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ANALYSIS

Peak Oil Demand Still Looming, and Gas Too

The strong rebound in oil demand following the Covid-19 crisis led several energy modelers to postpone the expected date of peak oil demand. Consultancy DNV and BP, which last year considered oil could have peaked in 2019, now see demand peaking respectively in 2024 and 2025. But the desired and likely direction of travel has not changed. In fact, the Intergovernmental Panel on Climate Change's (IPCC) recent warning — that keeping a 1.5ºC or even 2ºC warming limit in sight will require a big strengthening of policies — could mean an even faster phasing out of fossil fuels than initially envisaged.

Indeed, Paris-compliant energy scenarios assume oil and gas demand will fall by respectively 40%-80% and 20%-60% between now and 2050. Gas demand would also need to peak only a few years after oil, around 2025-30.

Most scenarios, however, even among Paris-compliant ones, do not achieve net-zero — or near net-zero — CO2 emissions by 2050. This would only happen with the International Energy Agency's (IEA) and BP's net-zero scenarios, and the IPCC's 1.5°C group of scenarios with limited warming "overshoot" — in other words, there is a limited degree to which the average temperature increase misses or overshoots what is targeted. In the IPCC's 1.5°C scenarios with high overshoot, reaching net zero would happen five to 10 years later, and only around 2070 in the 2°C scenarios, in line with Shell's Sky 1.5 scenario. China, Indonesia and Saudi Arabia are targeting net-zero CO2 by 2060, and India by 2070.

Role of CCS

Many forecasters emphasize the role carbon capture and storage (CCS) needs to play to keep emissions within budget, based on its ability to limit emissions in hard-to-decarbonize industrial processes, along with its projected ability to achieve negative emissions by removing CO2 from the atmosphere when combined with bio-energy (BECCS). Conservative scenarios such as Equinor's Rivalry, the IEA's Stated Policies and BP's New Momentum only assume limited amounts of CCS of just a few hundred million tons per year of CO2 by 2050. That's a seemingly modest amount, but five to 10 times more than today's installed capacity of 40 million tons/yr.

Paris-compliant scenarios assume more substantial amounts of CCS, ranging from 4 billion tons/yr in BP's Accelerated scenario to 8 billion tons/yr in the IEA's net-zero and over 9 billion tons/yr in the IPCC's 1.5°C scenarios. This is considerable — and unrealistic, critics argue — as it more or less matches the current physical size of the oil and gas industry, which in 2021 has been handling 4.2 billion tons of oil and 3.4 billion tons of gas. Building such a big industry from scratch would require some $150 billion per year over 2030-50, according to a recent report from the Energy Transition Commission (ETC), an international think tank. This is huge but amounts to less than a third of today's oil and gas capital expenditure, at around $500 billion/yr, the ETC's Kash Burchett notes.

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RENEWABLE ENERGY BREAK-EVEN PRICES

Developing Asia	Coal	Gas
Market Price	4.62	47.00
Wind Onshore	2.29	2.61
Solar PV	1.06	0.00
Solar CSP	19.25	25.42
Mideast	**Oil**	**Gas**
Market Price	100.44	45.24
Wind Onshore	7.91	2.83
Solar PV	0.00	0.00
Solar CSP	61.65	14.56

Market prices Aug 2. Coal and Gas in $/MMBtu, Oil in --$/bbl. Table indicates fuel price above which renewable energy is more profitable than new coal-, gas- or oil-fired power, without subsidies. Source: Energy Intelligence

All Paris-compliant pathways involve rapid and deep emissions reductions in all sectors, but also deployment of negative emissions technologies such as afforestation-reforestation, BECCS and direct air capture (DAC) to counterbalance residual emissions and reduce excess CO2 concentration in the atmosphere.

Negative emissions options, while "unavoidable," face substantial "implementation challenges" including technological and social risks, scaling and costs, the IPCC warns. It also stresses that negative emissions "cannot fully compensate for delayed action."

Gas Demand Up, Then Down

Natural gas demand increases in most scenarios in the current decade — with the notable exceptions of truly net-zero projections such as the IPCC's 1.5°C and BP's and the IEA's net-zero scenarios. Deep emissions reductions by 2030, particularly natural gas-related methane emissions, "reduce the likelihood of overshooting warming limits and lead to less reliance on negative emissions that reverse warming in the latter half of the century," the IPCC notes.

Sharper divergences on natural gas demand appear after 2030. Paris-compliant projections see it peaking no later than 2030-35 while several scenarios do not foresee a peak at all.

Those include the notoriously bullish US Energy Information Administration's International Energy Outlook and Opec's World Oil Outlook, but also Exxon Mobil's base case, TotalEnergies' Momentum, BP's New Momentum and the IEA's Stated Policies scenario.

