That will be one big step. Secondly, we are also going for biofuels in a big way. Of course hydrogen, to begin with, we have recently commissioned a plant in Delhi, which produces hydrogen-spiked compressed natural gas. About 18% of hydrogen is there in the CNG.

So it's basically a consolidation of the core business and of course looking very positively at the new forms of energy and adopting them in a big way.

How do you see natural gas as a part of the energy mix? How do you see investment and expansion happening over the next few years?

Natural gas for India will be the path to energy transition. The decarbonization will be more from gas. Today, in the energy pie, we consume about 6% of natural gas, about 30% of crude, then 55% is coal.

We intend to take gas to about 15% of the energy pie. The country is investing heavily in gas infrastructure. We have got about 13,000 km of natural gas pipeline. We intend to go up to 33,000 km. A lot of ports are being developed for LNG imports because the country will still import. We don't have much domestic gas – 50% is imported.

Piped natural gas is also coming. The gas for the automotive industry is also coming in a big way through the city gas distribution network.

We have identified our 50 retail outlets along the golden corridor for LNG for the transportation fuel.

There's increased focus on hydrogen and some of these non-carbon based energy sources. Is that something Indian Oil is thinking about as a part of the future energy strategy, being one of the principal providers of transportation energy in India? What's the overall approach to non-hydrocarbon based fuels?

I just touched upon the hydrogen-spiked CNG – we see a lot of promise. I'm insisting on 18% because beyond that, the pipeline network needs to have a different metallurgy. So the same CNG network can work very well with up to 18% hydrogen, and that is one way I feel that hydrogen can really come in the automotive sector much earlier than going for hydrogen fuel cells.

We already have one plant operating in Delhi and we intend to have more such plants for hydrogen-spiked CNG. It will be one step toward the hydrogen economy.

I'm very happy to share that Indian Oil, among its 11 refineries, we are converting a couple of refineries – one at Mathura and one at Panipat – to green hydrogen. We tend to use green hydrogen for the hydrogen that the refinery normally requires.

Secondly, we have also tied up with an Israeli startup company for the manufacture of aluminum air batteries. This is already in the final stage of trials. And once these trials are successful, which we are very sure they will be, we'll put up a battery manufacturing unit in India, in the aluminum zone of the country. So, that is also one big step that we are ready to take. It will be just a matter of time before we set up the factories. ■

Go deeper

Watch exclusive interviews and interact with stakeholders in the commodities space. Join the PlattsLIVE Community.

This is an extract from an interview between Saugata Saha and Shrikant Madhav Vaidya in September 2021; it has been lightly edited for clarity.

Insight from Moscow

By Rosemary Griffin and Anastasia Dmitrieva

Russia plans to leverage its large natural gas reserves, existing infrastructure, and cooperation with foreign partners to take a major stake in the global hydrogen market.

Targeting 20% of market share by 2030, Russia is set to ramp up production over the next five years.

S&P Global Platts Analytics forecasts Russian hydrogen production at 3.4 million mt in ammonia and 2.7 million mt in refining in 2021. It expects these volumes to increase to 3.8 million mt and 3.1 million mt, respectively, by 2025.

Russia's export plans include shipments of 2 million mt/year by 2035, and 15 million-50 million mt/year by 2050. The end-goal of 50 million mt/year would be equivalent to around 160 Bcm/year of natural gas.

"This would in essence replace all natural gas exports from Russia to Europe today with hydrogen," Platts Analytics said.

In August, the Russian government approved a roadmap for hydrogen development, which is becoming an increasingly important government priority.

At the Russian Energy Week in mid-October, President Vladimir Putin said that hydrogen and ammonia will become increasingly important in global energy markets.

"Russia has the scientific, resource, and logistics capabilities to take a significant share in these promising markets," he said.

Russian Prime Minister Mikhail Mishustin said in mid-October that Russia will spend over Rb9 billion, equivalent to around $127 million, to develop technology for the production, storage and transportation of hydrogen over the next three years.

Russia plans to produce hydrogen from nuclear and renewable sources, but with Russia's vast gas reserves, analysts expect natural gas to play the biggest role in hydrogen production.

"Russia sees hydrogen as a partial substitute for hydrocarbons in terms of what it can offer to market," Vladimir Drebentsov, chief advisor to the director general of the Russian Energy Agency (RosEnergo), said October 26, during a Chatham House webinar on Russia's approach to climate change.

During a government meeting on hydrogen in mid-October, Russian Deputy Prime Minister Alexander Novak said that hydrogen should be integrated into Russia's energy and low-carbon development strategies, as once a global hydrogen market emerges, it will compete with hydrocarbons markets.

Price assessments

These plans are being developed at a time when production prices for blue hydrogen continue to be lower than green in Europe.

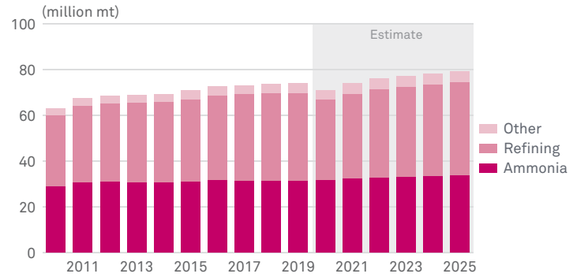
Production prices for hydrogen produced from gas with carbon capture and storage (CCS), including capital expenditures and carbon, averaged Eur2.932/kg in January to October 2021, according to Platts assessments. The cost assessment for hydrogen produced from renewables using electrolysis was higher at Eur6.904/kg during the same period.

"In Platts' models, SMR with CCS generally uses a lower-cost input [natural gas] than electrolysis hydrogen [grid electricity], leading to lower production costs for blue hydrogen than green hydrogen," Brian Murphy, Platts senior analyst, hydrogen and low carbon fuels, said.

Climate concerns

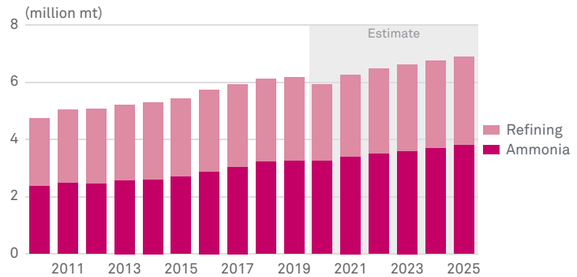
Russia is targeting Europe and Asia as key export markets. It plans to create at least three hydrogen clusters – in the northwest for European exports, the east for Asian supplies, and the Arctic for domestic consumption and potential exports.

Global hydrogen demand



Source: S&P Global Platts Analytics

Russia's hydrogen production



Source: S&P Global Platts Analytics

Russia's hydrogen export plans to some extent depend on how hydrogen demand develops among European customers for blue hydrogen, as they may prioritize green hydrogen in light of EU climate legislation.

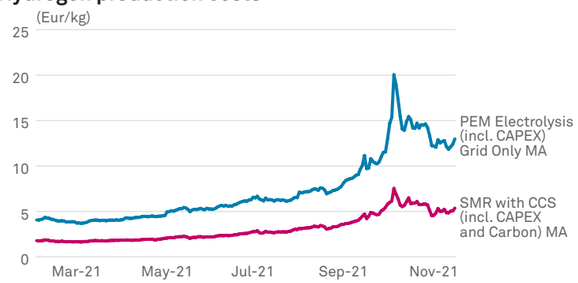
"With its vast gas reserves, Russia has a large potential for blue hydrogen [with carbon capture, utilization and storage], but export potential for blue hydrogen will realistically depend on whether other countries treat it as sufficiently environmentally friendly," said Elena Anankina, senior director (analytics), Ratings and Infrastructure, S&P Global Ratings.

Russia is investing in ways to reduce the carbon impact of blue hydrogen, including carbon capture and the use of pyrolysis in production, as well as shipping gas for hydrogen production to facilities with good access to power generated from renewables. The Russian energy ministry argues that with carbon capture, up to 90% of emissions from gas-based hydrogen can be eliminated.

Anankina added that there is some potential for low-carbon hydrogen projects in Russia, including in the Murmansk region, using wind and nuclear power.

Russian domestic consumption is less sensitive to concerns over carbon emissions, with projects including hydrogen buses and power generation using a hydrogen and methane mix.

Hydrogen production costs



Source: S&P Global Platts

Russian officials have also held talks with their counterparts from the UAE and Saudi Arabia on hydrogen cooperation.

These plans will develop in the context of existing energy cooperation, with factors including climate legislation, sanctions, and the OPEC+ crude production agreement likely to affect the success and long-term viability of these projects. ■

Foreign cooperation

Hydrogen is also becoming a key element in talks on future cooperation with foreign partners, including partners in Asia, Western Europe, the Middle East and Australia.

Russia and Germany have signed a deal on potential cooperation on sustainable energy, including hydrogen. Officials from western companies with long-standing involvement in the Russian energy sector have also expressed interest in joining hydrogen projects in Russia, including BP and TotalEnergies.

Meanwhile, Japan has announced that it will work with Russia's Rosneft and Novatek on lower-carbon projects, including hydrogen and ammonia, as well as CCS.

Go deeper

Hydrogen offers a new pathway to decarbonization. Find out how S&P Global Platts price assessments are bringing transparency to this emerging fuel.

Going with the flow

As North Sea oil production declines, it is also getting heavier and more sour. Paul Hickin, Nick Coleman and Robert Perkins examine how the quality shift is playing out in global trade flows

North Sea crude is getting heavier and more sulfurous. Medium sour crude will make up almost a third of the region's volumes by 2040 compared to just over 2% in 2010, according to a data analysis compiled by S&P Global Platts.

Light sweet grades, traditionally the mainstay of crude found in waters straddled mostly by the UK and Norway, may still make up more than half of all output in two decades' time, but overall volumes could be down at not much more than 600,000 b/d by that time from closer to 3 million b/d in recent years and almost double that in 2000, according to S&P Global Platts Analytics.

Johan Sverdrup, which celebrated its two-year anniversary in October, is the medium sour grade responsible for creating metaphorical waves in the North Sea. With gravity of 28.7 API and a sulfur content of 0.8% it has already established itself as a firm favorite among Asian refiners and in China in particular.

Production from the Equinor-operated oil field has ramped up quickly and over half a million barrels a day jostle with key OPEC grades from the likes of Saudi Arabia and Iraq. And the competition is set to grow as the flagship field is expected to achieve capacity of 755,000 b/d around the end of 2022. According to the Platts data analysis, that could mean Sverdrup comprises more than a quarter of all North Sea output by then.

Widening interest

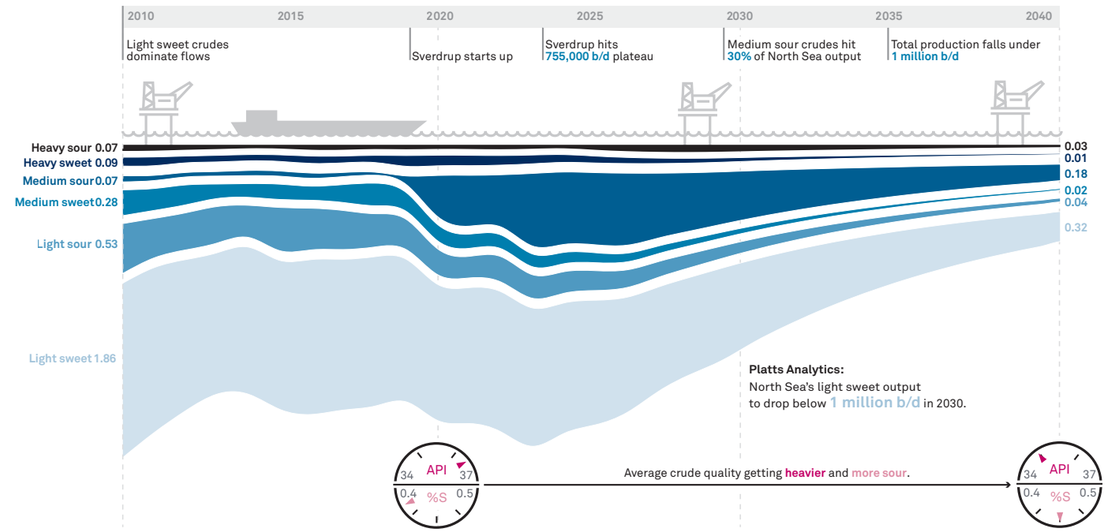
The popularity of Sverdrup is also spreading after finding a natural home in China, with further buying interest in 2021 coming from South Korea and India.

Not only does Sverdrup suit many Asian refiners, but that area of the world is likely to be the hub for demand

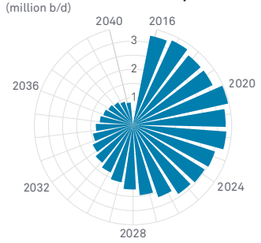
North Sea oil flows adapt as crude quality evolves

Demand for North Sea crude is expected to remain strong for decades, underpinning the Dated Brent benchmark published by S&P Global Platts and used to price approximately two-thirds of the world's oil. The giant Johan Sverdrup field in Norway's territorial waters has given the basin new impetus but crude from the region, which started producing in the 1970s, is growing heavier and more sulfurous. Europe has traditionally been the main market for North Sea crude but Asia is becoming an increasingly important customer.

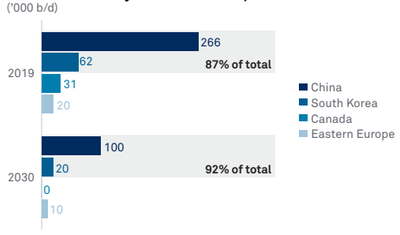
Sverdrup shaking up North Sea crude quality outlook (million b/d)



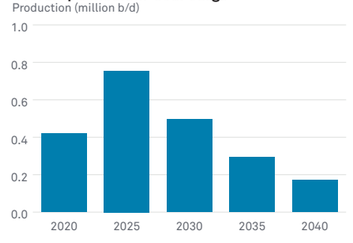
Outlook for North Sea oil production
(million b/d)



Asian refiners key to North Sea exports
('000 b/d)



Sverdrup's medium-sour surge
Production (million b/d)



Source: S&P Global Platts Analytics, S&P Global Platts, Equinor

Developed by Robert Perkins, Nick Coleman and Paul Hickin, designed by Reynaldo Dizon

growth for many years to come. Some 7 million b/d of additional Middle East, African and Asian downstream capacity could come in the next five years, while the US and Europe either close or convert refineries amid environmental and economic pressures, according to Platts estimates.

Sverdrup also follows in the vapor trail of fellow North Sea grades such as Ekofisk and Forties, which are similarly well liked by Asian customers – albeit taken in smaller volumes. Forties has a sulfur content higher than many of its peers at 0.54% (and closer to Sverdrup) according to the Platts Periodic Table of Oil, while Ekofisk is an example of the wider interest for classic light sweet North Sea crude.

