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EI NEW ENERGY™

CONTENTS

TotalEnergies' Global Strategy Put to the Test in Iraq

Iraq, Opec's second-biggest oil producer, has inked a $10 billion deal with French major TotalEnergies to help it curb frequent power blackouts. Besides helping with the urgent problems in Iraq, the deal could be illuminating for the wider oil industry by serving as a test of Total's global game plan — many aspects of which are mirrored in the new partnership. The deal would see Total work to boost Iraq's gas-fired generation, build utility-scale solar photovoltaics, boost oil production, reduce gas flaring and, ultimately, help the country rely less on intermittent imports from Iran.

Oil-rich Iraq frequently suffers from widespread blackouts as demand for electricity often outstrips supply. This imbalance happens both domestically and through various import routes — including from neighboring Iran, which has been hampered by payment disputes. Attacks on electricity infrastructure have compounded the challenges. In its latest country report on Iraq, the International Energy Agency (IEA) said power outages in Iraq are "a daily occurrence for most households." The problem naturally worsens during the peak summer months as air conditioning usage spikes amid soaring temperatures.

Fighting Blackouts

The gap between peak demand and peak supply is growing despite capacity additions, the IEA notes, with the mismatch often rising above 10 gigawatts (see graph). Total said last week that Iraq is "experiencing electricity shortages while it faces a sharp increase in demand from the population." If all goes as planned, the deal would eventually increase domestic electricity production capacity by up to 4 GW, including 3 GW of gas-fired capacity and 1 GW of solar photovoltaics.

The $10 billion deal Total has struck with Baghdad is designed to help the country fight these power issues on multiple fronts, while potentially drawing up a blueprint for international oil companies to use their low-carbon expertise in oil-rich countries that lack the know-how to transform their energy systems unaided. Under the agreement, Total will construct a new gas gathering network and treatment units to supply local gas-fired power stations. The aim is to recover flared gas from three oil fields — Iraq ranks second on the World Bank's top flaring countries list behind Russia — and use it to supply 1.5 GW of gas-fired power capacity under a first-phase development. This could be expanded to 3 GW under a possible second phase. Total will also build 1 GW of utility-scale solar PV capacity to supply the Basrah regional grid. Further, the deal would see Total construct a large-scale seawater treatment unit to increase water injection capabilities, enabling increased oil and gas output without further stressing water supply.

Mirror Image of Total's Strategy

As such, the deal is a mirror image of Total's own energy transition game plan, which aims to promote the synergies of natural gas and renewables (NE May20'21). CEO Patrick Pouyanne says "this project perfectly illustrates the new sustainable development model of

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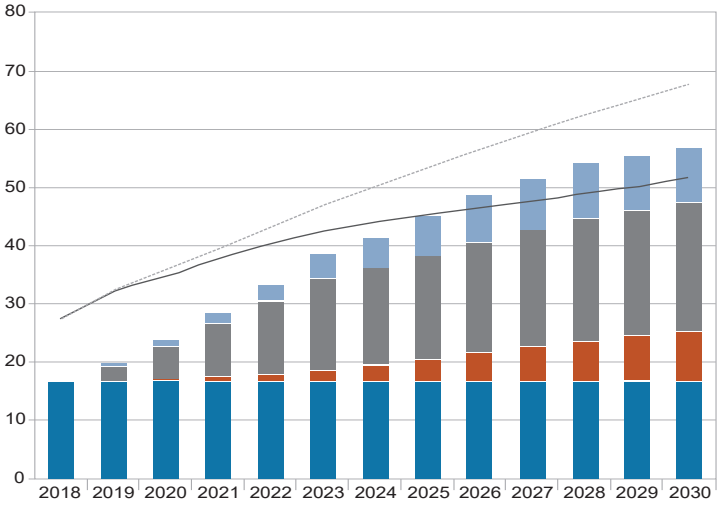
REGIONAL POWER GENERATION COSTS

($/MWh)	US	Europe	Japan	Dvlpg. Asia	Mideast
Large Solar PV	36	69	120	36	35
Wind Onshore	41	57	113	50	72
Gas CCGT	42	92	91	79	75
Large Hydro	61	72	93	41	89
Coal	74	128	80	53	84
Gas OCGT	81	154	147	135	132
Geothermal	83	83	74	50	121
Wind Offshore	91	89	160	102	99
Nuclear	101	101	115	56	57
Biomass	110	110	99	85	101
Solar CSP	128	162	NA	137	111
Coal w/ CCS	140	161	163	112	138
Wave-Tidal	286	286	279	271	271