The IEA's Announced Pledges scenario, which might replace the Stated Policies as the agency's implicit base case, and the IPCC's 2°C scenarios see gas demand peaking in 2030 at around 150 exajoules, just a few percent higher than today's 145 EJ. It would then decrease by around 0.5% per year to 2050.

Philippe Roos, Strasbourg

OIL DEMAND TO 2050

(million b/d)	Peak	2030	2040	2050	2021-50
Energy Watch Group (0 Gt)	<2021	72	31	0	-100%
UNPRI 1.5 (2 Gt)	2025	88	46	20	-79
IEA Net-Zero (0 Gt)	<2021	72	43	24	-74
BP Net-Zero (2 Gt)	<2021	90	55	24	-74
UNPRI Forecast Policy (9 Gt)	2026	99	63	37	-61
IPCC 1.5°C Low Overshoot (1 Gt)	<2021	86	63	41	-56
Total Rupture	<2021	88	59	41	-56
Equinor Rebalance (9 Gt)	<2021	88	61	46	-51
BP Accelerated (10 Gt)	2025	96	72	47	-50
IPCC 1.5°C High Overshoot (6 Gt)	<2021	99	78	53	-44
DNV (19 Gt)	2024	85	69	49	-48
IEA Sustainable Development (8 Gt)	<2021	88	65	57	-39
Total Momentum	<2021	94	74	63	-33
IPCC 2°C (14 Gt)	2030	100	88	70	-26
IEA Announced Pledges (21 Gt)	2030	96	84	77	-18
BP New Momentum (31 Gt)	2030	101	92	81	-14
Equinor Reform (24 Gt)	2030	100	92	84	-11
Shell Sky 1.5 (18 Gt)	2025	100	94	85	-10
IPCC 2.5°C (29 Gt)	2040	105	107	99	+5
Shell Islands (34 Gt)	2040	102	104	102	+8
IEA Base (34 Gt)	2040	103	104	103	+9
IPCC 3°C (38 Gt)	2040	104	108	106	+13
Exxon	>2040	104	107	107	+14
Opec (34 Gt)	>2045	107	108	108	+15
Equinor Rivalry (32 Gt)	>2050	107	110	110	+17
IPCC 4°C (52 Gt)	2040	107	111	111	+18
Shell Waves (35 Gt)	2040	111	119	111	+18
US EIA (43 Gt)	>2050	109	117	126	+34%

Projected oil demand to 2030-50 in million barrels per day in a range of scenarios. When available, projected CO2 emissions in billion tons are shown in parenthesis.
Source: BP, DNV, Equinor, EWG, Exxon Mobil, IEA, IPCC, Shell, TotalEnergies, UNPRI, US DOE

GAS DEMAND TO 2050

(EJ)	Peak	2030	2040	2050	2021-50
Energy Watch Group (0 Gt)	<2020	28	12	0	-100%
UNPRI 1.5 (2 Gt)	2021	104	72	53	-64
IEA Net-Zero (0 Gt)	<2021	129	75	61	-58
BP Net-Zero (2 Gt)	2025	133	93	61	-58
UNPRI Forecast Policy (9 Gt)	2023	122	96	68	-53
IPCC 1.5°C Low Overshoot (1 Gt)	<2021	111	88	82	-43
IEA Sustainable Development (8 Gt)	2030	139	108	85	-42
BP Accelerated (10 Gt)	2025	152	130	94	-35
Equinor Rebalance (9 Gt)	2030	149	144	107	-26
IPCC 1.5°C High Overshoot (6 Gt)	2030	149	129	113	-22
Shell Sky 1.5 (18 Gt)	2035	157	151	115	-21
IPCC 2°C (14 Gt)	2030	149	139	130	-11
DNV (19 Gt)	2030	159	154	131	-10
IEA Announced Pledges (21 Gt)	2030	147	136	133	-8
Total Rupture	2040	157	160	153	+5
Shell Islands (34 Gt)	2045	152	161	160	+10
Equinor Reform (24 Gt)	2040	156	164	161	+11
Equinor Rivalry (32 Gt)	>2050	154	165	165	+14
Shell Waves (35 Gt)	2040	161	175	169	+16
IEA Base (34 Gt)	>2050	157	169	176	+21
BP New Momentum (31 Gt)	>2050	160	176	181	+25
Total Momentum	>2050	158	175	185	+27
IPCC 2.5°C (29 Gt)	2060	156	175	186	+28
Opec (34 Gt)	>2045	167	186	191	+31
Exxon	>2040	175	187	197	+36
US EIA (43 Gt)	>2050	176	188	204	+40
IPCC 3°C (38 Gt)	2080	161	189	204	+40
IPCC 4°C (52 Gt)	2080	168	198	217	+49%

Projected gas demand to 2030-50 in exajoules in a range of scenarios. When available, projected CO2 emissions in billion tons are shown in parenthesis.
Source: BP, DNV, Equinor, EWG, Exxon Mobil, IEA, IPCC, Shell, TotalEnergies, UNPRI, US DOE

TRANSPORTATION

India's EV Race Runs Into Charging Roadblock

With diesel and gasoline prices likely to stay high, Indian consumers want to transition to electric variants (EV) but are finding it difficult to switch. City dwellers who live in apartments do not have private garages to charge their cars and scooters, while public charging stations have yet to take off in a big way.