Lots of Sverdrup cargoes have travelled less far in recent months too. Refiners across northwest Europe have added it to their baskets, and Greece and Turkey have been snapping up the Norwegian barrels as European refiners dabble a little more with the less familiar as a lower price enables it to compete with Russia's medium sour Urals grade.

Sverdrup is also lauded for its greener credentials.

State-controlled Equinor says emissions from the Sverdrup production process are among the lowest of any oil and gas field in the world at 0.67 kg of CO2/barrel produced, or around 4% of the global average, thanks to the use of hydropower to generate electricity used in operations.

Equinor's minority partner, Lundin Energy, has gone one further, vowing that all its 20% share of crude shipments from the field will be carbon neutral, with residual emissions to be "neutralized" using "high quality" natural carbon capture projects under the Verified Carbon Standard process.

Sverdrup is arguably the right crude at the right time with the right production processes in terms of giving the North Sea oil sector a much-needed boost. But after the surge in medium sour crude, with another stream due from the Johan Castberg development in the Barents Sea in late-2022, there is uncertainty on where the next big boost might come from.

Revolving doors

Platts Analytics forecasts the North Sea's light sweet crude production falling below 1 million b/d by 2030. But demand for this premium grade – since sulfur lowers the yield of various refined products such as gasoline, diesel and even plastics – will remain strong in Europe.

This gap is being filled by an ever increasing amount of US crude. Ever since US shale was freed from its shackles in 2015, when an export ban was lifted, the country's light sweet crudes have gone global. As many as 24 European countries have taken delivery of US crude and it has become something of a baseload grade in the region.

So while a greater proportion of US crude flows heads eastward across the Atlantic satisfying European refiners' appetite for high quality crude, a greater proportion of North Sea crude, largely in the guise of Sverdrup, also heads eastward via the Suez canal.

Ever since US shale was freed from its shackles in 2015, when an export ban was lifted, the country's light sweet crudes have gone global

This complexity – and with it issues around loading programs, delivery mechanisms, quality adjustments and more – has left the market divided over the next evolutionary step in the Platts Dated Brent benchmark, used to price about two-thirds of the world's oil.

Platts has been in open consultation with the market over whether to include more crude oil in the benchmark, focusing mainly on Johan Sverdrup and the US' WTI Midland. In recent decades, North Sea grades Forties, Oseberg, Ekofisk and Troll have boosted volume in the Brent benchmark, which started production in the 1970s.

The North Sea, as a reflection of the global crude sector, has been facing many shake-ups in recent years: from the rise of US shale on the supply side to changing customer preferences and energy transition pressures on the demand side. But it is clear that demand both at home and abroad, for North Sea crude in all its shapes and forms, will remain robust for many years to come. ■

Drive to zero emissions

Carbon intensity is set to be a major driver for the future of crude. By Arsalan Syed and Paula VanLaningham

The need to pursue aggressive decarbonization has become ever more urgent, with the Intergovernmental Panel on Climate Change's most recent report underscoring that climate change will almost certainly breach the 1.5 degree Celsius objective set out in the Paris Climate Agreement within the next 30 years.

Comprehensive and immediate action to manage and reduce the emissions generated by human activity will require a complete re-think about how we look at the carbon intensity of the things we rely on every day.

While progress has been made in exploring alternatives to fossil fuels in power generation, transportation and industrial use, the world is expected to remain reliant on them for some time to come, which means the oil industry will have to have to start reckoning with the relative climate impact of the fuels it produces and the crudes it opts to use.

Many oil producers have already started to do this, looking for ways to diversify their portfolios away from a reliance on oil and gas and toward the fuels of the future, focusing heavily on investment in hydrogen and renewable energy. Companies like TotalEnergies, Shell, Repsol and BP have all announced plans to cut 100% of their carbon emissions by 2050, while other producers like Occidental, which operates in the Permian Basin, have set their 100% reduction targets for 2040. Eni and Equinor have set their targets for 2030.

However, if any of this is going to be possible, changes have to start being made now, and made aggressively.

How the industry plans to manage this, though, raises some additional questions. In early 2021, Oxy sold the first "carbon neutral" crude cargo – building on a strategy pioneered by the LNG industry in 2020 – shipping 2 million barrels of crude to Indian refiner Reliance, offsetting the emissions generated across the full life cycle of the cargo with voluntary carbon credits certified by the Verified Carbon Standard.

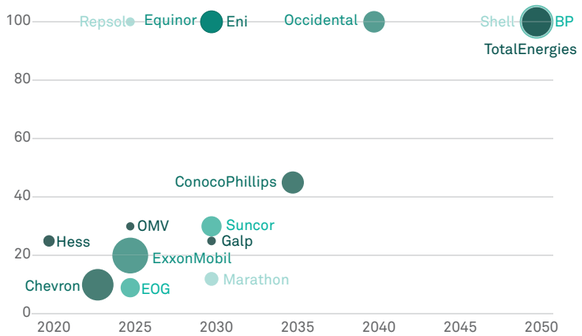
In April, Norway's Lundin sold 600,000 barrels of "certified carbon neutral" crude to Mediterranean refiner Saras, covering "life of field" emissions, and not combustion.

While both these cargoes claim carbon neutrality status, the differences in their scope raise real questions about what carbon neutrality really means when applied to high-carbon commodities trading.

Depending on which segment of the life cycle is in question, it could have an immense impact on the total CO2 emissions that are observed. Some market participants are looking at the entire supply chain, while others are focusing on a specific section. Figuring out which segments are considered when summing up the emissions is a vital piece of the puzzle.

For example, "well-to-tank" commonly refers to the crude production, transport, refining, as well as the refined products' transportation to the storage tank, whereas "tank-to-wheel" refers to the storage tank

Select IOC emissions reduction targets (%)



Note: For those IOCs which have announced multiple targets and target dates, the nearest target is represented
Source: S&P Global Platts, company announcements

Carbon intensity is the calculation for the number of kilograms of carbon emitted in the production of one barrel of crude

to end-use combustion. For context, only about 20% of the total emissions from crude occur in the well-to-tank segment. Most of the emissions occur during the end-use segment of the supply chain.

Homing in on carbon intensity

The other major question facing the industry is how effective carbon offsetting really is in the absence of emissions savings throughout upstream production and, critically, how to effectively measure that.

This is where the carbon intensity (CI) of the production process can become its own attribute of the crude itself, like the density of the crude and how much sulfur is included. This avenue has a much longer timeline as not only does carbon intensity have to be transparent, but the way that price differentiation will occur will take time as well.

The industry sees this as the end goal but getting to a point where carbon intensity is thought of as an attribute equal to API and sulfur will take evolution from the market. As a first step to adding transparency to what the carbon intensities are for different crudes around the world, S&P Global Platts has begun to work on what an upstream calculation will look like.

Carbon intensity is the calculation for the number of kilograms of carbon emitted in the production of one barrel of crude. Carbon intensity differs across the board when looking at various crudes from around the world. To add transparency to this space, Platts has calculated the CI for several different fields.

When calculating carbon intensity, Platts has taken a bottom-up approach and is looking at the production-to-storage terminal section of the life cycle.

Emissions during the exploration and drilling stages are not accounted for at this time. For example, Platts Upstream Carbon Intensity Assessments for the US Permian Basin crude include the measurement of carbon intensity from well-head, including venting/flaring, through pipeline and into storage on the Gulf Coast. We do not include any emissions or emissions effects from activities that happened prior to "today" –that is, we are calculating today's emissions to deliver today's barrel.

In addition to the individual carbon intensities for each field, Platts also publishes CI premiums for each one of these. The CI premium represents the $/b calculation to offset the emissions of the crude using a removal-based credit.

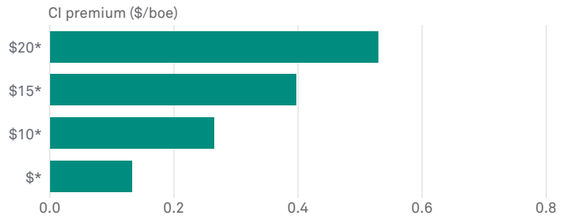
The Cold Lake crude field in Canada has one of the highest upstream carbon intensities among the fields that Platts currently publishes, sitting at 81.54 KgCO2e/boe for the month of October. It will cost producers of Cold Lake crude around $1.35/boe to offset greenhouse gas emissions using removal-based credits.

Looking further south, Bakken's upstream carbon intensity was 26.44 KgCO2e/boe for the month of October. The carbon offset premium for Bakken was assessed at 44 cents/boe November 15.

Similarly, Iraq's Kirkuk field had an upstream carbon intensity of 68.90 KgCO2e/boe for the month of October. The carbon offset premium was assessed at $1.14/boe November 15.

The greater the carbon intensity of a particular crude, the higher the carbon intensity premium will be to account for the price of carbon removal. This is calculated based on the price of the Carbon Removal Credit, or CRC, assessment and its goal is to increase transparency of the CI of each crude and how that relates to the premium that the crude has to be sold for to take into account the removal of the carbon associated. As the market evolves, crudes with lower CIs will be the premium barrels in the market as companies make strides to lower their greenhouse gas footprints.

CI premium increases as carbon credit price rises



*Carbon credit price ($/mtCO2e)
Note: Carbon intensity calculation is based on Crude-Bakken while carbon intensity premium is calculated on 26.44 kgCO2e/boe
Source: S&P Global Platts

First steps

The interest from the market on carbon intensity and the evidence of trades to account for carbon emissions is a step in the right direction. It is obvious when looking at the International Energy Agency's roadmap to net-zero by 2050 that other technological advances in addition to lower fossil fuel use are a key piece of the puzzle. The IEA's net-zero scenario relies on the use of carbon capture and storage to help tackle emissions from existing energy sources and provides a solution for industrial sectors where emissions are hardest to reduce.

Carbon markets, both voluntary and compliance-based, will work in tandem to accelerate the investment into projects that will reduce or avoid greenhouse gas emissions for years to come. In turn, this will also open the door to accelerate technological advancements as these markets become more sophisticated over time.

Looking at the bigger picture and all that is necessary to achieve net-zero by 2050, being aware of carbon intensity when it comes to existing commodities is just the first step. Nevertheless, it is one that is absolutely necessary. ■

Go deeper

S&P Global Platts carbon intensity calculations can help you better understand the emissions associated with producing different crude grades.

Insight from Washington

By Ellie Potter and Maya Weber

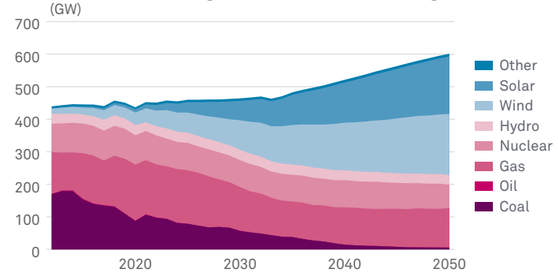
As energy transition ambitions amp up around the world, a key US energy regulator is about to embark on a transformation of its own.

After months of deadlock on some pivotal policy choices, the Federal Energy Regulatory Commission is poised to gain a Democratic majority for the first time under the Biden administration. President Joe Biden's nominee, District of Columbia Public Service Commission Chairman Willie Phillips, was confirmed by the Senate November 16.

The shift could pave the way for Democrats' priorities in transmission infrastructure buildout and might also raise the bar for approval of natural gas projects, which once advanced with relative ease.

The 2-2 deadlock prior to the new appointment resulted in two major proceedings affecting eastern US power markets becoming automatically effective after the commission failed to act on them in time.

US (lower 48 states) generation by technology



Source: Enverus, NYMEX

Democratic Chairman Richard Glick, nonetheless, quelled notions he might operate in a partisan fashion.

"I intend to work in a bipartisan manner and not assume that because we have three Democrats we're just going to roll the Republicans all the time," he said in November.

Electricity implications

Glick has acknowledged that FERC has a role to play in climate mitigation but noted that the commission is not advocating for a specific resource mix. Rather, the commission's role is to react to actions in energy markets and ensure there is a level playing field for all energy technologies and resources, he said during an October webinar.

A fifth commissioner could cast the deciding vote on future disagreements among the members as they advance through an important proceeding that could alter rules pertaining to transmission buildout. The commission launched an advance notice of proposed rulemaking in July, aiming to assist regulators in altering their planning, cost allocation and generator interconnection rules to help bring more clean energy technologies onto the grid.

Republican commissioners wrote in their July concurrences that the transmission proceeding contained some proposals that they would not support.

"A Democratic majority on the commission suggests support for market rules favoring growth in clean energy, incentives for [regional transmission organization] membership, resolving interconnection queue backlogs, and expediting long-haul transmission projects," said Morris Greenberg, senior manager of low carbon electricity for S&P Global Platts Analytics.

However, major transmission upgrades, particularly those requiring new rights-of-way, would likely still face lags of at least a decade while states retain siting authority, Greenberg said.

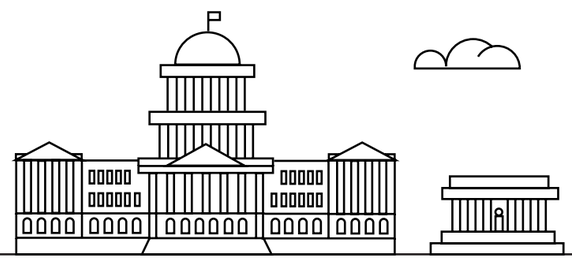
Platts Analytics forecasts US gas demand to increase by more than 8 Bcf/d by 2030, creating a need for additional pipelines

According to Sasha Mackler, executive director of the Bipartisan Policy Center's Energy Project, FERC can help advance transmission buildout, which is and will continue to be "one of the key enablers or potential constraints to the pace at which we hit our net-zero goals."

Some studies have projected that the US will need to double or triple its transmission capacity to achieve Biden's midcentury decarbonization targets.

"I think they have a critical role to play, and I think part of the challenge of the energy transition that's in front of us right now is figuring out how to leverage an organization like FERC to help shepherd some of the key pieces of infrastructure that we will need to have in place to hit our goals," Mackler said.

In addition to the transmission proceeding, FERC has worked to better facilitate wholesale market participation of aggregated distributed energy resources, such as rooftop solar projects and battery storage facilities. Commissioners are considering how to improve integration of hybrid projects, such as solar



or wind generators coupled with storage technologies, into the system as well.

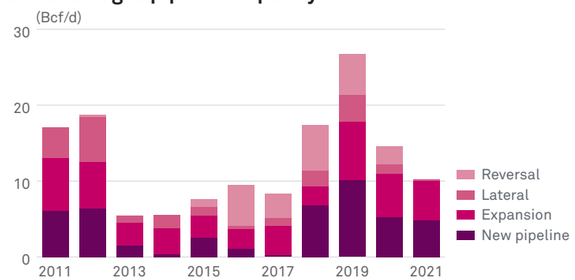
Additionally, the commission is evaluating possible reforms for the energy, ancillary services and capacity markets in grid operators across the country.