Levelized cost of energy, or cost of generating electricity over lifetime, including capital, operating, fuel and carbon costs. Dvlpg. Asia = developing Asia, mostly China and India. Source: Energy Intelligence

IRAQ'S POWER NEEDS



Source: International Energy Agency

TotalEnergies … and supports producing countries in their energy transition by combining the production of natural gas and solar energy to meet the growing demand for electricity." Pouyanne adds that Total wants to "leverage its unique position in the Middle East, a region where the lowest-cost hydrocarbons are produced, to gain access to large-scale renewable projects" (NE Oct.15'20).

No Time to Linger

Long term, Iraq will need to upgrade its local transmission and distribution electricity grids and overhaul its antiquated high-voltage transmission network. Yet this could take up to 10 years to complete once started. System losses can reach 50%, making them some of the highest in the world, despite Iraq working with Germany's Siemens and the US' GE to strengthen the ailing grids. Increasing imports from regional neighbors including Jordan, Kuwait, Saudi Arabia and Egypt would also help but this would take time.

Short-term fixes include building more small oil-fired generation units, but this would increase greenhouse gas emissions and air pollutants. Medium-term fixes include building solar PV units and wind farms, which typically take two to three years to complete, and gas-fired combined cycle power stations, which the IEA predicts would take roughly two to four years to build in Iraq. In its country report, the IEA said "there are a number of pathways available for the future of electricity supply in Iraq but the most affordable, reliable and sustainable path requires cutting network losses by half at least, strengthening regional interconnections, putting captured gas to use in efficient power plants, and increasing the share of renewables in the mix." The Total deal would help tackle some of those tasks, but minimizing system losses would require additional action.

Jay Eden, London

ANALYSIS

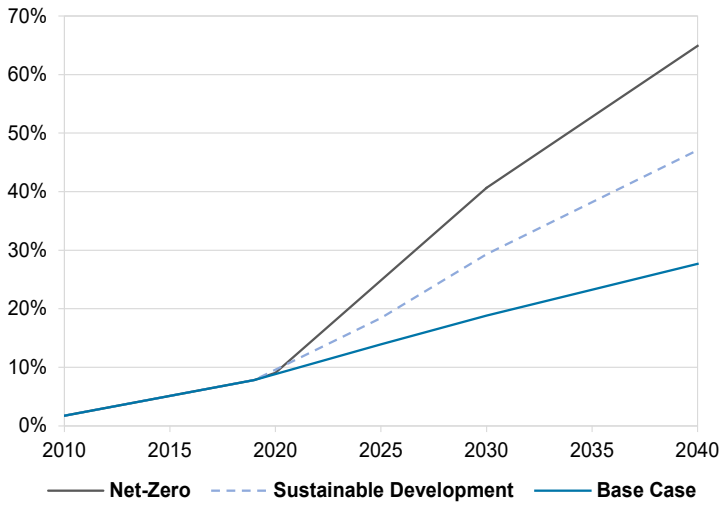
Top Criticisms Against Renewables: How True are They?

While every energy scenario assumes thousands of gigawatts of new renewable capacity will be built in the next two to three decades, critics argue this is not feasible. They mostly point to intermittency and growth sustainability issues. Wind and sunlight are intermittent, they emphasize, which puts the grid — and consumers' safety and finances — at risk when the wind is not blowing and the sun not shining. They also insist that projected renewable growth is so fast that it won't be possible to find enough money to fund projects, or enough raw materials and even space to build them (see graph). So, objectively speaking, are the critics right? Some of the arguments have more truth and backing behind them than others.