Mounting interest in EVs is evident: India's EV sales rose three-fold in the fiscal year ended Mar. 31 to 429,217 units, according to the Federation of Automobile Dealers Associations of India. As a percentage of overall vehicle sales, however, the proportion is still low — at 2.4%.

Charging access is a big obstacle. India's Federal Transport Minister Nitin Gadkari told parliament Jul. 20 that India has just around 3,000, which is considered low. The South Asian nation may need a network of 400,000 charging stations with EVs expected to touch 2 million by 2026, notes a report released in June by Grant Thornton Bharat and business lobby group FICCI.

The number could be as high as 2.9 million if India is to achieve Prime Minister Narendra Modi's goal of making EVs account for 30% of all vehicles sold by 2030, according to a study by New Delhi-based think tank the Council on Energy, Environment and Water.

Policy Support

Charging is, of course, a "chicken and egg problem, says Anup Jain, a managing partner with Mumbai-based venture capital fund Orios Venture Partners, while speaking at an industry event last week. Too few EVs are on the road due to a lack of charging infrastructure — but without enough vehicles on the road, investors are not willing to invest in infrastructure.

India's state-owned refiners presently command 90% of its 84,000 operational fuel retail stations. But they are slow to invest in charging infrastructure, with a promise for just 22,000 charging points in the next few years.

While the US is investing $5 billion for an expanded EV charging network, Modi's government has set aside just $164 million under its Faster Adoption and Manufacturing of Electric Vehicles scheme. The government does not want to use taxpayer money for fast rollout of chargers, which could hinder development of a competitive market.

The government in January eased the permitting process for public charging stations and simplified land and electricity tie-up rules, and some states have reduced power tariffs too for EV charging. The government has set a target for having a public charging system every 3 square kilometers in cities and every 25 kilometers on highways in three years. And in April, it launched a draft policy for battery swapping.

Transport Minister Gadkari brushed aside the concerns about infrastructure, saying the "chicken and egg" conundrum is just intellectual discourse and that charging stations are fast coming up everywhere across the country.

Stumbling Blocks

Still, the investors are not opening up their purse strings. The charging business does not look financially viable, and a lack of standardization of chargers and batteries, including fast chargers, is making matters cumbersome. Ratings agency ICRA says that the business is capital intensive and that low utilization rates will result in a relatively long payback period of about four years for charging infrastructure investments.

Analysts say that the charging stations, on standalone basis, may not be viable. Operators would need to also offer driver-friendly amenities like food courts and supermarkets to keep the drivers engaged while their vehicles get charged — although this would only increase the investment cost.

The lack of standardization in charging ports means every vehicle cannot be charged at every charging station. The battery swapping model faces the same dilemma: ICRA says that ensuring interoperability, adequate financing availability and maintaining sufficient battery inventory can prove challenging.

Another issue with the battery swapping model is that with the batteries accounting for half of the vehicle cost, the automakers will not be willing to permit third parties to control the batteries, Nilesh Kothari, managing partner with Trifecta Capital, a financing and advisory firm, told an industry event last week. And if ultra-fast charging technology takes off, it may negate the need for battery swapping.

India will need innovative solutions to address charging issues, analysts say. Vivekananda Hallekere, CEO of electric two-wheeler maker Bounce, said last week that India should not set up big automated battery swapping stations and should instead focus on adding small grocery stores to their ecosystem.

The stores can easily keep up to 10 batteries and serve the customers, ensuring low initial investment and also the flexibility to change. "We have to shed the baggage of conventional gasoline stations when we look at battery swap stations," he said. "We need to take away the concept of energy provider from Shell to local mom-and-pop stores that can be energy vendors."

Rakesh Sharma, New Delhi

POLICY

Surprise US Legislation Could Advance Key Technologies

US Democratic Senate leaders unveiled details of a surprise legislative compromise last week that includes a significant chunk of new clean energy spending that could accelerate key technologies if the legislation clears. These come alongside some prizes for fossil fuels — including required US Gulf of Mexico oil and gas leasing — which are also included in the 725-page bill in order to snag support from key swing vote US Sen. Joe Manchin (D), who hails from fossil fuel-dependent West Virginia. The bill was released Jul. 27, signaling an agreement between Manchin and US Senate Majority Leader Chuck Schumer (D-New York) after legislative efforts crashed and burned late last year.