"We know that because of the way the grid is changing, there's a growing need for greater flexibility," Glick said. "It's not entirely clear that our current approach to addressing issues associated with capacity or resource capacity ... is sufficient to address the needs of the future."

FERC's approach to gas

The commission is also at an inflection point in its work reviewing proposals for expansion of natural gas infrastructure, including pipelines, LNG projects and storage facilities.

US natural gas pipeline capacity



Source: S&P Global Platts Analytics

The addition of a third Democrat could tip the balance toward more stringent reviews, though it's unclear just how dramatic the changes will be.

For years, opponents of fossil fuels have pressured FERC to conduct stricter environmental reviews of gas projects. And the Biden administration has made climate a top priority.

The next few months should start to reveal under what conditions FERC's Democrats will support gas projects that substantially increase capacity or emissions.

Christi Tezak, managing director for research at ClearView Energy Partners, sees the addition of a Democrat as facilitating changes to FERC's 1999 certificate policy statement for natural gas pipelines.

"We expect the new policy statement to give less weight to economic benefits and more weight to the adverse environmental impacts, making securing approval more difficult," she said.

One midstream gas company official said the ongoing uncertainty at FERC is affecting company decisions about where to invest capital, as companies decide whether to look for opportunities that don't have to go through FERC.

While FERC is an independent agency, Glick has agreed with the US Environmental Protection Agency that the commission should be able to estimate the significance of climate impacts of the projects it approves.

He also has urged the commission to give greater scrutiny to the market need for projects, particularly those that rely on precedent agreements with pipeline affiliates. And he is seeking to elevate the role of environmental justice in FERC's decisions about whether and where to site gas infrastructure.

Despite support from fellow Democratic Commissioner Allison Clements, Glick thus far has lacked the votes to push through substantial changes in FERC's approach.

During his confirmation hearing in the Senate, Phillips walked a careful line when queried on his views in that debate. He promised senators to work toward efficiencies in permitting, while also noting that courts have directed FERC to do more on climate and environmental justice.

Investments could shift toward projects contained within states more open to gas project permitting and to small additions to existing pipelines – or perhaps toward carbon capture or hydrogen projects, he suggested.

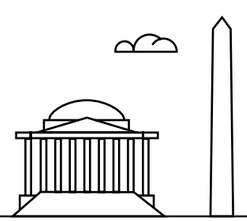
It remains to be seen how much midstream investment will come off the sidelines. Multiple large gas pipeline projects crossing states in the eastern US have recently stalled or run aground amid stiff opposition in recent years.

"It does seem increasingly likely that Appalachia – Marcellus and Utica [basins] specifically – will be fenced off in terms of contributing incremental production to the gas market," said Rich Redash, head of global gas planning, Platts Analytics.

Platts Analytics forecasts US gas demand to increase by more than 8 Bcf/d by 2030, creating a need for additional pipelines, much of which would serve export regions.

But for now, Redash points to a chilling effect on investment amid a general environment of uncertainty in which unknowns about federal climate and energy policies are layered on top of economic uncertainties.

One certainty is that FERC's actions over the coming months will be closely scrutinized by the energy markets. ■



Certified gas hits new milestones

The US market for certified natural gas is developing rapidly, and allocation of dedicated pipeline capacity for transporting the cleaner molecules could be a tipping point. By Kelsey Hallahan and Emmanuel Corral

Recent announcements by several US midstream natural gas operators could lead to the ability to move natural gas certified for environmental friendliness directly from producers to end-users.

With natural gas drawing increasing scrutiny for its emissions footprint, the industry has responded with a cleaned-up version of its traditional product: certified gas. While a universally accepted definition has yet to emerge, this broadly means gas that has been verified by an independent third party to have been produced in a manner consistent with certain environmental, social and governance standards.

Methane emissions have emerged as a key performance metric for certified gas, with an emphasis on monitoring and measurement.

Producers, such as Southwestern Energy and EQT in Appalachia, were among the first to embrace the concept during the first half of 2021. Since then, interest in certified gas among producers has expanded to the Haynesville Shale with Chesapeake Energy and Comstock Resources, as well as to the Permian Basin where ExxonMobil intends to certify a facility in New Mexico.

Although a handful of utilities have signed deals to purchase certified gas, the demand side of the market has generally been enthusiastic but skeptical. Some end-users have told S&P Global Platts they prefer physical molecules as opposed to offsets. But without dedicated pipeline capacity to carry certified gas, there was no way to ensure they were getting the cleaner molecules.

That barrier might be about to fall, with midstream operators announcing intentions to dedicate capacity to transport certified molecules to end-users:

■ DT Midstream has proposed expanding its Haynesville gathering, boosting and transport system and creating a "carbon-neutral wellhead to water" service for certified gas to flow south to LNG exporters, according to a September 30 presentation. The midstream operator's LEAP pipeline already provides a potential route for Chesapeake Energy's soon-to-be certified Haynesville production to flow directly toward the Cameron and Sabine Pass LNG export facilities. Under the proposal, electric compression would be provided by renewable generation and facilities would be paired with carbon capture and sequestration.

■ Tallgrass Energy inked a multi-year partnership with Project Canary to assess and certify the bidirectional 4.4 Bcf/d Rockies Express Pipeline to a standard focused on environmental stewardship, operational practices and real-time emissions detection and monitoring. A major objective of the partnership is to "enable tip-to-tip certification and tracking of gas molecules," according to a September 28 statement. This will be facilitated by REX dedicating specific capacity to transporting certified gas from Appalachia to Midwest markets.

■ Kinder Morgan announced earlier that its Tennessee Gas Pipeline would partner with Southwestern Energy to transport its certified gas in Appalachia to "benefit a large market in the Northeast," according to a September 21 press release. Southwestern partnered with Project Canary in mid-June to certify approximately 3 Bcf/d of Appalachia gas production to its IES TrustWell standard, continuing a relationship that dates back to the first known certification deal in 2018.

Major certification standards

	Focuses on methane emissions?	Deployment of emissions monitoring technology?	Qualitative ESG criteria? (e.g. community engagement, corporate governance)	Nonprofit organization?	Authorizes external auditors to complete assessment?
Project Canary's TrustWell Standard	Yes	Yes	Yes	No	No
Equitable Origin's EO100 Standard	No	No	Yes	Yes	Yes
The MiQ Standard	Yes	Yes	No	Yes	Yes

Source: S&P Global Platts, company websites

In addition to formal proposals, representatives from other major midstream operators, such as Williams – owner and operator of Transco Pipeline and Northwest Pipeline – and Boardwalk Pipeline Partners – owner and operator of Texas Gas Transmission and Gulf South Pipeline – mentioned interest in certified gas at the LDC Gulf Coast Forum in October.

Certification standards

There have been two distinct certification waves: in 2018-2019 and 2021. One of the earliest certified gas transactions took place in 2018 between Southwestern Energy and utility New Jersey Resources, with IES – now part of Project Canary – certifying to its TrustWell standard.

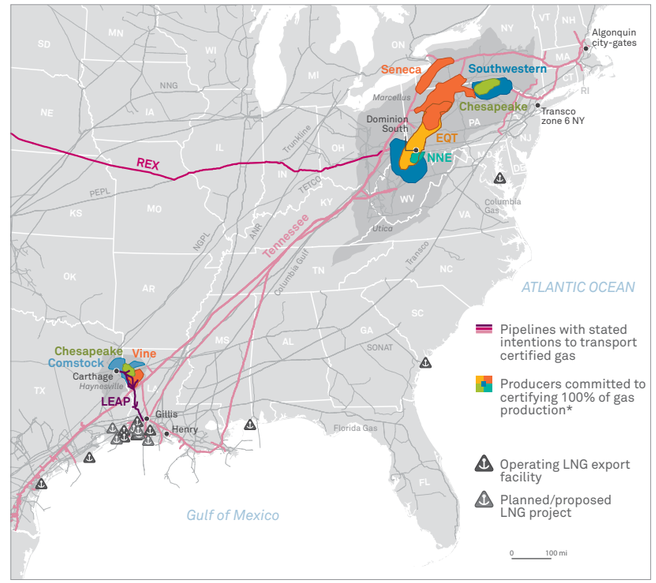
Currently, there are three major standards:

■ Project Canary's TrustWell Certification: IES was the original gas certifier and merged with Colorado-based continuous monitoring firm Project Canary in 2020. The TrustWell Certification assesses data points in 24 operational categories, ranging from water management to well integrity. It is frequently paired with the deployment of Canary X methane continuous monitoring sensors.

■ Equitable Origin's EO100: Equitable Origin is the most qualitative of the three standards, focusing on Indigenous People's rights, corporate governance and ethics, fair labor and working conditions, climate and biodiversity, as well as community engagement. This standard does not include a methane emissions measurement component, which has led Equitable Origin to partner with MiQ on several certification deals.

■ The MiQ Standard: MiQ – which is a partnership between RMI, formerly the Rocky Mountain Institute, and SYSTEMIQ, a global sustainability consultancy, grades on methane intensity, technology deployment, and operational best practices. MiQ's focus includes developing an international governance framework for certified gas, in reflection of the increasingly global gas market.

Midstream companies join certified gas movement



*Not shown: Crestone Peak Resources in Colorado committed to certifying 100% of gas production; total volume undisclosed. Data as of November 15, 2021.
Source: S&P Global Platts Analytics, company websites

As of November 9, companies had committed to certifying nearly 7 Bcf/d of production by the end of the year, according to a Platts survey of certifiers

Appalachia

Certification first took off in Appalachia in 2021. Environmental Protection Agency data shows that Appalachia has the lowest natural methane intensity of all production regions in the contiguous US. Starting with a lower methane intensity lowers the bar for the production to meet certification standards.

■ EQT, the largest US gas producer, has taken an expansive approach to certified gas, announcing a pilot program to certify two well pads with Project Canary in January, followed by a deal in April with MiQ and Equitable Origin to certify 100%, or approximately 4 Bcf/d, of the company's Marcellus production. Because no market consensus has been reached about what kind of certification will best attract buyer interest, EQT has covered all the bases with this strategy.

■ Northeast Natural Energy signed a deal in May with MiQ and Equitable Origin to certify a production field in West Virginia, using Baker Hughes LUMEN Terrain ground-based sensors on one well pad for an emissions monitoring pilot.

■ Range Resources announced a pilot program in June to have Project Canary certify gas from two well pads in southwestern Pennsylvania. An unspecified European multinational energy utility contracted with Range to buy the gas, according to the June 15 press release.

■ Southwestern Energy, a first mover for certified gas, made public a deal with Project Canary in late June to assess the entirety of its 3 Bcf/d of Appalachia gas production. This commitment signified the largest deployment to date of Project Canary's continuous monitoring technology.

■ Chesapeake Energy was the next regional producer to announce that it would certify 100% of its approximately 1.3 Bcf/d of Appalachia gas production. The company partnered with MiQ and Equitable Origin, with the certification expected to be completed in the second quarter of 2022. Chesapeake has also committed to a pilot program with Project Canary to certify an undisclosed amount of gas.

■ Antero Resources signed with Project Canary for a pilot program to certify two well pads in late July, with the certification expected to be complete by the first quarter of 2022.

■ Seneca Resources announced in early September that it would work with Equitable Origin to certify all of the company's Appalachia gas production. The company also signed a smaller certification partnership with Project Canary to install continuous monitoring at three well pads and certify 300 MMcf/d to the TrustWell Standard.

Appalachia leads the way in 2021 certification commitments

Company	Amount of production	Certification commitment	Expected completion	Certifier
EQT	N/A	2 well pads (pilot)	Not disclosed	Project Canary, TrustWell Standard
EQT	100%	4 Bcf/d	Q4 2021	MiQ, Equitable Origin
Southwestern Energy	100%	3 Bcf/d	Q1 2022	Project Canary, TrustWell Standard
Antero Resources	N/A	2 well pads (pilot)	Q1 2022	Project Canary, TrustWell Standard
Range Resources	N/A	2 well pads (pilot)	Not disclosed	Project Canary, TrustWell Standard
Northeast Natural Energy	N/A	0.5 Bcf/d	Q4 2021	MiQ, Equitable Origin
Chesapeake Energy	100%	1.3 Bcf/d	Q2 2022	MiQ, Equitable Origin
Chesapeake Energy	N/A	Not disclosed (pilot)	Not disclosed	Project Canary, TrustWell Standard
Seneca Resources	100%	1 Bcf/d	Q1 2022	Equitable Origin
Seneca Resources	N/A	0.3 Bcf/d	Not disclosed	Project Canary, TrustWell Standard

Deals as of November 2021

Haynesville emerges as second frontier for certified gas

Company	Amount of production	Certification commitment	Expected completion	Certifier
Chesapeake Energy	100%	1 Bcf/d	Q4 2021	MiQ, Equitable Origin
Chesapeake Energy (Vine)	100%	1 Bcf/d	Q4 2021	Project Canary, TrustWell Standard
Comstock Resources	100%	2 Bcf/d	Q2 2022	MiQ
Chesapeake Energy	N/A	Not disclosed (pilot)	Not disclosed	Project Canary, TrustWell Standard
TG Natural Resources	N/A	Not disclosed (pilot)	Not disclosed	Project Canary, TrustWell Standard

Deals as of November 2021

Haynesville

With its proximity to US LNG export facilities and the basin's naturally low emissions intensity, the Haynesville Shale in northern Louisiana and East Texas has emerged as a second major basin for certified gas.

■ In November, Comstock Resources announced a partnership with MiQ to certify approximately 2 Bcf/d of its East Texas and Louisiana gas production by the end of the first half of 2022.

■ As part of Chesapeake Energy's mid-July announcement that it would work with MiQ and Equitable Origin to certify its Appalachia production, the company also made plans to certify 100% of the company's Haynesville production by end-2021. Chesapeake has also embarked on a pilot program in the basin with Project Canary.

■ Vine Energy, which is to be acquired by Chesapeake through a deal announced in August, also pursued certification, working with Project Canary to deploy Canary X sensors and certify its 1 Bcf/d of production to the certifier's TrustWell standard.

■ TG Natural Resources, which is jointly owned by Japanese utility Tokyo Gas and commodities merchant Castleton Commodities International, announced a pilot project with Project Canary October to install continuous emissions monitors on a number of Haynesville well locations. The wells will also undergo TrustWell certification.

In addition to Appalachia and the Haynesville, the Permian, Denver-Julesburg and Green River basins have each also had at least one producer seek certification so far this year. Outside of the US, Canada has also seen several certified gas deals, supported by Quebec gas distributor Energir's Initiative for Responsible Procurement of Natural Gas.