Land Space

Because of its low density, even in the sunniest and windiest places, renewable energy requires a lot of equipment and, perhaps more importantly, a lot of space to be harvested. Stanford University's Mark Jacobson has estimated that converting the global power sector to renewables would require 1.6 million onshore wind turbines and 250,000 utility-scale solar power plants, which would occupy some 1% of the global land area. This looks very small but can be an issue in densely populated areas. Jacobson found for example that wind and solar plants would take over 6% of Belgium, the Netherlands and Luxembourg in a 100% renewable scenario. This could end up generating a "social backlash" against covering the planet with solar panels and wind mills, predicts consultancy EY's Gus Schellekens. In fact, Northern Europe may not have enough resources and space to accommodate

PROJECTED RENEWABLE PENETRATION



Renewables as a percentage of total generation in the International Energy Agency's (IEA) base case and climate-friendly scenarios. *Source: IEA*

its "energy hunger," industrial gases giant Linde's Tilman Weide recently told Energy Intelligence (NE Aug.5'21). He believes, however, that 100% renewables is possible if Europe imports clean energy from sunnier regions in the form of electrolytic hydrogen or derived molecules such as green ammonia (NE Jul.29'21).

Financing

Projects also need finance. The International Energy Agency found in its recent net-zero report that annual investment in electricity should rise from $0.5 trillion over the past five years to $1.6 trillion by 2030, including $1.3 trillion just for renewables (NE Jun.10'21). But money is abundant and not really an issue even though renewable returns are low — and unlikely to ever increase. Electricity in general is in fact a low-risk, low-return business, which is quite attractive for investors struggling to beat the current very low interest rates. Developers, including oil companies, can take advantage of this to boost returns by leveraging and farming down assets (NE Jun.24'21). Rather than finance, the biggest hurdle for projects might be slow permitting, Enel's boss Francesco Starace said in a press interview. Weide concurs. "Building quotas of wind and solar are not growing fast enough," he recently told Energy Intelligence.

Raw Materials

By contrast, and despite alarmist press reports, availability of raw materials is not a significant long-term problem. Some minerals such as copper and cobalt are even expected to be in surplus in the next few years, a recent International Energy Agency (IEA) report found. And while medium-term projected demand surpasses the expected supply from existing mines and projects under construction for many minerals, the challenges are "not insurmountable," said the IEA's executive director, Fatih Birol. Indeed, history suggests that scarcity fears often emerge, particularly when new technologies pick up, but never materialize. Historical examples of concerns that proved unjustified revolved around platinum and platinoid metals in the 1970s and 1980s when catalytic converters were generalized in cars, or oil and gas in the early 2000s when some were predicting supply was about to peak (EC May21'21).

Intermittency Tools

The other major criticism against wind and solar relates to intermittency. To make up for periods of reduced wind or sunlight, renewables either need backup or considerable excess capacity. They are both costly and cannot completely eliminate reliability risks, critics say. But utilities and grid operators no longer see intermittency or seasonal variations as a major obstacle (NE May2'19). They have a variety of tools to address it, including gas turbines, which can ramp up and down very quickly. Batteries, which are already competitive for managing very short-term fluctuations, are becoming increasingly competitive with turbines for longer periods of operation. Another way of reinforcing a given power system is by expanding its geographic footprint. Weather conditions vary across geographies and systems under stress can receive help from neighboring ones. This important feature is working well in Europe and most of the US to stabilize grids under a wide range of weather conditions (NE Feb.25'21). In Europe, for example, wind and solar account for 55% of generation in Denmark, which is exchanging power with Germany and Sweden while taking advantage of Norway's hydro storage capacity.

Intermittency is costly, critics also insist. The IEA recently introduced a value-adjusted cost of generation to assess each technology's full system impact. It reflects the average power price a generator can actually capture over the course of a year, and the additional revenue it can gain from being available to run and provide energy or grid services. The IEA's analysis confirms gas turbines are "far more competitive" than their cost of generation alone suggests. Conversely, it shows that solar photovoltaic (PV) suffers from its lack of flexibility and the fact that its output is "highly concentrated during certain times of day." Pairing PV with energy storage technologies will mitigate this effect, the IEA notes (NE Aug.5'21).

True 'Greenness'

In addition to being expensive, renewables are not as clean as they claim, detractors say. A recent report by scientists from University College London (UCL) found that renewable technologies become "relatively less attractive" once indirect emissions are taken into account. But this effect is "not large" because fossil fuel technologies are hugely more carbon intensive than renewables. Rather than impacting renewables as a whole, indirect emissions mostly change relative attractiveness within renewable technologies. UCL modeling found, for example, that wind deployment is slightly increased against every other technology when indirect emissions are accounted. Wind's lifecycle emissions amount to just 15 kilograms of CO_2 per megawatt hour, according to the US' National Renewable Energy Laboratory. That compares to 20 kg/MWh for hydropower, 25 kg/MWh for nuclear and 60 kg/MWh for PV — but 465 kg/MWh for combined cycle gas turbines and 1,050 kg/MWh for coal (NE Aug.15'13).