Still a Mass Injection

Although some of the clean energy tax credits have been slightly pared down from the Build Back Better bill President Joe Biden had previously backed, the package still includes a massive injection of clean energy funding. According to a recent Rhodium Group analysis of the new bill, its policies would result in slashing greenhouse gas emissions by 31%-44% below 2005 levels by 2030, depending on oil and gas prices, economics and technology costs. That's shy of the Biden administration's topline goal of slashing 50%-52% of emissions by 2030 but puts the target closer within reach than policy scenarios that do not include legislation.

The latest version of the legislation largely leaves intact — and extends — sweeping long-term tax credits for new wind and solar generation, and significantly boosts credits for carbon capture, direct air capture, clean hydrogen and clean fuels. If passed, the bill would extend a wind and solar production credit, which has a base value of 0.5¢ per kilowatt hour plus a 2¢ bonus for meeting labor requirements, for projects placed in service through 2024. A 6% solar investment tax credit would also apply to projects that come on line through 2024, after which a broad "clean electricity" performance standard would replace renewable-specific production and investment credits.

The bill offers permanent extenders to wind and solar credits that have lived and died within lawmakers' whims for years and were set to phase out completely. That should help expand renewables growth, which had arguably slowed in part due to uncertainty over the tax credits, according to clean energy lobbies.

American Clean Power Association data indicated the rate of growth for US clean power installations slowed to 11% in the first quarter of 2022, compared to the 50% year-over-year growth rate between 2019-21. But concessions were made: the time frame for the legacy credits before they would be replaced by the more flexible performance standard — which allows other types of low carbon power to take advantage — is shorter by two years than in the previous bill.

More for Carbon Capture

The bill includes some big enhancements to the existing carbon capture and storage (CCS) tax credit known as 45Q. These include hiking the per-ton values of CO2 captured and stored from industrial and power facilities to $85 per ton, up from $50/ton currently. Captured CO2 for enhanced oil recovery would be raised from $35/ton to $60/ton, and values for direct air capture (DAC) would range from $130-$180/ton depending on whether it is stored in saline geologic formations or used for EOR.

The bill would also offer a multiyear extension of the window for projects to have broken ground to qualify for the credit, while thresholds for the size of qualifying capture projects would also be dramatically lowered, allowing a wider universe of projects to take advantage.

Raising the values of the capture tax credits is seen as essential for supplementing private investments in DAC. It's also essential for incentivizing CCS projects such as retrofitting gas-fired power plants, which have more diluted — i.e. costly — CO2 streams and are therefore viewed as needing bigger incentives, Jennifer Wilcox, head of the US Department of Energy's fossil energy and carbon management office, said in a recent interview. "We're confident that $85 is priced about right," Wilcox said. She added that the incentive could accelerate CCS deployment even more so for sectors like cement, which have more concentrated CO2 streams.

Hydrogen and EVs

For hydrogen, the bill would offer a hydrogen investment and production tax credit for the next 10 years at 60¢ per kilowatt hour, but only for projects where the hydrogen contains 4 kilograms or less of carbon per kilogram. The lower the carbon, the higher the tax credit value. According to the Rhodium analysis, having the long-term incentives will provide a launch pad for these key technologies to scale and build on investments following the modest infusion of clean energy cash provided in last year's infrastructure bill.

For electric vehicles (EVs), the bill extends $7,500 tax credits for North American-made EV purchases. More credit is available for vehicles whose batteries were also manufactured in North America, and $4,000 for used EVs. "Long-term electric vehicle tax credits will accelerate the diversification of passenger vehicles away from their over-reliance on petroleum, though the EV credits included in this bill are scaled back from previous proposals," according to the Rhodium analysis.

Bridget DiCosmo, Washington

NEW TECHNOLOGIES

New Twist on Hydrogen Tech Advances in North America

Low-emissions hydrogen is poised to play a crucial role in the energy transition in any scenario. Less certain is how all that clean hydrogen will be produced. The two leading methods — so-called "green" and "blue" hydrogen — have gained traction, but now a third is attracting attention as well. Methane pyrolysis, sometimes referred to as "turquoise hydrogen," involves extracting hydrogen from either fossil-based or renewable natural gas streams with catalysts or high heat instead of steam. Rather than releasing the carbon byproduct as emissions, the process captures it in a solid form that has several industrial uses. Research into methane pyrolysis has picked up in the last decade or so as hydrogen has emerged as key to future decarbonization efforts.