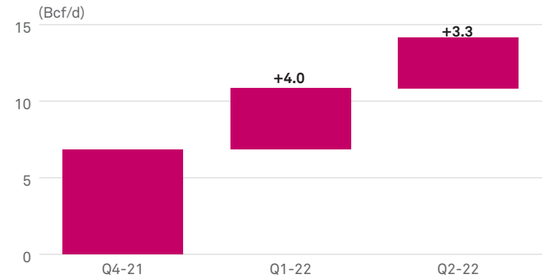
What's next

As of November 9, companies had publicly committed to certifying nearly 7 Bcf/d of production by the end of the year, according to a Platts survey of certifiers. An additional 7.3 Bcf/d is anticipated to come online in 2022, bringing the total to 14.3 Bcf/d, or around 16% of year-to-date US gas production. The full amount of certified gas coming online is likely slightly higher, as a number of pilot projects have not disclosed their expected volumes.

Beyond physical transactions, certificates for environmental attributes – similar to Renewable Energy Certificates, or RECs, in electricity markets – are another possible route for certified gas market development. Platts launched Methane Performance Certificates October 4, with Xpansiv hosting the registry. The Platts MPC methodology provides a framework and path forward for producers whose certified gas meets certain parameters to mint certificates through Xpansiv. These certificates can then be traded on the exchange and monetized. MiQ also has plans to issue certificates in a registry.

The strength of end-user demand for certified gas – either physical molecules or certificates – will determine whether this nascent market takes off or fizzles. Regulated utilities are scrutinized by state commissions on how much they pay for gas and pass through to ratepayers. This suggests LNG exporters are to be the real first-movers in certified gas as they seek to satisfy the environmental demands of offtakers in Europe and Asia.

Supply of US certified gas set to increase



Source: S&P Global Platts, company websites

Already, LNG export developer NextDecade signed a deal with Project Canary in April to certify its proposed 27 million mt/yr Port of Brownsville facility, Rio Grande LNG. The agreement could help the project secure sufficient offtake agreements for NextDecade to take FID.

Steep competition for LNG cargoes ahead of an undersupplied winter market might delay LNG sourced from certified gas in the near term, but the momentum of energy transition and increasing availability of both certified gas and dedicated pipelines to transport it means that it may only be a matter of time. ■

Go deeper

Learn more about S&P Global Platts methane performance certificates and be empowered to differentiate and accurately price cleanly produced or responsibly sourced natural gas.

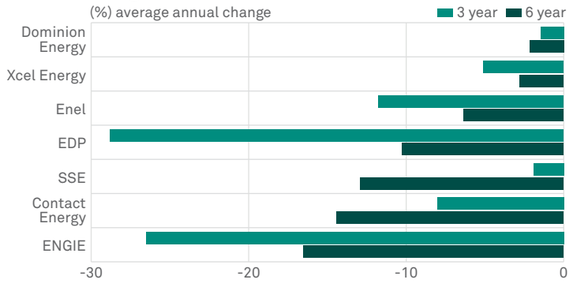
The 2021 Climate Leader Award - Power: the race to net-zero

By Drew Fryer
Manager, Methodology Innovation
S&P Global Sustainable1

The Climate Leader Award – Power (formerly the Energy Transition Award) was developed to recognize the leadership of power companies in the transition to a low-carbon, sustainable economy.

This was the fourth year in which it was awarded, as part of the 23rd annual S&P Global Platts Global Energy Awards held December 9, 2021 in New York City. 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 impacts, publishing robust targets to improve performance, aligning with global energy transition commitments and demonstrating leadership in innovative ways.

Greenhouse gas emissions (Scope 1 + Scope 2)



Source: Trucost

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.[1] The IPCC has stated that net-zero emissions will be required by mid century in order to limit the global temperature increase to 1.5 C.[2] The latest analysis in 2021 of a net-zero, 1.5 C-compatible scenario by the International 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 drives the shortlisted finalists for the Climate Leader Award - Power.

[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, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)].

Award criteria

No nominations were accepted for this award.

The shortlisted finalists were identified by S&P Global Sustainable1, by assessing the public disclosure of global power companies included in the S&P Global LargeMidCap Index[3], captured by Trucost's annual research engagement program[4]. 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

Shortlisted finalists

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 above criteria, companies' public reporting was evaluated for signals of recent outstanding ambition, innovation and transformative change in line with global needs for decarbonization of the energy system, and their alignment with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) , including evidence of 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 (% 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 excl. 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

[3]Data as of end June 2021: https://www.spglobal.com/spdji/en/indices/equity/sp-global-largemidcap/#overview
[4]https://www.spglobal.com/spdji/jp/documents/additional-material/the-trucost-research-process.pdf

Energy Agency further indicates that no new fossil fuel extractive assets – no new oil and gas fields and no new coal mines or extensions – could be built from 2021 onward while keeping the goal of limiting warming to 1.5 C achievable. Meanwhile available clean energy technologies like renewables would need to be deployed at an unprecedented rate, including a tripling of clean energy investment to $4 trillion by 2030. [5]

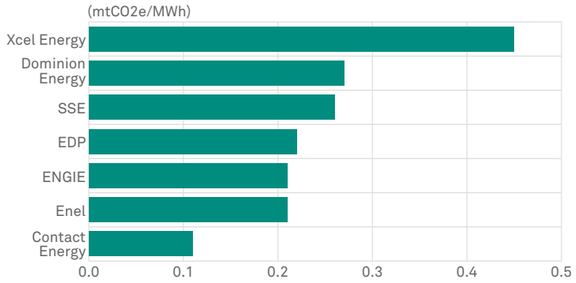
At the same time there are worrying reminders of the urgency of the task at hand and the costs of insufficient action. The US National Oceanic and Atmospheric Administration reported that there had been 18 separate weather and climate disasters with $1 billion or more in damage in the first nine months of 2021, including devastating wildfires in the western US and multiple hurricanes. This was the highest number on record for a nine-month period, and already second only to 2020 in the annual number of such extreme weather events. These are the types of extremes we expect to see more of under a situation in which mitigation of climate change fails.[6] In order to avoid a worsening of this already dangerous situation, there is a critical need for large emitters like the power generation industry to decarbonize, and decarbonize quickly. ■

2021 Award finalists

The shortlisted finalists for the 2021 Climate Leader Award - Power were:

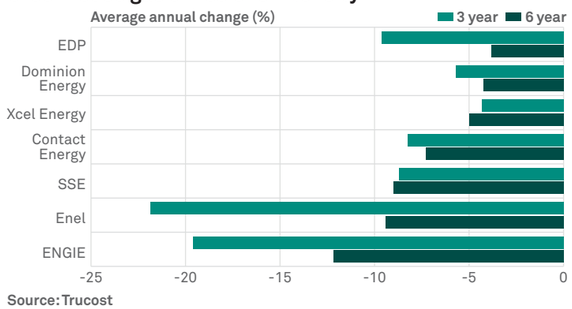
- Contact Energy
- Dominion Energy
- Enel
- EDP
- ENGIE
- SSE
- Xcel Energy

Greenhouse gas emissions intensity – latest year



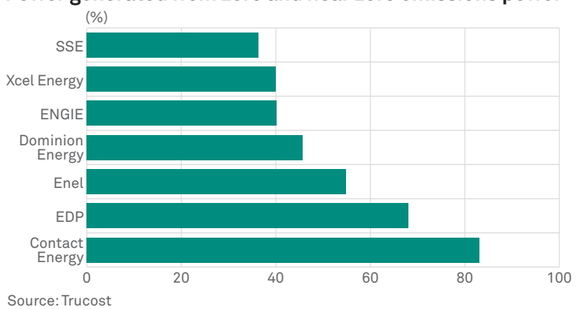
Source: Trucost

Greenhouse gas emissions intensity



Source: Trucost

Power generated from zero and near zero emissions power



Source: Trucost

[5]https://www.iea.org/reports/net-zero-by-2050
[6]https://www.noaa.gov/news/us-hit-with-18-billion-dollar-disasters-so-far-year

A closer look at net-zero targets

Recent years have seen a plethora of corporate commitments to achieving net-zero GHG emissions – reducing emissions to zero or as near zero as is feasible, then balancing out any remaining emissions with removals elsewhere.

Different and sometimes dizzying variations in details, timeframe and terminology are used by different companies. The inclusion of detailed plans is rare. The magnitude of planned mitigation relative to offsets or removals is typically unstated. Commitments sometimes explicitly or implicitly cover different scopes of emissions and operations (for example, in the case of a utility covering or not covering natural gas distribution to customers). Some companies are more transparent than others about the magnitude of the unresolved challenges in actually reducing emissions to net-zero (for example, Xcel Energy states that 20% of its goal will require the application of technologies that are not yet commercially available).

One fact is clear though – by making these commitments, even if non-specific and extending far into the uncertain future, companies will inevitably be closely held to account for them by their stakeholders in coming years.

Headline commitments:

Six out of the seven finalists have made a net-zero or similar commitment.

Contact Energy: not specifically committed to net-zero, though its operations are in New Zealand, a country with a goal of net-zero carbon dioxide emissions by 2050.

Dominion Energy: to achieve net-zero emissions by 2050, covering carbon dioxide and methane emissions from electricity generation and gas infrastructure operations.

Enel: to achieve full decarbonization of its energy mix and reach net-zero along the value chain by 2050.

EDP: to become carbon neutral by 2030 with a 98% reduction in emissions and residual emissions compensated.

ENGIE: to become net-zero by 2045, for the company and its clients.

SSE: to achieve net-zero carbon emissions from all business operations by 2050 at the latest.

Xcel Energy: to provide 100% carbon-free electricity by 2050.

The 2021 winner: ENGIE

ENGIE has reduced Scope 1 and 2 emissions by more than two-thirds over the six years to 2020, a difference of almost 100 million tonnes per year, and including a 55% reduction in the past three years, which are both outstanding within its industry. Emissions intensity is also on a sharp downward trajectory, with acceleration in progress evident in the past three years.

It has a net-zero target by 2045 covering all emissions scopes, five years earlier than many other utilities that have set net-zero goals, together with a strong interim goal, committing to reduce power generation emissions by 52% per kWh by 2030 from a 2017 base year. The 2030 target is validated as a Science Based Target by the SBTi. The company has detailed plans to eliminate coal from its power portfolio by 2027.

Highlights from the other 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. Its emissions intensity is very low by global standards. Contact has set a science-based target to reduce emissions by 45% between by 2026, and has published TCFD-aligned reporting, including commissioned modelling of potential physical and transition risks and opportunities from two IPCC scenarios.

Dominion Energy has reduced its emissions intensity by over 25% in six years, and is 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 North America.

EDP is a significant developer of renewable energy globally and derives 45% of its power from renewable sources, up from one-third five years earlier. Its latest decarbonisation targets include the reduction of emissions intensity by 98% by 2030 relative to 2015, validated as a science-based target, and is one in which the ambition level has been repeatedly increased. It also states an intention to double the production capacity of wind and solar power over the next five years.

Enel has halved its emissions and emissions intensity in the past six years. 55% of its power generated is from zero and near zero emitting sources. It is committed to a target to reduce emissions by 80% per kWh by 2030, compared with 2017, verified as a science-based target, and to achieving zero emissions by 2050. It plans additional renewable capacity of 96 GW in 2030 compared to 2020.

SSE shut its last coal-fired generator in 2020 and has set multiple emissions reduction targets, including to reduce the emissions intensity from power generation by 60% between 2018 and 2030, validated as a science-based target, and achieving net-zero emissions from all operations by 2050. Over the six-year period examined, SSE reduced its absolute emissions by almost 60% and its emissions intensity by 45%. It has zero emissions investments in place including for the world's largest offshore wind farm and the UK's largest onshore wind farm.

Xcel Energy reduced its emissions intensity by 25% and its absolute emissions by 15% over the past six years. It has so far put into operation 10,000 MW of wind power and announced a vision to provide 100% carbon-free electricity by 2050, as well as an interim goal to reduce carbon emissions 80% between 2005 and 2030. It has published TCFD-aligned reporting, analysis against 1.5 and 2 C scenarios, and it ties executive compensation to achievement of its emissions intensity target.

2021 S&P Global Platts Global Energy Awards

Building strength, bolstering commitment

By Murray Fisher

The S&P Global Platts Global Energy Awards program celebrates its 23rd year of honoring the organizations and individuals dedicated to excellence in the energy industry.

The awards recognize extraordinary accomplishments in 22 categories – accomplishments that are particularly laudable given the extreme challenges presented by the global pandemic.

Despite economic turbulence, labor shortages and supply chain disruptions, our winners are persevering and tackling the bigger issues: exhibiting leadership as a driver of innovation, expanding beyond traditional geographic and product markets, and truly embracing energy transformation.

Winners were selected from hundreds of nominations representing 29 countries, which were reviewed by an impartial panel of judges: international energy experts with backgrounds in regulation, policymaking, corporate leadership, trading and strategic consulting.

Platts salutes the Global Energy Awards winners for their inspirational resolve and dedication to continued advancement.

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

Naturgy Energy Group
Spain

Spanish energy group Naturgy receives the Platts Global Energy Awards' highest honor; it was selected by the judging panel from all nominees to reward all-around distinction in executing a total energy strategy. It is its country's largest integrated power and gas group and a major energy supplier in Latin America. As Energy Company of the Year, judges said it is now "charging ahead in renewables" and expanding to new markets.

Founded in 1843, Naturgy has a long history as a major producer and trader of natural gas. With an eye on energy transformation, it has been steadily "shifting assets from traditional sources" and growing its renewable energy business to develop what judges called an "impressively balanced portfolio of energy sources." Its installed renewable capacity includes 2 GW of wind, 0.4 GW of solar, and 2.1 GW of hydroelectric, and it aims to triple capacity internationally by 2025, through growth in Europe, Australia, the US and Chile.

With a "strong culture" and "bold leadership" by Chairman and CEO Francisco Reynés, Naturgy has "established a huge commitment to the future". By focusing on its goal of zero emissions by 2050, "it has really transformed from a gas company to a renewable company", the judges said.

CHIEF EXECUTIVE OF THE YEAR

Francisco Reynés
Naturgy Energy Group
Spain

Naturgy's rare dual win of the Platts Global Energy Awards' top two categories reflects its strong leadership as well as its growth. Francisco Reynés "has transformed the company" since he joined as Chairman and CEO in 2018, and judges felt his efforts to move the company into renewables are "inspiring a new generation at Naturgy".

Reynés arrived at Naturgy in a period of deep change in the global energy sector and quickly took action to ensure the company's future both in Spain and globally. His efforts included establishing a new business structure; leading the company's geographic expansion, including its entry into the US renewables market; downsizing and de-risking the business profile of the company to reduce volatility; and focusing on profitability.

Among his many accomplishments, judges praised Reynés' ambitious new ESG targets as well as his bold new strategic plan to invest Eur14 billion to boost Naturgy's renewable generation capacity and transform power and gas networks, with a goal of boosting core earnings 30% by 2025.

Judges saluted Reynés for being a "brave risk-taker" who balances confidence with "presence, maturity and vision" – a formula that generates results both internally and externally as it drives Naturgy's remarkable transformation.