Philippe Roos, Strasbourg

POLICY

Why Article 6 of the Paris Agreement Is Important

Article 6 of the Paris Agreement — which covers cooperative approaches to emissions reductions, including markets and more — has proven one of the most difficult parts of the accord to push over the finishing line. While most aspects of the rule book to implement the agreement have been finalized, negotiations on Article 6 have remained deadlocked. The upcoming COP26 talks in Glasgow offer perhaps the last, best chance to overcome the remaining obstacles (NE Aug.26'21).

What Is Article 6?

Article 6 encompasses three types of cooperative approaches to emission reductions. These include the potential linking of different countries' emissions trading systems, under Article 6.2, to allow international transfer of carbon credits. It also aims to set up a new UN mechanism, under Article 6.4, that would create emission reduction credits from projects that could be traded between countries, including by companies. This would essentially be a new version of the Kyoto-era Clean Development Mechanism. Article 6.8 covers non-market approaches, such as taxes.

Potential Pros

Advocates of Article 6 argue that, if properly designed, it would make it easier to achieve emissions reduction targets outlined in countries' nationally determined contributions (NDCs) and help raise ambition. Indeed, the International Emissions Trading Association (IETA) calculates that Article 6 could deliver potential cost reductions — versus independent implementation of countries' NDCs — of about $250 billion per year in 2030. If countries invest these cost savings in enhanced ambition, then Article 6 could make the way for additional emissions cuts under the Paris Agreement by 50% or around 5 billion tons of carbon dioxide per year in 2030, IETA suggests.

While Article 6 is not specifically designed to deliver a global carbon price, it is seen as a way to establish the policy foundation and market linkages that could help such a price emerge. Successful implementation of Article 6 could also create new channels for climate finance and lead to technology transfers by providing incentives for private-sector investment in various countries, suggests the International Chamber of Commerce, which represents the global business community during the climate conferences.

Possible Cons

Article 6, if done well, could arguably deliver these benefits. If done wrong, critics say it could undermine the goals of the Paris Agreement — with the Article 6 talks stalled over this dilemma. A key concern is whether emission reductions under Article 6 are additional to what would have happened anyway, without any carbon credit being generated. Key to this is the avoidance of double counting of carbon reductions, both by the host country where a project is located and by the sponsor country or company that pays for that project. This is needed to ensure that carbon credits represent real, verifiable emission reductions. Another question is what to do with old Kyoto Protocol-era credits, with many countries arguing that allowing their use would undermine the world's ability to keep 1.5°C within reach. Others stress the importance of enabling carryover of pre-2020 units to retain investor confidence.

Prospects for Success?

Negotiators came close to a deal at COP25 in Madrid in 2019, but failed to conclude an agreement on the critical details of Article 6. And progress has proved elusive since then during the interim talks to prepare for COP26, with countries just as firmly entrenched — if not more so — on key sticking points, notes Carbon Market Watch. After informal online talks between negotiators in early summer, the EU noted that there were key remaining differences "that can only be resolved at a political level." And at a more recent meeting in London, more than 50 ministers and high-level representatives met in London to discuss their expectations for COP26 in Glasgow, with many stressing that an outcome could not come at the expense of the environmental integrity of Article 6 — and could not undermine the ambition of the Paris Agreement.

There is a real prospect that agreement may not be reached in Glasgow. Even in this scenario, carbon markets are likely to continue to grow, with many countries and companies already embracing them. This includes voluntary markets, which businesses, including some big oil companies, have been using to buy offsets for some of their emissions (NE Jan.14'21). Agreement on Article 6 would help here, by providing a global framework. Yet other efforts are also under way to help these efforts, such as the Taskforce on Scaling Voluntary Carbon Markets, set up by leading climate-minded economist Mark Carney.