Green hydrogen, produced with an electrolyzer powered by renewable electricity, is naturally considered the cleanest method, albeit currently more expensive, while conventional methane reforming with carbon capture and storage, or blue hydrogen, is seen as the most readily deployable at scale. All three methods have their respective benefits and challenges and each face a steep road ahead before they can begin displacing the roughly 100 million tons of unabated hydrogen produced each year.

Unique Approaches

A small development-stage firm aims to be the next company to launch a methane pyrolysis hydrogen project in North America. Australia-based Hazer Group formed a partnership with Suncor Energy and the British Columbia (BC) arm of Canadian utility Fortis to build a pilot plant in the province that could produce as much as 2,500 tons per year t/yr of clean hydrogen. Hazer and its partners have launched a front-end engineering and design study and aim to sanction the project next year. It will be built at Suncor's Burrard products terminal in Port Moody, BC, with planned startup in 2025.

Hazer's proprietary technology is unique to other methane pyrolysis approaches. It was developed by researchers at the University of Western Australia and then spun into a company that went public on the ASX exchange in 2015. CEO Geoff Ward tells Energy Intelligence that Hazer's is an iron-ore-based catalytic process, which he says is lower cost and less energy intensive than other approaches.

Most other methane pyrolysis technology is based on a plasma process to create very high temperatures. But "we operate at lower temperatures," he says, noting that other catalytic processes often use precious or molten metals that can be challenging to work with. "We use a ground iron oxide — an easy-to-handle, readily available abundant catalytic material."

Marketing the Byproduct

Another key difference with Hazer's approach is the non-hydrogen byproduct. Other forms of methane pyrolysis yield hydrogen and carbon black, an "amorphous" form of carbon used as an additive in tires and asphalt, among other things, Ward says. Hazer produces a "graphitic" form of carbon that can be upgraded to a synthetic substance nearly identical to pure graphite, potentially opening its technology to more sophisticated markets beyond carbon black. Ward says Hazer is looking at graphite applications ranging from low-value bulk materials like cement and concrete to high-end products like electronics and batteries.

"As we move through the next phase where we're producing more of the carbon material, that will be where we do a lot of product qualification and product proving," he says. "We've got engagements of inquiries or investigations out with companies across that whole span of applications." The process produces 3.5-4.5 tons of solid carbon for every ton of hydrogen, he says. "Our strategy is to develop a range of applications."

Global Reach

Hazer recently received its first US patent for its process, adding to existing patents in Asia, Europe, Australia and elsewhere. It has begun a pre-feasibility study under a memorandum of understanding with French utility Engie for a hydrogen-production facility at an existing LNG import and re-gasification terminal in France. It is also working closely with Japanese engineering giant Chiyoda to gauge interest for the technology in Japan, particularly around hard-to-decarbonize sectors. Ward says Hazer aims to eventually build a larger commercial facility with around 50,000 t/yr of capacity, but at that scale the company would play the role of licensor rather than project developer.

Hazer has just completed construction of a 100 t/yr plant in Woodman Point, Western Australia, where it will convert biogas from a wastewater treatment plant. Startup has been delayed until next year, however, due to a "critical failure" during fabrication of the high-temperature heat-exchanger. Hazer is investigating the cause. Ward says while it is a setback, the company was already developing a second-generation reactor that does not require such complex materials. "This is part of the learning and development process," he says. "That's why you stage your technology."

More Players

Nebraska-based Monolith has established itself as an early leader in producing hydrogen through methane pyrolysis. The company last year secured a $1.04 billion loan guarantee from the US Department of Energy that will help finance a major expansion of its Olive Creek plant to around 50,000 t/yr of hydrogen with startup due in 2026. Last month, Monolith

closed a $300 million funding round that reportedly valued the company at more than $1 billion. Monolith counts affiliates of TPG, Blackrock, Temasek, SK and Warburg Pincus among its investors.

And more players are emerging. Just this week, Canada-based Aurora Hydrogen announced the closing of a $10 million Series A funding round that attracted investments from affiliates of oil and gas giants Chevron, Shell and Williams. Aurora uses a proprietary "microwave" pyrolysis approach that requires less heat than Monolith's technology, for example, but also does not rely on catalysts, like Hazer's. The funding will be used to build and operate a small demonstration plant for field trials in Edmonton, Aurora says.

Luke Johnson, Houston

POLICY

Food Crisis Weighs on Biofuels Debate

Finding consensus on the future of biofuels policy in Europe is proving even more difficult than usual, with the global food crisis caused by the war in Ukraine adding even more wrinkles. Biofuels have had a troubled history in Europe for a long time, with initially strong policy backing a few decades ago having been watered down over the last decade as concerns mounted about land use and competition with food crops.