CHIEF TRAILBLAZER OF THE YEAR

Sumant Sinha
ReNew Power
India

Sumant Sinha, a first-generation entrepreneur who champions "growth through acquisition", heads ReNew Power, one of India's largest renewable energy independent power producers. The company develops, builds, owns and operates utility-scale wind and solar energy projects as well as distributed solar energy projects.

Sinha founded ReNew Power in 2011 with a vision to transform the way energy is produced and consumed in India. ReNew Power now has a total capacity of approximately 10.2 GW, including commissioned and operational projects, and generates an estimated 1% of India's total electricity annually.

Sinha is a passionate advocate for solutions related to climate change through the intersection of business and public policy. He was recently named a Sustainable Development Goals Pioneer by the United Nations Global Compact. Judges applauded the business acumen and high-profile industry leadership of this "impressive individual".

LIFETIME ACHIEVEMENT AWARD

Ben Fowke
Xcel Energy
United States of America

The man judges hailed as "one of the first people in renewable energy generation", Ben Fowke, retired in 2021 as CEO of major electricity and natural gas service provider Xcel Energy, after serving as the company's chair, president and CEO since 2011. Fowke was instrumental in thoughtfully guiding both his company and the industry through the clean energy transition.

Peers call him "an extraordinarily effective executive" and "a visionary leader" who led the company to meet or exceed its carbon reduction goals and financial commitments every year. Fowke also launched the company's Steel for Fuel strategy in 2017, which led to one of the largest multi-state wind energy expansions in the country.

Fowke is a proud and vocal veterans' advocate who has testified before Congress about the importance of hiring military veterans in the private sector. The judging panel appreciated his broad-based service to the industry and his sincere commitment to diversity, equity and inclusion – efforts that signify his lasting influence on the country's utility sector.

RISING STAR AWARD - COMPANY

LevelTen Energy
United States of America

In a competitive category marked by many compelling entries, energy technology startup LevelTen Energy stood out for its platform that judges said is "making it easier to invest in clean strategies."

Founded in 2016, LevelTen aims to bring greater transparency and liquidity to the physical renewable energy industry and accelerate the move to clean energy by facilitating renewable energy transactions. It offers infrastructure for the renewable energy economy consisting of online marketplaces, analytics and software for large-scale renewable energy buyers, developers, advisors and financiers.

LevelTen calls its platform "the world's largest marketplace of renewable energy power purchase agreements", with more than 4,000 pricing offers through 21 countries in North America and Europe. "They are truly bringing liquidity into the market and making it global," said a judge.

Judges noted that this Rising Star is "reaching critical size". It has been involved in more than $5 billion in renewable energy transactions and 3.3 GW of renewable energy deals, and has raised more than $62 million in funding to fuel its continued growth.

RISING STAR AWARD - INDIVIDUAL

Wael Hamed Abdel Latif Abdel Moati
OAPEC
Kuwait

Wael Hamed Abdel Latif Abdel Moati, a "well known, well respected" gas industries expert at the Organization of Arab Petroleum Exporting Countries (OAPEC), drew the attention of all judges as a visionary young leader. He has over 16 years of petroleum industry experience in roles ranging from field operations to production planning.

At OAPEC, which coordinates energy policies among oil-producing Arab nations, Moati focuses on the evolving roles that gas and hydrogen play in fostering energy transition. In 2020, he took a lead in OAPEC's hydrogen initiative, a series of studies and workshops promoting production and use of hydrogen in the Middle East and North Africa.

Beyond OAPEC, he is a member of the United Nations Economic Commission for Europe's Group of Experts on Gas, which focuses on the critical role of gas in achieving the United Nations Sustainable Development Goals. Judges commended Moati for taking a proactive role in global discussions on natural gas, renewable energy and energy efficiency and they expect that this energy transition star will continue to rise.

DEAL OF THE YEAR - FINANCIAL

ENGIE
France

Highlighting intricate financial engineering between unique counterparts, ENGIE's deal with Google impressed judges as "the start of something new". The deal, a 24/7 carbon-free energy supply agreement in Germany, is designed to help the tech giant operate fully carbon-free by 2030. Judges felt the agreement was an excellent fit for this award, which honors deals that leverage less-traditional, structured finance for new energy projects, power purchase agreements and customary sponsors.

Under the agreement, ENGIE, a global energy player in electricity, natural gas and energy services, agreed to assemble and negotiate an energy portfolio to supply Google's German operations with solar and wind power. ENGIE will also provide energy management services including sourcing of residual supply and grid management.

The deal has "been in the works a long time"; ENGIE and Google partnered in 2019 on a five-year power purchase agreement in Belgium for renewable power supply from an offshore wind project, and completed a similar contract in The Netherlands. Judges applauded ENGIE for "utilizing partners to build a cleaner world".

DEAL OF THE YEAR - STRATEGIC

Cenovus Energy
Canada

Despite a tumultuous economic environment, integrated oil and natural gas company Cenovus Energy completed a merger that attracted judges' attention as "strategic for their business and its development".

Under the agreement, Cenovus and Husky Energy agreed to combine in an all-stock transaction valued at $23.6 billion, inclusive of debt. The deal brought together Cenovus' strength in production with Husky's pipeline and refining capacity, enabling it to better optimize margin capture across its value chain. The combination created a new global competitor: the company reports it is Canada's third-largest crude oil and natural gas producer, with approximately 750,000 boe/d of low-cost oil and natural gas production; as well as the second-largest Canadian refiner and upgrader, with total North American upgrading and refining capacity of approximately 660,000 b/d.

Judges liked that Cenovus "got a lot of efficiencies from the deal;" by using similar systems and synergies, the merger yielded immediate impact and profitability, as well as improved resilience in the face of uncertainty.

AWARD OF EXCELLENCE - UPSTREAM TRANSFORMATION

RWE AG
Germany

An unconventional winner, RWE AG "is coming in strong", said a judge. One of Germany's largest utilities, the company, which focuses on the generation and trading of electricity from conventional and renewable energy sources, is now aligning itself with a low-carbon future and aims to be carbon neutral by 2040. This "great company" that "takes climate change seriously" impressed judges by responsibly phasing out nuclear and coal while becoming a "widely diversified renewables company" – in the process, truly transforming the definition of upstream.

Judges particularly noted RWE's "exciting initiatives on hydrogen production". With 30 green hydrogen projects in process, the company is establishing itself along the entire value chain, and setting up ideal conditions for the expansion of a functioning hydrogen infrastructure.

Judges applauded RWE for "leading the charge" with its ambitious carbon neutral goal: "They're serious. They are working to meet targets, and they are investing a great deal in it."

AWARD OF EXCELLENCE - MIDSTREAM

Williams
United States of America

Midstreamer Williams offers striking metrics: the company owns and operates more than 30,000 miles of pipeline system-wide – including Transco, the US's largest-volume and fastest-growing pipeline – and handles approximately 30% of the nation's natural gas used for clean power generation, heating, and industrial use. But beyond its "remarkable operations," judges found the company excels in leadership across the board in the pipeline sector.

The company is actively exploring alternative energy options, including solar and renewable natural gas, as well as carbon capture, synthetic gas, and hydrogen as a fuel source. With the Energy Infrastructure Council and GPA Midstream, it co-led an initiative to launch the Midstream Company ESG Reporting Template, allowing midstream energy companies to present sustainability metrics to investors in a transparent way.

Judges appreciated that Williams invests in subject matter experts and development of future leaders. Its comprehensive efforts are paying off; founded in 1908, Williams established all-time record financial results in 2020. "It's an excellent company that's doing well," said a judge.

AWARD OF EXCELLENCE - DOWNSTREAM

Valero Energy Corporation
United States of America

Judges found this category a close race, but Valero, an international manufacturer and marketer of transportation fuels and petrochemical products, emerged as the winner through its "big efforts and bold moves". Already the world's largest independent petroleum refiner and second-largest renewable diesel and corn ethanol producer, the company is not slowing down; it is "actively showing leadership in areas that are still developing".

Judges were particularly taken with Valero's large-scale carbon capture and storage project with BlackRock and Navigator Energy, which will allow it to produce a lower-carbon ethanol product to be marketed in low-carbon fuel markets. The company is also planning to expand its renewable diesel production capacity, and developing opportunities in renewable naphtha, sustainable aviation fuel, and renewable hydrogen.

2020 ranked as Valero's best year ever for safety and environmental performance, and the company generated more than $58 million for charities through donations, fundraising and volunteerism, with more than $12 million dedicated to COVID-19 support. "This is a talented company that's planning for the future," said a judge.

AWARD OF EXCELLENCE - LNG

Sempra Infrastructure
United States of America

Dominating a competitive category, LNG infrastructure company Sempra Infrastructure aims to provide sustainable, safe and reliable access to US natural gas for global markets. Judges felt this subsidiary of 2020's Strategic Deal and CEO of the Year champion is a "pioneering and focused" category leader that is "fundamentally changing the business".

In addition to its interest in Cameron LNG, a 12 mt/year export facility operating in Louisiana, Sempra Infrastructure owns interest in Energía Costa Azul (ECA) LNG, a 3 mt/year export facility under construction in Baja California, Mexico. Judges noted that ECA is expected be the first LNG export facility on the Pacific Coast, with the potential to unlock North American natural gas for its partners to deliver to world markets. Notably, ECA LNG was the world's only LNG export project to reach final investment decision in 2020.

Judges observed that parent company Sempra's sale of its South American businesses, recognized in 2020, helped fund this growth in the US utility market and solidify its position as "a premier LNG infrastructure company".

AWARD OF EXCELLENCE - POWER

Masdar
United Arab Emirates

Masdar (Abu Dhabi Future Energy Company PJSC), which operates in renewable energy and sustainable urban development, "is doing great things, in Abu Dhabi and globally", reflected a judge in assessing its "dazzling display of accomplishments".

Established in 2006 by the Government of Abu Dhabi's Mubadala Investment Company, the company first developed Masdar City: a planned, sustainable urban community. Masdar is now one of the world's largest clean energy companies, with a wide-ranging portfolio including energy storage, waste-to-energy and green hydrogen as well as "small-scale wind and solar farms worldwide". Judges were particularly impressed with its Cirata Floating Photovoltaic Power Plant, the first of its kind in Indonesia; and Hywind, the world's first commercial-scale floating offshore wind farm, off the Scottish coast.

Masdar is developing projects in over 30 countries with a combined value of $20 billion and a generation capacity nearing 13 GW. The company continues to grow its portfolio and expand its geographical presence as it strives to be a global model for the commercial adoption of clean technologies.

GRID EDGE AWARD

Limejump
United Kingdom

Smart energy firm Limejump "saw grid problems coming years ago and came up with all kinds of solutions" including renewables, forward price projections, and now Europe's biggest battery. The company's technology platform manages a renewable energy portfolio of over 1.5 GW that delivers clean energy to businesses and homes, via the wholesale market and directly through National Grid. The company employs renewables and stored energy to meet demand. A judge noted: "they do a good job using their resources to go in and out of the grid, with a fast response rate."

Judges remarked on the company's optimization and dispatch involvement in the Mintey project, Europe's largest battery storage development. Shell Energy Europe signed a multiyear offtake agreement to trade all power from the battery, which has a capacity of 100 megawatts and is larger than a football field.

Judges found that "entrepreneurial" Limejump "keeps on moving forward", and expect that with support from its parent company, Shell, "their innovations will flourish in time."

CORPORATE SOCIAL RESPONSIBILITY CAMPAIGN OF THE YEAR - TARGETED

Nayara Energy
India

Downstream energy company Nayara Energy's operations encompass refining, marketing, production and retail. The company is known for owning and operating the country's second-largest single-site refinery, which provides approximately 8% of India's refining capacity and operates with an annual capacity of 20 million mt. Judges saluted Nayara Energy for targeted efforts to be a "neighbor of choice" to the community around its signature refinery; "their efforts are increasing farmers' income."

The refinery is located on India's west coast in Vadinar, where agriculture and farming are the community's major source of livelihood. Developing farmland in this saline belt is challenging, with seawater ingress affecting crop quality. To assist, in a public-private partnership with local government, Nayara Energy established Project Gram Samruddhi. Through the project, farmers in 15 villages have implemented climate-smart agriculture practices, efficient water resource management, and improved animal husbandry practices.

Nayara Energy's efforts have resulted in better soil quality and improved water efficiency across 11,000 hectares, and ultimately, increased profitability for farmers in the community. "They're making a big impact on small agricultural practices," said a judge.

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CORPORATE SOCIAL RESPONSIBILITY CAMPAIGN OF THE YEAR - DIVERSIFIED

K-Electric
Pakistan

K-Electric has powered Pakistan's largest city of Karachi since 1913 and is its country's only vertically-integrated utility, handling generation, transmission and distribution. The company impressed judges by offering "significant and transformative education and training programs for women" that establish it as not only a regional leader among utilities, but also an example of excellence in global corporate social responsibility.

The company "recognized a need" for better customer relations in parts of Karachi with areas of high loss and safety-related incidents. Through its Roshni Baji Women Ambassadors Program, 40 women were selected as safety ambassadors, trained as working electricians and taught to drive motorbikes. The Bajis engaged with more than 100,000 households in five months on issues related to electrical safety, energy conservation and the hazards of power theft, and verified 70% of customer accounts.

Judges liked that K-Electric's program provides it with insights on community members' needs and helps keep them safe, "benefitting the company as well as individuals". They commended K-Electric for setting an outstanding example of empowering women to break down barriers to non-traditional roles.

ENERGY CONSUMER SUSTAINABILITY AWARD

IBM
United States of America

IBM has a longstanding dedication to energy efficiency, with formal environmental and energy corporate policies dating back to 1971 and 1974 respectively. It continues these efforts through its commitment to achieve net-zero greenhouse gas emissions by 2030.

Recognizing that the most effective way to reduce its greenhouse gas emissions is by making its operations more efficient, IBM's "focused and comprehensive" efforts included 1,400 energy conservation projects at more than 230 locations during 2020. The projects delivered annual savings equal to 3.5% of IBM's total energy use during 2020, avoiding 51,000 mt of CO2 emissions and saving $15.4 million.

Judges appreciated that IBM's programs are "well-tracked" and offer "impressive continuity"; the company has published its annual "IBM and the Environment report" for 31 years, without interruption. Beyond its own operations, the company collaborates with clients and partners "across its entire value chain" to drive similar behavior. "Energy consumers like this one will bring about change by forcing our industry to think bigger," said a judge.

CONSTRUCTION PROJECT OF THE YEAR

Bechtel Energy
United States of America

Despite the many hazards and economic pressures of COVID-19, it seemed "smooth sailing" on Cheniere Energy's Corpus Christi LNG export terminal (CCL) for 123-year-old engineering and construction giant Bechtel, which operates in the defense, energy, infrastructure, mining and metals markets.