Ronan Kavanagh, London

E S G

ESG Demands on Big Oil Grow Tougher, Trickier

Investor demands on oil and gas companies are escalating — moving away from lighter requests for things like climate risk disclosure toward firm commitments, including for customer-level or Scope 3 emissions. And these demands are likely a stepping stone toward eventual calls to implement those commitments. Those were leading takeaways from the latest update to Energy Intelligence's ESG Climate Risk Benchmark, an offering of the Energy Transition Service (see graph). The challenge for companies is keeping up fast enough. This was illustrated by the fact that several companies that increased their actions actually fell in the ranking.

Tricky Question of Scope 3

Investor demands for action on Scope 3 emissions are rising because they account for such a large proportion of total oil and gas emissions at roughly 85%. They are therefore the "crux of the decarbonization challenge" and will grow in weight as disclosures improve, explains TJ Conway, head of Energy Transition Research. The process of tackling Scope 3, to be sure, will be tricky, with a number of unanswered questions ahead. For example, several companies sell more oil and gas products than they produce. This raises the question of whether companies should be responsible for the Scope 3 emissions of their own production alone or also from additional products they buy from

third parties and resell — even though the producers of those barrels would also presumably be held accountable.

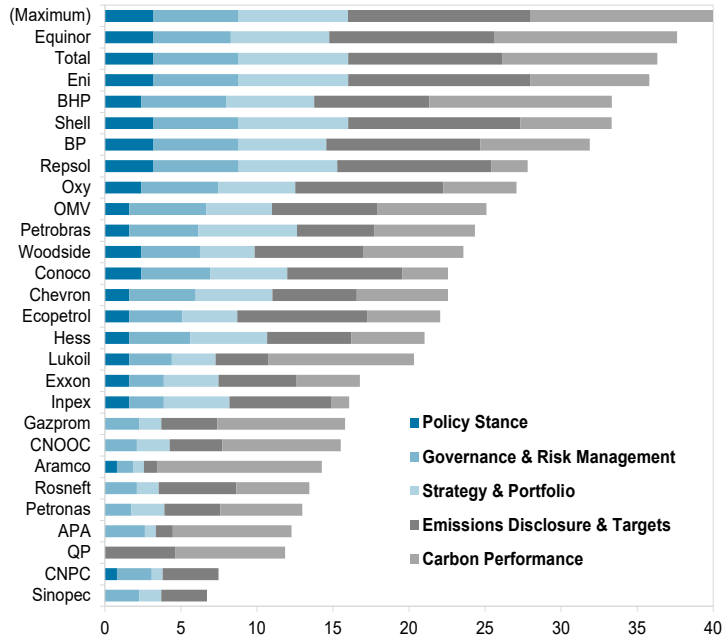
Some companies have made clear that they cannot reach net zero, or carbon neutrality, for their Scope 3 emissions alone or have only committed to net zero for certain regions in their portfolio. "Shell was the first to fully articulate the importance of working with buyers to achieve net zero. Total has set a net-zero Scope 3 target but only for Europe, similarly explaining that it has less control over other aspects of its portfolio," Conway explains. Total has also noted that policy action is less clear outside Europe, making it harder to set commitments.

Current investor trends suggest that all major traded companies will ultimately need to develop targets and strategies for Scope 3 emissions, even if they cannot commit to Scope 1, 2 and 3 carbon neutrality by themselves. US majors in particular will face this pressure. "Companies will likely need to cooperate with buyers and other relevant actors across the value chain to ensure that they all succeed," Conway says.

Top Performer Takeaways

Norway's Equinor leads the benchmark, which is updated on a semiannual basis by Energy Transition Research. The benchmark now includes updated methodology that raises the weighting of emissions and disclosure targets from 25% to 30% versus past installments. Equinor tops the list for several reasons. For one, it ranks highly on carbon performance, based on reported Scope 1 and 2 upstream emissions intensity reflecting very low emissions from its own operations. It also ranks highly on Energy Intelligence's proprietary estimates of life-cycle upstream emissions covering Scope 1, 2 and 3 emissions from its own production — with Scope 3 covering the end-use, customer-level emissions from that production. Equinor ranks fourth on engagement, which is broken down to cover policy stances, governance and risk management, strategy and portfolio, and emissions disclosure and targets. The wider oil industry can learn not only from Equinor but also other top scorers. For example, Eni and Shell rank first and second in the engagement category.