Today's food crisis has lent fresh urgency, with both environmental and humanitarian campaigners now calling on policymakers to take more definitive steps to stop using food crops to make biofuels. On the other hand, biofuels are seen as an important tool as policymakers seek to finalize the EU's fit for 55 policy package, which aims to put the 27-member bloc on a pathway to cut emissions by 55% by 2030. Transport is a big part of this effort, with the EU having set out ambitious targets to phase out internal combustion engine sales by 2035, on which agreement has been broadly reached.

Policy Revisions Underway

In a key vote last month, the European Parliament's Industry Committee (ITRE) agreed to a move that would end the use of soy as a biofuels feedstock — as the EU has already done for palm oil imports amid concerns about deforestation. The ITRE position, adopted by a vote of 54 in favor, 14 against, and 6 abstentions, did, however, largely maintain a framework for crop-based biofuels — from feedstocks such as rape seed and sunflower oil — proposed by the European Commission. This sets a crop-based biofuel cap at each member state's 2020 final consumption of energy in transport at a maximum of 7%. The ITRE stance contrasts with an earlier vote by the parliament's Environment Committee in favor of reducing the maximum share of food and feed biofuels in the EU by more than half. The Parliament as a whole will now vote on a final position at its next plenary session in September.

The biofuels industry welcomed the ITRE decision. In a joint statement, biofuels, food and feed chain companies said it was a "positive step" to leave member states free to use crop-based biofuels in their transport energy mix. Campaigners are less pleased, however, having long opposed biofuels for being environmentally damaging and competing with food. "With food prices soaring, it is irresponsible that we continue to burn crops like wheat and corn for fuel," said Barbara Smailagic, fuels policy expert at Brussels-based Transport & Environment. She called on the European Parliament to "put that right in the plenary vote in September and choose food over fuel."

Looming Food Crisis

The crisis in Ukraine is also weighing on the biofuels debate — and threatening the food supply of many millions beyond Europe's shores. Researchers from the International Food Policy Research Institute suggest that the loss of Ukrainian agricultural production could be partly compensated by Europe suspending biofuels support policies.

A recent report by NGO network group RePlanet estimates that about a fifth (20%) of total Ukraine wheat exports could be substituted by the ending of European wheat being diverted to ethanol for biofuel production. In 2020, 3.3 million tons of wheat were used as a feedstock for EU biofuels while Ukraine's 2020 global wheat exports were 16.4 million tons, the RePlanet report said.

Biofuel producers, however, dispute these assertions as overly simplistic, arguing it's not such a binary choice of fuel versus food. The European ethanol industry association, ePure, says that its members' biorefineries produced more high protein, GMO-free animal feed co-products (4.48 million tons) than renewable ethanol (4.40 million tons) in 2021. Describing that as "a win-win for Europe's energy independence and food security," ePure says this is "often overlooked or misrepresented in the debate over biofuels."

Overall production of biofuels in the EU has doubled since 2008, growing from 138,000 barrels of oil equivalent per day to 280,000 boe/d in 2020, according to latest figures from downstream industry body Fuels Europe. Among the EU member states, the share of renewable energy in transport fuel consumption ranged from highs of 31.9% in Sweden, 13.4% in Finland and 12.6% in the Netherlands and Luxembourg down to 7% or less in Greece (5.3%), Lithuania (5.5%), Poland and Croatia (both 6.6%).

Ronan Kavanagh, London

IN BRIEF

Shell Eyes Hydrogen Fueling

Shell and China's Shenergy group have signed an agreement to build a network of hydrogen refueling stations in Shanghai through a joint venture, Shell said in a statement on Jul. 29. This would be Shell's first hydrogen refueling network in Asia. The joint venture plans to build six to 10 hydrogen refueling stations in Shanghai and the Yangtze River Delta in the next five years and scale up to 30 stations by 2030.

According to Shell, the 30 stations could provide hydrogen to around 3,000 fuel-cell trucks or buses every day. These stations will use low-emission, industrial byproduct hydrogen from the local chemical industry in the short term, while the two parties will seek to produce and supply green hydrogen in the long term.

The Shanghai municipal government announced in May that, by 2025, the city aims to build about 70 hydrogen refueling stations, alongside growth in hydrogen fuel-cell vehicles and the hydrogen industry. The China Hydrogen Alliance, backed by the government, predicts that hydrogen will make up 5% of China's energy systems by 2030.

BP Moves on EVs, Hydrogen

BP and Spanish utility Iberdrola plan to work together on electric vehicle (EV) charging and green hydrogen production in Portugal, Spain and the UK. BP said the partners expect to jointly invest more than $1 billion to build a network of up to 11,000 fast charging points for EVs in Spain and Portugal by 2030. The collaboration may be extended to the UK. The pair are also eyeing 600,000 tons/yr of green hydrogen production in the same three countries, powered by new renewable electricity projects.