Bechtel's more than 1,000-acre CCL facility contains three liquefaction units with a total capacity of 15 million mt/year, enough energy to power a city of 2.5 million people for an entire day. The company was hard at work on CCL Stage 2, adding the project's third liquefaction unit and tank and a second berth, when the initial impacts of the pandemic reached the US. Bechtel, deemed an essential business, deftly enacted new health and safety protocols, including a mobile app to enable real-time collaboration between experts in the field and those working remotely.

Bechtel ultimately completed CCL Stage 2 ahead of schedule and on budget. The company's "sharp execution and ability to solve issues" enabled Cheniere to begin shipping LNG cargo ahead of schedule. Judges respected that Bechtel "persevered, and everything fell into place".

ENGINEERING SOLUTION OF THE YEAR

Samsung Engineering
South Korea

Judges praised construction and project management firm Samsung Engineering for its "modern take on a traditional plant": a $700 million ethylene oxide/ethylene glycol plant the firm completed for SABIC in Saudi Arabia.

With capacity to produce 700,000 mt/year of monoethylene glycol, the project was designed to reflect Samsung Engineering's experience while incorporating new innovations. The firm had successfully completed eight construction projects for SABIC in the past, and delivered 16 ethylene glycol plants in the US, Malaysia, Thailand and India. For the SABIC project, Samsung Engineering sought to reduce greenhouse gas emissions, water use and waste generation. It also changed refrigerants, a move designed to lower the energy demand of the cooling systems by at least 33% and reduce greenhouse gas emissions by 14,773 mt/year.

The SABIC project faced complications because COVID-19's quarantines, curfews and closed borders meant "they couldn't get people or materials in and out". Despite this, judges deemed it a "fine engineering company", with a "compelling project" that lays the groundwork for its client to maintain global market dominance.

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COMMERCIAL TECHNOLOGY OF THE YEAR

Micatu
United States of America

Optical sensor company Micatu presented an "interesting technique" that brings utilities critical information for managing the modern grid. The company is reportedly the first to commercialize an optical sensing technology platform that provides highly accurate grid measurements and analytics. Judges felt that its novel solution "has the potential to be groundbreaking, particularly as renewables increase on the grid".

The company's GridView optical sensing technology uses light passed through an optical crystal to measure voltage, current, vibration, harmonics, and temperature. Its modular platform is less costly and simpler to install than legacy technology such as instrument transformers. Micatu estimates that utilities can save up to 50% of their total costs compared to legacy solutions when the technology is deployed inside a substation, for example. In addition, judges appreciated that its optical sensors cannot be saturated, avoiding risks such as open electrical circuits that may harm field crews, cause equipment to overheat, explode or combust.

Micatu's GridView "provides a much better reading of how many amps are going through the line," admired a judge. "It could be a game-changer."

EMERGING TECHNOLOGY OF THE YEAR

Bloom Energy
United States of America

Green energy firm Bloom Energy scored a win with its "inventive and efficient" method of producing hydrogen, a solution that judges said is "on the radar for many people in the energy industry."

While the conventional process of making hydrogen creates carbon emissions, clean hydrogen can be made by using an electrolyzer, which uses zero-carbon electricity to split water into hydrogen and oxygen. Bloom Energy's high-temperature electrolyzer uses less electricity to make low-cost, clean hydrogen for use in power generation, injection into the natural gas pipeline, transportation, or industrial processes.

Bloom Energy calls its product "the most energy-efficient electrolyzer to produce clean hydrogen to date" and says the green hydrogen it produces represents a "viable and scalable solution" to the world's current energy crisis, thanks to its status as "affordable, always-on and sustainable."

With manufacturing facilities capable of producing 500 MW of electrolyzers and planned expansion to a gigawatt, judges felt that Bloom Energy has developed an "exciting innovation" that will be "compatible with other sources" in the move to clean energy.

Nicole Bulgarino
Executive Vice President and
General Manager
Ameresco

Ameresco

Founded in 2000, Ameresco, Inc. (NYSE: AMRC) is a leading cleantech integrator and renewable energy asset developer, owner and operator. The company's portfolio of services includes energy efficiency, infrastructure upgrades, asset sustainability and renewable energy solutions for businesses and organizations throughout the United States, Canada, and the United Kingdom. Ameresco's sustainability services include upgrades to facility energy infrastructure and the development, construction, and operation of renewable energy generation plants. Ameresco has successfully completed energy savings and environmentally responsible projects with federal, state, and local governments, healthcare and educational institutions, housing authorities, and commercial and industrial customers. With its corporate headquarters in Framingham, MA, Ameresco has more than 1,000 employees worldwide who provide local expertise throughout the territories.

Ameresco congratulates Nicole Bulgarino, executive vice president and general manager of Ameresco's Federal Solutions group, on her recognition as a finalist in the 2021 S&P Global Platts Rising Star category. Under her passionate and devoted leadership, the Federal Solutions team has designed and developed some of the most innovative and complex energy efficiency and renewable energy projects on behalf of the company for a multitude of government agencies including the Department of Defense, the Department of Energy, the General Services Administration, the Department of Justice, the Environmental Protection Agency, the Veterans Administration, the Department of Interior, the Department of Commerce and more.

Nicole has played an essential role in Ameresco's tremendous growth and is an outspoken advocate for smart, meaningful innovation. Having risen through the company's ranks from a project engineer to executive, she is able to recognize the amount of support needed during each phase of execution and can foster innovation and commitment within her team.

Nicole's outstanding achievements over the course of her career in the energy industry have established her as a thought leader in the clean energy sector. She regularly participates in educational panels about the importance of renewable energy and most recently spoke as a panelist on MarketScale's Energy Roundtable, where she contributed to a discussion about the opportunities and challenges of renewable energy technologies. Nicole's insights have also been quoted in numerous industry publications including Grist, Reader's Digest, POWER Magazine, Energy Storage News and more. Her ardent dedication to innovation, mentorship of women pursuing similar careers in clean energy, and advocacy for sustainability make Nicole deserving of the 2021 S&P Global Platts Rising Star Finalist designation.

George Sakellaris, founder, president and CEO of Ameresco, wrote, "I've had the distinct privilege of working closely with Nicole since she started as a project engineer at Ameresco in 2004. As soon as she started, it was clear that her passion, dedication, and expertise in the field would lead her to great success. It has been a pleasure and an honor to see her grow over the years and I am proud of the leader she has become. When I founded Ameresco in 2000, I dreamed the company would be seen as a leader in innovative clean energy solutions, and now that it has come to fruition, I realize it would not have been possible without Nicole's guidance and management of the Federal Solutions team. I am eager to see all that her team accomplishes in the coming years because her knowledge and passion is palpable and inspires others to think imaginatively."

Lorenzo Simonelli
Chairman, President
and Chief Executive Officer
Baker Hughes

Baker Hughes is a leading energy technology company that provides solutions and services for energy and industrial customers worldwide. Our purpose is to take energy forward – making it safer, cleaner, and more efficient for people and the planet. This is made possible through our technology, our people, our scope and scale, and our low-carbon commitment.

For more than a century, our inventions have revolutionized energy. We harness the power of engineering, data, and science to redefine what is possible. We have integrated offerings and a unique set of products and services across our four product companies: Oilfield Services, Oilfield Equipment, Turbomachinery and Process Solutions, and Digital Solutions.

Together these businesses make up the industry's only fullstream technology portfolio that spans across oil and gas, alternative, and renewable energy, as well as industrial sectors, positioning us to take advantage of various market opportunities to improve outcomes for ourselves and our customers as we lead in new ways.

Our strategy is focused on improving our core competitiveness and delivering higher productivity solutions today while positioning for the future. We have a three-pronged approach to guide our execution:

- Transform the core – focusing on improving margins and cash flow across our businesses through cost improvements, portfolio rationalization, and new business models.
- Invest for growth – driving organic and inorganic growth in high-potential segments, such as industrial power, industrial asset management, AI, nonmetallic materials, and chemicals.
- Position for new frontiers – making strategic bets to drive decarbonization of energy and industry via CCUS, hydrogen, geothermal, emissions management, and energy storage.

Baker Hughes seeks to lead in the energy transition — recognizing hydrocarbons 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 and industry.

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, and a diverse and inclusive culture in which employees collaborate without boundaries to solve tough challenges.

Visit us at bakerhughes.com.

2020 Statistics:

Operated in 120+ countries worldwide with ~55,000 employees
Earned $20.7 billion in revenue, invested $595 million in R&D, and received 3,066 patents
Progressed 2019 commitment to reduce our carbon equivalent emissions 50% by 2030 and reach net-zero carbon equivalent emissions by 2050: achieving a 15% reduction in Scope 1 and 2 carbon equivalent emissions across our global operations compared to 2019 and expanding reporting of Scope 3 emissions across our value chain to include new categories
Strengthened our culture by prioritizing DEI metrics in our talent strategy and increasing engagement around talent development, health and well-being, and community partnerships

Paul Marsden
President
Bechtel Energy

Bechtel

Great infrastructure has the power to transform communities. For nearly 125 years, businesses and governments worldwide have turned to Bechtel to help deliver projects that have impact. We align everything we do to help customers achieve their goals and leave a lasting positive impact—creating access and opportunity, building paths to net-zero, protecting people and the planet, and accelerating progress so current and future generations thrive. We focus on:

- Delivering infrastructure that powers and connects communities to opportunity including transport, digital networks and future cities
- Accelerating the clean energy transition through renewables, nuclear energy, retrofits, LNG, decarbonization technologies, electrification of transport, and access to critical commodities including aluminum, lithium and copper
- Providing advanced expertise to solve complex environmental, water scarcity, and allied national security challenges

We have helped customers complete more than 25,000 projects in 160 countries, including the financing and development of capital projects through Bechtel Enterprises totaling $90 billion of capital investment.

Cleaner energy solutions to support a sustainable future

Energy plays a key role in promoting social and economic progress — and technological advancements have created new opportunities to improve how we bring power to communities worldwide.

Bechtel's integrated self-perform EPC model has enabled the successful delivery of 16 LNG trains in six years. We have built more than 70MTPA of liquefaction capacity since 2015 and we are engaged in the development of another 40-50MTPA that we expect to be delivered over the next 6-8 years.

Our specialized LNG services deliver solutions to support customers wherever they are in their energy transformation journey, whether their goal is to increase access to renewable energy sources, improve energy efficiency, or decarbonize their existing infrastructure across the project lifecycle.

Successful delivery starts on day one of the planning process. Our LNG Technology Center of Excellence is solely dedicated to delivering design improvements, innovations and efficient execution of projects for our customers. Our LNG experts within the center target certainty of outcome on the delivery of projects from concept through design, commissioning, start up, performance testing and post plant turnover services. We have expertise in several liquefaction technologies including Optimized Cascade, C3 MR, DMR, SMR and Nitrogen cycles servicing plant capacities ranging from base load to medium scale and small-scale LNG.

Helping customers reach decarbonization goals

We all must play our part in the global effort to bring greenhouse gas emissions to net-zero, to help stabilize the planet's temperature and mitigate the impacts of climate change.

Whether your goal is to electrify transport systems, expand your renewables portfolio, transition from coal to gas, improve energy efficiencies, decarbonize existing infrastructure, deploy zero-emission nuclear energy as part your energy mix, switch to zero-emission hydrogen fuel, or generate energy storage solutions, we are proud to support you on this critical path to a cleaner planet.

Visit bechtel.com

Statistics:

120+ years of experience
Backlog $32.2B
20,000 employees
> 177 active projects

Bloomenergy®

KR Sridhar, Ph.D

Founder, Chairman and CEO
Bloom Energy

Bloom Energy – Resilient Energy Solutions For A Decarbonized World

Bloom Energy is revolutionizing onsite primary power generation with its solid oxide fuel cell technology and AlwaysON Microgrid solution. Bloom Energy provides facilities and communities with clean, reliable, cost-effective alternatives to combustion-based technologies and the traditional electric grid.

When determining a long-term energy strategy, it's important for businesses and communities to address both the causes and consequences of climate change. The causes of climate change being the need to rapidly decarbonize, and the consequences being the need to protect businesses against extreme weather and power outages that grind operations to a halt and prevent businesses from serving their neighbors.

As a critical, always-on solution, Bloom's AlwaysON Microgrid solution can operate alongside a main grid, but independently of it during a power outage, enabling businesses to protect themselves from increasingly frequent, lengthy, and costly power outages, both planned and unplanned. Bloom has powered customers through thousands of grid outages, avoiding costly disruptions to their operations.

Uninterruptible power provided by a microgrid solution is more important now than ever. The demand for reliable, clean electricity is growing as our businesses and communities face an aging grid, with more frequent natural disasters and rising electricity costs.

Bloom's AlwaysON Microgrid solution is uniquely positioned to help overcome today's compounding energy challenges, delivering facilities a powerful combination of resiliency, sustainability, and predictability that no other power generation solution can match.

By utilizing Bloom's solutions, you can reduce or eliminate your need for dirty backup technologies like diesel generators, while still achieving diesel's primary benefit of resilient power – all while advancing corporate sustainability goals.

Bloom's solution operates 24/7, lowering carbon emissions by displacing dirty and less efficient alternatives. Since Bloom began commercial deployments in 2011, its systems have achieved millions of metric tonnes of CO_2 reduction globally. Importantly, Bloom's systems are future-proof and fuel-flexible.

By partnering with Bloom, customers are adopting the most carbon-efficient, clean system for today's fuels while also embracing a platform that is ready for tomorrow's zero-carbon fuels, namely biogas and hydrogen. Bloom has also committed to help set a standard for certified, low-leak, natural gas that is produced responsibly to reduce methane emissions.

The AlwaysON Microgrid requires no upfront capital to install, which is very compelling for customers looking reduce operating expenses. The solution also enables customers to fix a large portion of electricity spend, hedging against volatility and price escalation.

Bloom is also accelerating the hydrogen economy with the Bloom Electrolyzer, which is expected to produce the lowest-cost green hydrogen through electrolysis – while being 15 to 45 percent more efficient than any other product in today's market.

Statistics:

Global operations with 100+ customers across 700+ sites powered by Bloom
Over 500 MW of installed systems today, reducing approximately 430,000 metric tonnes of CO_2e vs. grid alternatives (as of 2020)
Bloom and SK ecoplant announced contracts for a minimum of 500 MW of power from Bloom through 2024 at an estimated $4.5 billion in equipment and service revenues
Bloom and SK ecoplant will create two hydrogen innovation centers, one in the US and one in South Korea, to advance the commercialization of green hydrogen
In 2020, Bloom improved air quality by reducing approximately 2.2 million lbs of NOx and 550,000 lbs of SO_2 vs. grid alternatives – a 99.7% and 100% reduction vs. grid respectively
In 2020, Bloom reduced approximately 19,000 gallons of water per MWh of electricity produced vs. grid alternatives, a 100% reduction in water usage

CHART
Cooler By Design.®

Jillian C. Evanko

President, Chief Executive Officer
and Director
Chart Industries

Chart Industries: Revolutionizing and Enabling the Energy Transition

Being at the forefront of the clean energy transition, Chart Industries, Inc. (NYSE: 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 specialized products also serve unrelated industries like Food & Beverage, Water Treatment, Aerospace, and Molecules by Rail, just to name a few.