ESG CLIMATE RISK BENCHMARK



Weighted Scores, Maximum = 40 *Source: Energy Intelligence, Energy Transition Research*

The "key takeaway" from Equinor's leading position is that companies will be "increasingly judged by investors both by engagement and carbon performance," Conway says. Given that the ultimate objective is to decarbonize operations and product use, carbon performance metrics will rise in importance. More detailed and standardized reporting on emissions is needed, however, to help make better assessments of carbon performance across the oil and gas value chain. "As emissions measurement, disclosure and transparency improve, we expect there will be increased scrutiny of companies' performance in this area — and thus more pressure to act," Conway says.

The setting of emissions targets — part of the engagement category — has surged in recent years. But even more action is expected going forward. For example, net-zero targets generally are set for 2050 but investors are pressing companies to set intermediate targets — including absolute emissions reduction targets — by 2030-35. Such targets are considered critical for advancing on the trajectory needed to reach net zero by 2050. "So companies that have committed to net-zero targets by 2050 are under pressure to begin delivering today, not several years from now. And we expect more companies to set net-zero targets in 2021-22, including independents, US majors and some national oil companies [NOCs]," Conway says.

The influence of the approaching UN climate talks in Glasgow cannot be ignored. Because many countries are under pressure to ratchet up their climate pledges, that can have "direct implications" for the emissions targets of NOCs that tie their goals to overall country ambitions. Colombia's Ecopetrol is a "notable example," Conway says (NE Aug.5'21). The EU's Fit for 55 proposal and the climate elements of the US' infrastructure bill could similarly influence companies with operations in those jurisdictions.

Lauren Craft, Washington

POLICY

Indonesia Net-Zero Pathway Raises Eyebrows

Indonesia opened the door to setting a net-zero emissions target by recently presenting a long-term strategy to become carbon neutral by 2060. While this net-zero pathway is not a firm commitment to achieving carbon neutrality yet, it is a step in that direction for one of the largest polluting countries in the world.

But analysts are questioning the viability of the plan — which relies heavily on biofuels, carbon capture and storage (CCS), and natural carbon sinks.

Under its net-zero pathway, the populous Southeast Asian country will focus its decarbonization effort on its two most polluting sectors, namely the energy industry — which includes power generation, transport and commercial energy use — and the agriculture, forestry and other land-use sector.

Indonesia aims to see its greenhouse gas emissions peak in 2030 slightly below 1.5 million tons of carbon dioxide equivalent and then fall through to 2060. However, the consumption volumes of all fossil fuels but oil would increase until 2050. The pathway was recently submitted to the UN Framework Convention on Climate Change in a long-term strategy document that Indonesia plans to use to inform future short-term emission reduction plans. Two other scenarios were also presented in the long-term strategy document, but contrary to the low-carbon pathway, they were not compatible with the Paris Agreement.

As of today, Indonesia has only pledged to cut greenhouse gas emissions by 29% by 2030, or 41% if it can secure international assistance through technical cooperation, financing, capacity building, and the like.

Counting on Capture

Indonesia is counting on CCS to partly decarbonize its power generation sector since coal would still represent 38% of the country's power mix in the pathway document. To limit emissions, the plans envisage around 76% of coal plants will be equipped with CCS equipment by 2050. In turn, the share of renewable energy will reach 43% by midcentury, encompassing hydro, geothermal, solar, wind, biofuels and biomass.

Indonesia's reliance on CCS is risky, analysts say, as it would require significant investments in a technology that is not proven at this scale. Exploring electricity generation technologies beyond coal, such as geothermal energy, and planning for a coal phase-out are more suitable strategies to reduce emissions from the power sector, argues NewClimate Institute analyst Leonardo Nascimento.

It could also be uneconomical to use CCS on Indonesia's existing coal power plants, says the Jakarta-based Institute for Essential Services Reform (IESR), which recently released a study showing that Indonesia could phase out coal by 2040 and reach net-zero emissions by 2050. The use of CCS would increase the cost of electricity generation and put it higher compared to most renewables, the institute says. In its calculation, the institute used a carbon price of $60-$100-ton CO2e, which would increase electricity prices from 6¢/kWh to 10-12¢/kWh.