This would include the production of derivatives such as ammonia and methanol to facilitate potential exports of green hydrogen to northern Europe. BP and Iberdrola expect to finalize agreements on the two projects by the end of this year.

Russia Mulls CO2 Penalty

Russia's economic development ministry has submitted to the government a draft resolution that would set a penalty for exceeding a CO2 emissions quota within the so-called Sakhalin experiment. The fee was proposed at 1,000 rubles — or $16 at the current exchange rate — per each extra metric ton of CO2 emissions, which would be paid to the regional budget by participants of the experiment. The rate was determined "based on international experience" when a fine for exceeding the quota at the initial stage was three to 10 times higher than the market value of a ton of emissions in regulated markets, the economic development ministry explained. The decree should come into force on Mar. 1, 2023 and run until the end of 2028. The Sakhalin experiment, formally set to start on Sep. 1, 2022 and last until Dec. 31, 2028, is aimed at reaching carbon neutrality for the region in 2025 and testing the country's carbon trading system.

Total, Veolia in Oman Solar

Total Energies and utility Veolia have teamed up to build a solar project in eastern Oman that will provide electricity for a desalination plant. The solar photovoltaic project will have peak capacity of 17 MW and feed a desalination plant in the city of Sur — about 200 kilometers southeast of the capital Muscat — that supplies drinking water to more than 600,000 inhabitants in the eastern region, according to a joint statement by the two French companies. The solar plant would produce some 30,000 MW hours of green electricity, or more than a third of the desalination plant's daily consumption.

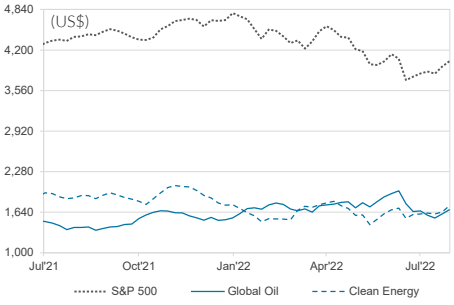
The project is in line with Oman's National Energy Strategy aimed at converting 30% of its electricity use to renewable sources by 2030. Countries across the wider Middle East — including the United Arab Emirates, Saudi Arabia, Oman, Egypt and Morocco — are pressing ahead with renewable projects as they seek to diversify their countries' energy portfolios in anticipation of growing global energy transition pressures. For Total, which is already active in the sultanate's oil and gas sectors, the project adds to a growing regional portfolio, including in renewables.

Tatneft Eyes Carbon Farms

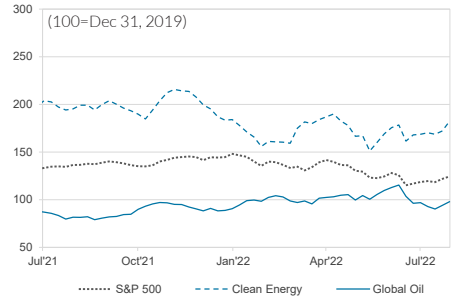
Russian oil producer Tatneft aims to create so-called carbon farms in its home region of Tatarstan as part of its efforts to become carbon-neutral by 2050. Tatneft says it started relevant studies to create these farms — areas where the absorption of GHG increases due to the implementation of special measures, including new woods. The company said that the biological method of CO2 capture can become one of the tools for the company to reach carbon neutrality by 2050. Predictive models of GHG absorption for the period up to 2050 in potentially suitable areas will be prepared based on the field study results taking into account the initiatives that increase the absorption capacity of the forest. Russia has long pledged that its forestry has huge CO2 capturing capabilities and can be widely used to help the country meet its decarbonization targets by 2060.

CLEAN ENERGY EQUITY MARKETS

Equity Index Values



Equity Class Performance



Source: S&P Global

EI NEW ENERGY DATA

ENERGY FUTURES: REFERENCE PRICES

Carbon (€/ton)	Jul 29	Jul 22	Chg.
ECX EUA	77.00	80.01	-3.01
CME GEO ($/offset)	2.94	3.42	-0.48
Crude oil ($/bbl)			
Nymex WTI	96.80	100.03	-3.23
ICE Brent	105.46	105.52	-0.06
Natural gas ($/MMBtu)			
Nymex Henry Hub	8.55	7.80	+0.76
ICE UK NBP	41.70	30.89	+10.81
Coal ($/ton)			
McCloskey CSX	188.60	176.00	+12.60
ICE Rotterdam	385.22	375.66	+9.56