Chart is a key player in the development of small-scale models and the associated infrastructure that are 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 for that matter) to areas where no pipeline or gas grid exists.

Aside from our transport trailers and mobile regasification systems, we also 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 also offers a complete portfolio of mobile solutions to make these LNG and hydrogen distribution options a reality.

We have over 55 years of experience in the design and manufacture of hydrogen equipment solutions through our global manufacturing footprint. Our hydrogen capabilities span a wide variety of applications including fueling stations, transport trailers, storage, heavy-duty LH2 onboard vehicle tanks and liquefaction.

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

Last year alone, our products helped produce about 50 million tons of LNG to replace coal-fired power generation outside the US. In the US, our equipment helped to reduce over 25 million tons of coal used in power generation. We also helped to reduce over 500 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. In 2020, Chart reduced Scope 1 and Scope 2 emissions by 8.5% and 8.9%, respectively, while reducing total energy consumption by almost 16.0%. We have also set a target to reduce our carbon intensity 30% by 2030 and last year, we made progress towards achieving our goal by reducing GHG Intensity by almost 6.0% year-over-year.

Edouard Neviaski

Chief Executive Officer
Global Energy Management
Business Unit
ENGIE

ENGIE

Our group is a global reference in low-carbon energy and services. Together with our 170,000 employees, our customers, partners and stakeholders, we are committed to accelerating the transition towards a carbon-neutral world, through reduced energy consumption and more environmentally-friendly solutions. Inspired by our purpose ("raison d'être"), we reconcile economic performance with a positive impact on people and the planet, building on our key businesses (gas, renewable energy, services) to offer competitive solutions to our customers.

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.

1,500 experts are developing this business in +21 business platforms worldwide, including in Paris, Brussels, London, Houston, Singapore, Mexico, Melbourne, Moscow, Warsaw, Bucharest Rome, Madrid, Köln. 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; Net-zero transition solutions; risk management and market access along with asset management for third parties.

We cover the full energy mix: renewable and thermal power, natural gas & LNG, biomass, environmental products.

Our 800+ clients span the entire value chain: producers, asset developers, financial players, utilities, distributors and industrials. Our global reach and strong local presence enable us to offer these diverse clients tailor-made services, and respond to rapid changes in mature or emerging markets alike.

Our energy management offer is a first-class asset for value-creation. It includes physical supply, offtake, cross-border trading, physical and financial risk management, market access, and M&A facilitation for energy producers.

We are growing into a reference glocal, green and client-centric midstreamer, linking clients who want 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:

N°1 global independent power producer, SBT certified
101 GW installed power capacity including 31GW renewables
306 MW French Biomethane installed capacity
2.5MT certified sustainable biomass sold worldwide
-59% emissions CO2e since 2016
~20Mt CO2e avoided for clients (2020)
€12bn green bonds issued. Named "Largest Non-Financial Green Bond Issuer over the last 10 years" by Climate Bonds Initiatives
Ranked by clients & peers best global energy dealer on energy markets
3.3 GW Corporate PPAs (N°2 Americas & Europe, 2019-2020)

Mr. Worawat Pitayasiri

President and
Chief Executive Officer
GPSC

GPSC, the power and smart energy flagship of PTT group

Global Power Synergy PLC (GPSC), the power and smart energy flagship of PTT Group, was founded on 10 January 2013. GPSC's parent company is PTT PLC, a fully integrated national petroleum and petrochemical company. Our core business is to generate and supply electricity, steam and industrial water to Thai state-owned power utilities and industrial customers. Currently, GPSC Group has total generating capacity on equity basis of 7,102 MW of electricity, 2,946 tons per hour of steam, 15,400 refrigeration tons of chilled water, 7,372 cubic meters per hour of industrial water, and Energy Storage Unit Production Plant and Battery 141 MWh/year.

GPSC is extensively seeking business opportunities to expand its footprint from Thailand to selected target countries i.e. Lao PDR, Japan and the US including the newly announced renewable investment in India and Taiwan totalling approximately $10 billion in July 2021. This investment aligns with GPSC's growth strategy internationally. In addition to its core business, GPSC is also exploring and developing new S-Curve business to gain business competitiveness and create value to all stakeholders with the following Vision and Mission Statements.

Our current vision is to be "The Global Leading Innovative and Sustainable Power Company", and our aspiration is "To be Top Three Power Company in Southeast Asia with more than half of MW from green portfolio". We have formulated a 10-year long-term strategy and roadmap to ensure our vision and aspiration are achievable, as well as successfully advancing energy transition that is taking place in the power industry. To put it simply, we have to be big in generating capacity, employ innovation that will define 'New Energy' and diversify our assets aggressively towards clean energy. Our aim is to achieve 12+ GW of renewables by 2030.

With that in mind, we have developed our 4S strategic pillars to serve our expectations. S1, "Strengthen and Expand the Core" focuses on being best-in-class operation, employing customer centric utility, and expanding into the adjacent businesses such as sustainable water supply to industry. S2, "Scale Up Green Energy", focuses on expanding exclusively into renewables and energy storage system to ensure a reliable and sustainable energy is achievable. S3, "S-Curve & Batteries", focuses on employing innovations that will lead to future energy solutions. Our primary initiatives now lie with batteries for ESS and EV, but we also look into the future possibility of Carbon Capture Storage (CCS) and Hydrogen technologies. Finally, S4, "Shift to Customer Centric Solutions", focuses on distributed generation, district cooling and energy management services, as we firmly believe will answer the need for the "Prosumer" concept in the future.

In addition, we are moving towards low carbon utilities, therefore, we have put carbon emission roadmap into our strategy, which clearly states that by 2030 at least 50% of our capacity will be renewables, and our Carbon Equivalent Intensity will be reduced by at least 35%. We are certain that these targets will be achieved even faster than anticipated, as our remarkable expansion over the past few years has already brought 37% of renewables to our portfolio, an increase from none in 2013.

Finally, we will remain committed to running an innovative energy business with responsibility for society, communities, and the environment, underlined by good governance and fair disclosure while pursuing the Global Leading Innovative and Sustainable Power Company goal.

Mohamed Jameel Al Ramahi

Chief Executive Officer
Masdar

Based in Abu Dhabi, Masdar is a global leader in renewable energy that is advancing commercially viable solutions in energy, urban development and clean technologies in the UAE and around the world.

Headquartered in the UAE, we have been advancing the development, commercialization, and deployment of cutting-edge solutions for over 15 years. Masdar's expertise lies in the development of clean energy projects, sustainable urban planning and development, the commercialization of high-impact innovations and facilitating world-class industry and knowledge platforms that accelerate the adoption of clean-tech solutions and help to mitigate the impacts of climate change.

Masdar operates in some of the world's most exciting, cutting-edge industries, creating a vibrant corporate culture and partnership model that is constantly pushing the limits of science, engineering, and design.

We are partners in the UAE's transition to a knowledge-based economy and are passionate champions of sustainable development. We seek to be a model of sustainability for other companies, just as we help the UAE to be a model of sustainability for the wider Middle East.

Masdar is wholly owned by the Mubadala Investment Company, a pioneering global investor that deploys capital with integrity and ingenuity to accelerate economic growth for the long-term benefit of Abu Dhabi and the UAE. A global leading strategic investment company, Mubadala has operations in more than 50 countries globally and manages assets of approximately US$229 billion, creating lasting value for its shareholder, the Government of Abu Dhabi.

Masdar brings technical expertise, innovation, and experience to help solve some of the most difficult challenges in renewable energy and sustainable urban development. We identify and develop commercially viable solutions that push forward the world's ability to address key issues such as energy access, water scarcity, climate change and the need for a more diverse energy mix. Promoting the UAE's economic development vision, we build local talent and R&D capabilities, innovate new industry solutions and contribute to the country's economic diversification. We help solidify the UAE's position as a hub for renewable energy, clean-tech industries and climate change mitigation.

Our work includes renewable energy power projects of all sizes; sustainable urban development through Masdar City and its clean-tech cluster; collaborative sustainability innovation, research and development projects; and knowledge platforms that bring together different audiences – from thought leaders and policymakers to SMEs, young professionals and high school students – in different collaborative forums to drive progress in these fields. Cooperation and partnership are pillars of our execution model, whether through strategic co-investments or joint research and development projects with peer organisations based in the UAE, the wider Middle East or across the globe.

Masdar was founded by Abu Dhabi's leadership as a powerful mechanism to foster home-grown innovation and the development of cutting-edge technologies, as part of the UAE's ongoing economic diversification agenda, while also serving the vital cause of climate change mitigation.

Masdar is a live demonstration of and a major contributor to climate change mitigation in the United Arab Emirates. Since 2006, we have invested in renewable energy projects in over 30 countries with a combined value of nearly US$20 billion and a gross power generating capacity exceeding 13 gigawatts (GW). Our projects mitigate over 16 million tonnes of CO2 per year and power over 4 million homes globally.

Through Masdar City, Abu Dhabi's home of technology and sustainability innovation, Masdar is spearheading sustainable urban development toward net-zero. We are also raising awareness of climate change, creating platforms for knowledge transfer, and enabling discussion and action toward net-zero ambitions in the UAE and around the world, and will continue to actively support the UAE's Net-zero by 2050 strategic initiative.

Mr. Auttapol Rerkpiboon

President and Chief Executive Officer
PTT

PTT Public Company Limited
PTT is a fully integrated national petroleum and petrochemical company with its mission to conduct business as the nation's energy company and respond to all stakeholders – the country, society and communities, shareholders, customers, business partners, and employees – in a balanced manner. Our businesses consist of the natural gas, gas transmission, international trading, new business and infrastructure businesses; the rest are invested through subsidiaries joint arrangements and associates venturing with PTT Group.

Vision, Strategies and Business Directions of PTT Group
PTT's commitment is to achieve economic growth, elevating national competitiveness, improving society and people's quality of life, forging innovation and technological application in all sectors, and to be the driving force for people, societies, communities, and the environment to overcome change and duly forge ahead.

As the energy industry undergoes Energy Transition and Technology Disruption, PTT's new vision is announced, **"Powering Life with Future Energy and Beyond"**, which reflects PTT Group's business transition going beyond traditional energy company. "Powering Life" is our purpose, to empower and embrace life whether it be people or environment. There are 3 main aspects: 1) creating growth along the way of life through technology, innovation, partnership, and platform 2) sharing positive contribution to enhance livelihood and 3) moving toward a low carbon society.

"Future Energy and Beyond" is PTT's strategic positioning, focusing on future cleaner and greener energy trends such as renewables, energy storage system and EV value chain. PTT Group plans to step out to new businesses that support and drive people well-being such as **Life science, Mobility and lifestyle, High Value Business, Logistics & Infrastructure and AI & Robotics Digitalization.**

PTT Aspiration
Our Aspiration, "PTT by PTT" or **P**owering **T**hailand's **T**ransformation by **P**artnership and Platform, **T**echnology for All, and **T**ransparency and Sustainability, is the guidance for all businesses operation. PTT aspires to be the national energy company and taking on the leading role in driving the future of Thailand through the use of advanced technology and innovation in order to enhance national competitiveness, along with contributing to society and improving Thai people's quality of life. This is known as **Powering Thailand's Transformation**. To elaborate, we run businesses with **Partnership and Platform** emphasizing on building business alliances and develop PTT business platform, deployment of technology arising from integrated knowhow, competency, innovation, and digital **Technology for All** in all aspects of work; and **Transparency and Sustainability**, with due regard for ESG balance (Environmental, Social and Governance). Additionally, we also promote our SPIRIT corporate values: Synergy, Performance Excellence, Innovation, and Responsibility for Society, Integrity & Ethics, and Trust & Respect in order to achieve our goals.

Environmental and Social Responsibility
With the situation of energy transition and high interest in environmental issues, PTT has clearly defined strategic directions to adapt its business toward a low-carbon society, and control and minimize the impact on the ecosystem and biodiversity as well as mitigating and being more resilient to climate change. Moreover, PTT takes into account environmental stewardship, business operations and social projects, and is committed to continuously developing the society and quality of life while focusing on collaboration and engagement with stakeholders. PTT also connects to work within the Group to apply experience, knowledge and technology to implement social activities for sustainable development.

We hope to remain Thailand's national company that is committed to undertaking business along with development of community, society, natural resource conservation, and corporate governance. We are committed to growing and delivering sustainable growth for the nation and all stakeholders.

Mr. Montri Rawanchaikul
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 partnerships 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 Future 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.

Rattikool Piyavongwanich
President
PTT LNG Company Limited

Powering Life with LNG

PTT LNG Company Limited (PTTLNG) is a subsidiary company of PTT Public Company Limited, Thailand's national oil and gas company. PTTLNG owns and has commercially operated LNG-receiving terminals since 2011 as the first LNG-receiving terminal in Southeast Asia. PTTLNG's primary obligation is to secure the national energy security of Thailand.

Readiness of infrastructure and services with a total capacity of 19 MTPA with 2 PTTLNG terminals consist of LMPT1, currently 11.5 MTPA regasification capacity which can further expand to 15 MTPA, and LMPT2 with 7.5 MTPA under construction with 83% completion which can also be expanded to 15 MTPA. Moreover, LMPT1 and LMPT2 terminals are located in brilliant geography in which almost 50% of global LNG trading occurs within 2,500 nautical miles from Map Ta Phut, Rayong.

According to PTTLNG's vision of being a World Class and Competitive service provider of Excellence in the LNG terminal value chain, PTTLNG emphasizes on 3 directions:

Operational Excellence:
Over a decade of operational responsibility, 99.99% of plant's reliability and availability have been achieved and maintained. In relation to strengthening competitiveness, internal performance controlling leads to success by implementing cost-saving, process efficiency, and flexibility.

Expand New Business Portfolio:
Aligning PTT's group direction, which is Powering Life with Future and Beyond, PTTLNG initiates cold utilization. We apply engineering technology to integrate LNG regasification and waste cold energy recovery. This reflects commitment and determination to become the leader in LNG service business. PTTLNG is not only providing a traditional LNG receiving terminal services but also managing and making a decent profit from cold energy. It is considered as the strategic diversification and balancing portfolio between regulated and non-regulated portfolios.

Besides this, PTTLNG has started an LNG reloading service to serve high regional demand. PTTLNG will improve process excellence and share innovation with PTT group to increase opportunities in capturing and better provide services that match with customer requirements for both domestic and regional markets.

Carbon Neutrality:
In respect of real transformation, PTTLNG's slogan, Powering Life with LNG 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. PTTLNG promises to be a clean energy company that enhances people's lives and makes a better and cleaner society. PTTLNG has firmly committed to be a carbon-neutral organization by reducing 30% carbon emission by 2030.

PTTLNG has embraced the power of development and leveraged innovative ideas to adapt and become a Competitive service provider. PTTLNG strives technology and innovation to develop processes that achieve Operational Excellence while also being Environmentally conscientious and Socially responsible. Regarding transformation, implementation, and business expansion that PTTLNG has succeeded, there are further milestones await. PTTLNG will strive forward to overcome more challenges and truly become the leader in the LNG service provider business in Thailand and Southeast Asia.

Statistics:

Established: since 2004 as the first LNG receiving terminal in Southeast Asia
Facility and Location: 2 LNG receiving terminals, named LMPT1 and LMPT2, in Rayong, Thailand
Total capacity: 19 MTPA in Q4/2022 which currently 83% construction progress of LMPT2
Services: unloading/reloading, storage, regasification, send out via pipeline, truck loading, and ISO-container
Market share: over 40% of terminal capacity supplied domestic gas demand
Networking: 3 times growth of LNG shipper lists compared with the previous year and contact with LNG supplier over 460 LNG cargoes annually
1st Priority in Safety: achieved 8.1 Million man-hours, over 3300 days, without lost time injury record
Carbon Neutrality: committed to 30% reduction in CO_2 emissions by 2030

Josu Jon Imaz
Chief Executive Officer
Repsol

Repsol

Repsol is a global multi-energy company that is leading the energy transition with its ambition of achieving zero net emissions by 2050. Present throughout the entire energy value chain, the company distributes its products to around 24 million customers in nearly 100 countries.

Digitalization and technology play a key role in Repsol's strategy. The company is relying on digital technologies such as artificial intelligence, automation, and cloud solutions to improve operational efficiency. Its Repsol Technology Lab research center is developing a pioneering R&D model that is based on open innovation and working with a network of institutions around the world to offer new technological solutions and forge a new, more efficient, and more competitive energy sector.

Repsol has seven industrial complexes – five in Spain, one in Portugal, and one in Peru – and it boasts one of Europe's most efficient refining systems, capable of processing over one million barrels of crude oil per day. It produces a wide variety of petrochemical products with high added value, used for creating a multitude of everyday products that improve people's safety and quality of life. The company's facilities are being transformed into multi-energy hubs capable of producing fuels and other materials with a low, zero, or even a negative carbon footprint. Repsol aims to become a benchmark company in the field of low-carbon fuels, with a production of 1.3 million tons per year by 2025 and 2 million tons by 2030, and to lead the renewable hydrogen market in Spain and Portugal, with a capacity of 0.55 GW equivalent by 2025 and 1.9 GW by 2030. The company is developing circular economy solutions that prioritize efficient resource management to make its businesses units more sustainable, deploying over 200 circular economy initiatives in 14 countries focused on ecodesign, process innovation and efficiency, renewable energy, and alternative raw materials. By 2030, the company aspires to reuse three million tons of waste every year and, thereby, mitigate more than seven million tons of CO2 per year.

The company is working to meet all its customers' energy needs, offering digital solutions like Waylet, a service station payment app, and Vivit, an app that allows them to manage the energy consumption in their homes. With more than 4,600 service stations in Spain, Peru, Portugal, and Mexico, Repsol leads the development of sustainable mobility solutions. By 2022, the company will have more than 1,000 public electric charging points in Spain and fast or ultra-fast charging points every 50 kilometers on the country's main roads.

The company is also working to increase its renewable asset portfolio as it expands internationally and becomes a global operator, aiming to have a generation capacity of 6 GW by 2025 and 20 GW by 2030. Currently, Repsol has renewable projects in operation and three under development in Spain, Chile, and the USA where, earlier this year, it acquired a 40% stake in Hecate Energy, a PV solar and battery storage developer with a total pipeline of more than 40 GW.

Repsol produces an average of 650,000 barrels of oil equivalent per day. It prioritizes value over volume in exploration and production and concentrates its upstream activities in key geographical areas, with short-cycle projects and attractive returns capable of generating instant cash flow. This business is a leader in emissions reduction in the sector, with the goal of reducing its carbon intensity by 75% in the 2021-2025 period.

Repsol's 24,000 employees in over 30 countries form a diverse, committed, and enterprising team that works every day to reach the goal of zero net emissions by 2050.

Jeffrey Martin
Chairman and
Chief Executive Officer
Sempra

We Are Sempra: Advancing a Better Future for All

People around the world deserve access to cleaner, safer and more reliable sources of energy. As a premier energy infrastructure company serving 36 million consumers in North America, Sempra embraces our role as a leader in advancing a net-zero future.

Enabling the delivery of cleaner energy while expanding energy access is one of the defining challenges of the 21st century. Each day, 19,000 employees across the Sempra family of companies deliver progress through excellence. Sempra serves some of the largest and fastest growing economies in the world, including California, Texas and Mexico, and is a leader in U.S. liquefied natural gas infrastructure.

Sempra has a strong track record for generating long-term, sustainable growth through the advancement of essential energy networks, and is well positioned to be a leader in the global energy transition. Through our infrastructure platforms in North America, including our cross-border energy networks and LNG facilities on the Gulf and Pacific Coasts, the company is helping create jobs and economic growth, and expand energy access in the U.S. and Mexico.

Investing in Energy Systems of Tomorrow

Sempra has focused our role in the energy value chain on transmission and distribution investments that provide attractive risk-adjusted returns. Sempra's three growth platforms – Sempra California, Sempra Texas and Sempra Infrastructure – combine for nearly 290,000 miles of transmission and distribution lines. At Sempra California and Sempra Texas, Sempra is currently executing on robust capital plans focused on safety, reliability, economic growth and connecting customers to cleaner energy. Sempra Infrastructure is a growth platform that combines the strengths of the company's assets in the U.S. and Mexico with a focus on building infrastructure to facilitate the global clean energy transition. Sempra Infrastructure is organized around three key business lines: Clean Power; LNG and Net-Zero Solutions; and Energy Networks.

Advancing a Net-Zero Future

For two decades, the Sempra family of companies has been on a sustained path to decarbonize business operations and the markets we serve with a view toward transitioning to net-zero. In April 2021, the company issued our 13th annual sustainability report where we shared an enterprise-wide action plan to continue growing the company to meet the evolving needs of customers, while making critical infrastructure investments with the aim of net-zero greenhouse gas emissions across all three scopes by 2050.

We believe investment in three key areas is essential to advancing a net-zero future and developing climate-resilient energy systems: decarbonization, diversification and digitalization.

ESG Leadership

Sempra has been consistently recognized for our role as a leader in diversity, inclusion and sustainability. The company has been the only North American utility holding company named to the Dow Jones Sustainability World Index for the last four years. Sempra has received numerous recognitions for our 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.

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

Dr. Adel Chaouch

President and
Chief Executive Officer
ShaMaran Petroleum

ShaMaran Petroleum: Focused on Growth

ShaMaran is a Kurdistan focused oil development and exploration company which holds a 27.6% interest in the Atrush Block and will have an 18% interest in the Sarsang Block upon closing of this recently announced transformative acquisition. ShaMaran is listed on the TSXV and OMX (Sweden) under the symbol "SNM" and is part of the Lundin Group. The world class Atrush Field is a discovery made and developed by the Company. Current 2P reserves are 30.3 million barrels which represents a 108% replacement ratio over the previous year. Ongoing development has allowed year on year increases in reserves. Total discovered oil in place in the Atrush block is a low estimate of 1.7 billion barrels, a best estimate of 2.0 billion barrels and a high estimate of 2.3 billion barrels. Cumulative gross field production of over 50 million barrels was achieved in September 2021 despite the challenges of the global coronavirus pandemic with its impact on crude oil prices and a significantly reduced capital development program in 2020. Daily gross field production is currently 42,000 bopd.

The Company recently announced the acquisition of an affiliate of TotalEnergies which holds an 18% interest in the two producing Sarsang oil fields. Upon completion of the transaction, ShaMaran will have three adjacent producing fields in Kurdistan. The acquisition adds immediate incremental production of approximately 5,000 bopd of light crude oil (36-38 API) and is expected to double ShaMaran's Q2 2021 average net production, exceeding 20,000 bopd, following the completion of the processing facility expansion at the Sarsang project by mid-2022.

With continuing improvement in oil prices the Company anticipates a continuation of strong operating cash flow that will be supported with prudent capital deployment.

Dr. Adel Chaouch joined as CEO in mid-2019 with a mandate to revitalize the company and put it on a growth path. The onset of the COVID pandemic, oil prices crashing and extremely volatile financial markets left ShaMaran just over a year ago facing very challenging liquidity issues. Significant bond interest payments were due at the same time the oil market crashed and the impact of COVID resulted in a financial covenant breach with the bondholders.

After quickly establishing strict COVID protocols, Dr. Chaouch entered into intense negotiations with the bondholders resulting in the liquidity shortfall being successfully resolved and the company's liquidity position strengthened.

Subsequently, negotiations began to significantly reduce the capital program budget and bring in additional efficiencies. The result being Atrush becoming one of the top 5 producing fields in the region.

In line with his strategic vision the CEO then successfully pursued the transformative acquisition of TotalEnergies' Sarsang oil fields effectively doubling the size of the Company in terms of reserves and production.

The second quarter of 2021 brought in record financial and operating results for the company.

Statistics:

Daily field production: 42,000 bopd
Cumulative production: 50 million barrels
Lifting cost: $4.54
Region: Kurdistan
Key assets: Atrush and Sarsang Fields
Status: Development and acquisition growth
Website: www.shamaranpetroleum.com
Twitter: @ShaMaran_Corp

Alan Armstrong

Chief Executive Officer
Williams

A FORTUNE 500 investment-grade corporation headquartered in Tulsa, Oklahoma, Williams (NYSE: WMB) was founded in 1908 and has continuously grown and evolved. Today its operations span the natural gas value chain including gathering, processing, interstate transportation and storage of natural gas and natural gas liquids (NGLs). Positioned in top U.S. supply basins, Williams connects the best supplies with growing demand for clean energy.

With more than 30,000 miles of pipelines system wide – including Transco, the nation's largest volume and fastest growing pipeline – Williams handles approximately 30 percent of the natural gas in the United States that is used every day for clean-power generation, heating and industrial use. And as the world moves to a low-carbon future, Williams is well-positioned to leverage its natural gas-focused strategy to reliably fuel the clean energy economy.

Williams was the first North American midstream company to establish a climate commitment, encompassing both near and long-term goals focused on reducing emissions while also leveraging its infrastructure to support the growth of renewables and emerging areas like responsibly sourced natural gas, hydrogen and carbon capture.

"As we think about sustainability both today and into the future, our highly reliable natural gas infrastructure is extremely well-positioned to continue replacing higher carbon fuels while supporting the growth of renewable energy and responsibly sourced natural gas for LNG export," says Williams President and Chief Executive Officer Alan Armstrong. "We are looking forward and anticipating future innovations and technologies that we can use on our key energy networks to deliver on our country's clean energy future."

For more than a century, the Williams name has been associated with energy, innovation and trust. We have a long history of building and operating facilities that move safe, affordable, reliable energy sources that heat and fuel the nation. We take a long-term view and work hard to maintain our reputation as an industry standout.

Williams serves major markets across the South, East, Northeast and Northwest. With approximately 5,000 employees and operations across 26 states, Williams is committed to communities across the nation. In 2020, the company gave nearly $11 million to help meet community needs throughout the country while Williams employees volunteered more than 18,263 hours.

Williams is focused on reliably delivering value to its investors, customers and communities by running its business with authenticity and a safety-driven culture, leading the midstream industry into the future.

Statistics:

Founded	1908
Employees	5,000
Miles of pipeline	30,000
Customers	600
Key markets served	15

Ben Fowke

Executive Chairman
Xcel Energy

Ben Fowke, executive chairman of Xcel Energy, will retire at the end of the year following a distinguished career as a global leader for the clean energy transition. He enjoyed a successful career at Xcel Energy for more than 25 years, serving as CEO for a decade from 2011 to 2021. During that time, under Fowke's leadership, Xcel Energy became the first investor-owned utility in the country to announce a vision to produce carbon-free electricity for its customers by 2050. More than 25 peer companies have quickly followed with similar carbon-free or net-zero announcements, demonstrating that the electric power industry is well positioned to significantly reduce carbon emissions in the coming years, building on the progress already made.

During his tenure as CEO, Fowke developed Xcel Energy's "Steel for Fuel" growth strategy that has delivered economic and environmental benefits for customers and an attractive return for shareholders. As part of the strategy, the company developed an expertise in building and operating its own wind farms – the traditional fossil fuels (often coal or natural gas) needed to create energy are replaced with steel needed to operate large wind farms. The cost to build and operate wind farms is less than fossil fuel options, which, collectively, will save customers hundreds of millions of dollars over the expected 25-year life of the wind projects.

Xcel Energy has been a leading utility wind energy provider – ranked number one for several consecutive years since 2005 – and was among the first companies in the world to eclipse 10,000 MW of wind energy on its system. Adding significant amounts of renewable energy while concurrently retiring traditional fossil fuel plants early have been catalysts for Xcel Energy to reduce carbon emissions 51% from 2005 levels at the end of 2020. The company is ahead of pace to reduce carbon emissions 80% by 2030.

Fowke served as Chairman of Edison Electric Institute (EEI), the power industry's trade association, for the 2020-21 term. During his tenure, Fowke focused on three areas: leading the clean energy transition, helping the country recover from the economic impacts of COVID-19 and promoting diversity, equity and inclusion across the industry. As the industry leader, Fowke gained commitments from every EEI member in the country to take action steps to improve diversity, equity and inclusion at their companies and within their communities.

Since he was appointed by President Obama in 2016, Fowke has also been one of two utility industry CEOs to serve on the National Infrastructure Advisory Council that presents recommendations to the president to protect critical infrastructure, such as the electrical grid, from physical or cyber-attacks. Fowke has also testified several times before Congress on a variety of subjects, including cyber-security preparedness, bettery storage technology, the use of drones, the importance of hiring military veterans, the need for a clean energy standard.

During Ben Fowke's tenure as CEO, Xcel Energy:

Tripled its total wind capacity from 3,400 MW to over 10,000 MW, with owned wind growing from 300 MW to more than 4,000 MW
Reduced the coal on its system from approximately 50% to 21%
Reduced carbon emissions 51% from 2005 levels (at the end of 2020)
Improved its nuclear fleet operations from third-quartile performance to the best performing fleet in the industry while lowering its cost structure by 20%
Tripled its market cap from $12 billion to ~$37 billion
Saw stock price increase from $24 per share to almost $70 per share, reflecting a TSR of ~300% – outpacing our peer group
Met or exceeded earnings guidance every year
Employee safety improvement: OSHA recordable incident rate declined for eight straight years (2008-2015)

S&P Global
Platts

Platts LIVE is here to connect the people who are navigating the biggest global challenge of our generation: the evolution of energy.

Join the future at PlattsLIVE.com