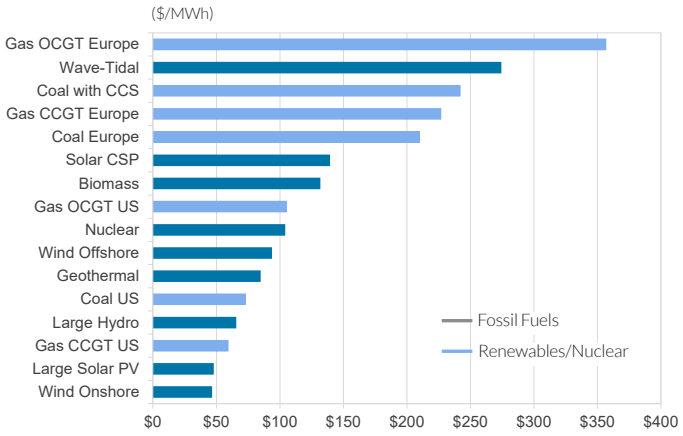
All prices are weekly averages and front-month. EUA = EU Allowances; GEO = Global Emissions Offset. Replaces ECX CER starting 3/30/21. ICE UK gas converted from p/therm. *Short tons. *Source: Exchanges*

GLOBAL ELECTRICITY PRICES

Europe ($/MWh)	Jul 29	Jul 22	Chg.
Germany (EEX)	404.13	349.49	+54.64
France (Powernext)	477.95	473.44	+4.50
Scandinavia (Nordpool)	118.87	141.18	-22.31
UK (APX)	373.01	328.32	+44.68
Italy (GME)	500.92	502.76	-1.84
Spain (Omel)	144.96	147.58	-2.62
North America			
New England	101.80	193.45	-91.65
Texas (Ercot)	74.24	111.20	-36.96
US Mid-Atlantic (PJM West)	109.43	147.18	-37.76
US Southwest (Palo Verde)	99.60	107.90	-8.30
Canada (Ontario)	49.88	53.80	-3.92
Other			
Australia (NSW)	194.37	237.03	-42.66
Brazil (SE-CW)	13.56	12.59	+0.97
India (IEX)	75.63	71.09	+4.54
Japan (JPEX)	184.88	145.16	+39.72
Singapore (USEP)	236.76	227.78	+8.98

Weekly average of wholesale prices. Source: Exchanges

NEWBUILD POWER GENERATION COSTS



Source: Energy Intelligence

DATA: The complete set of EI New Energy data is available to web subscribers, including historical and forecasted levelized cost of energy (LCOE) calculations, EV sales, our Green Utilities rankings, fuel switching thresholds, electricity production by sector, ethanol and biodiesel fundamentals, carbon and energy prices, along with methodologies and reader's guides. The New Energy Data Service can be accessed here.

LATEST INDICATORS: SALES AND FLEET PENETRATION OF EVS

China	
NEV sales (Mar 2022)	484,000
% LDV sales NEVs Mar 2022	**21.7%**
NEV sales (Feb 2022)	334,000
% LDV sales NEVs Feb 2022	**19.2%**
Total NEV fleet as of Mar 2022	8,915,000
% fleet NEVs	**2.90%**

US	
EV sales Mar '22	72,899
% LDV sales NEVs Mar '22	**5.85%**
EV sales Feb '22	59,554
% LDV sales NEVs Feb '22	**5.66%**
Annual EV sales 2021	605,958
% LDV sales NEVs 2021	**4.14%**

Europe (EU, UK, and EFTA)	
Sales Penetration	
EV registrations Q1'22	562,276
% LDV sales EVs Q1 '22	**20.47%**
EV registrations Q4 '21	684,655
% LDV sales EVs Q4 '21	**26.2%**
EV registrations Q1 '21	454,694
% LDV sales EVs Q1 '21	**14.83%**

NEVs = all New Energy Vehicles. EVs = plug-in hybrids and all-electrics. LDVs = light-duty vehicles. EFTA includes Norway, Switzerland, Iceland, Liechtenstein. Sources: China Association of Automobile Manufacturers, China Passenger Car Association, US Alliance for Automotive Innovation, US Argonne National Laboratory/Wards Auto, European Automobile Manufacturers Association

GLOBAL CARBON PRICES

Europe (€/ton)	Aug 2	Jul 26	Chg.
EUA Dec '22	81.95	76.68	+5.27
US ($/ton)			
CCA (Calif.) Dec '22	29.95	27.99	+1.96
RGGI (Northeast) Dec '22*	13.35	13.22	+0.13
New Zealand (NZ$/ton)			
NZU (spot)	80.00	80.75	-0.75
Asia ($/ton)	**Jul 29**	**Jul 22**	**Chg.**
China (National)	8.60	8.44	+0.16
South Korea	13.89	14.20	-0.31

Benchmark months. *Short tons; all others metric tons. *Source: ICE, OMF*

EU CARBON FUTURES PRICES

ECX front-month futures. *Source: ICE*

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