"Considering the declining trend of renewable energy and battery storage is ongoing, we think renewable energy — solar and wind combined with storage — is a more obvious choice, providing better certainties for investment return and cheaper than the use of fossil fuel with CCS alternative in the medium to long term," the IESR says.

Betting on Biofuels

Indonesia plans to use electrification and biofuels to decarbonize its transport sector. Biofuels are expected to account for 46% of the energy mix in the transport sector by 2050, followed by electricity (30%), oil fuels (20%) and natural gas (4%) (NE Feb.25'21). Biofuels have already been used for more than 10 years in Indonesia where B30 — a 30% biodiesel blend — was rolled out in 2019. Indonesia also aims to introduce B40 (40% biodiesel) in the coming years and B100 — made entirely from palm oil — in 2026.

But Indonesia's ambitious biofuels program, which relies heavily on subsidies, is struggling. Earlier this year, the Oil Palm Plantation Fund Management Agency — which supports producers by covering the price difference between biodiesel and diesel — was in a perilous situation of near-empty coffers (NE Jan.7'21). Biofuels are also not emissions-free, and their sustainability has not been fully addressed yet. Only a third of Indonesia's palm oil plantation area was certified by the Ministry of Agriculture as sustainable in 2020.

Given these issues, the IESR recommends electrification to be prioritized to reach 50% of transportation energy demand in 2050 while biofuels would only meet 15%. "The remaining could come from renewable hydrogen and synthetic fuels. These are potential and important energy carriers that have not been considered yet in the long-term strategy. According to our model, we will need to start using these fuels by 2030 as the biofuel production gets limited by land availability," the IESR says.

Forestry

Indonesia intends to turn the agriculture, forestry, and other land-use sector — its highest polluting segment — into a net-sink after 2030, which means it would absorb more carbon than it releases. This would happen by reducing deforestation and peatland fire, and pursuing reforestation, afforestation and forest conservation. The low-carbon pathway requires future deforestation to be limited to 6.8 million hectares by 2050 for the agriculture, forestry and other land-use sector to become a net sink. Under current policies, deforestation is expected to reach 14.6 million hectares by mid-century.

"Relying on emissions sinks to reduce overall emissions is an uncertain strategy," argues Nascimento. Land-use emissions fluctuate a lot due to forest fires or higher-than-usual deforestation. In addition, emissions sinks are not permanent and are a finite resource due to the land constraints needed for expanding forestry, which also has other socioeconomic implications. These trends cast doubt on the feasibility of the most ambitious scenarios presented in Indonesia's long-term strategy, he says.

Marc Roussot, Singapore

IN BRIEF

Hyundai Big on Hydrogen

Hyundai Motor has announced a goal to equip all its commercial vehicle models with hydrogen fuel-cell systems by 2028, making the South Korean automaker the first to officially pursue such plans. By 2030, it hopes to achieve a fuel-cell vehicle price point comparable to that of a battery-electric vehicle, the company said this week. Such goals are part of Hyundai's Hydrogen Vision 2040, which envisages the clean-burning fuel being applied to not just transportation but also to "wider areas of industries and sectors."

To pave the way for hydrogen popularization, Hyundai says it plans to introduce — in 2023 — next-generation fuel-cell systems of 100 kW and 200 kW that would be over 50% cheaper. The company says these systems would offer double the power output and be up to 30% smaller than those in the range of its NEXO fuel-cell SUV model (NE May9'19).

China Carbon Prices Slump

Prices on China's seven-week-old carbon market have slumped to a low this week, contrasting with the rising trend in the New Zealand emissions trading scheme (ETS). The Chinese ETS closed Tuesday at 43.90 yuan/ton ($6.80) — the lowest since its Jul. 18 launch and 14% down from the launch day close of 51.23 yuan. Trading volumes, at 2,000 tons on Sep. 7, were also sharply down from the launch day level of 4.1 million tons.

The Chinese ETS sluggishness con-trasts with a bull run on the New Zealand market, which hit new highs of above NZ$60 ($42.60) this week after a May 31 Climate Change Commission report recommended a tightening in emissions limits. Wellington also recently revised up the 2022 carbon price cap from NZ$51/ton to NZ$70 ($48.60) (NE Jul.22'21; NE Aug.26'21).

Reliance: H2 Costs to Fall

India should be able to lower the cost of green hydrogen to $1/kg in a decade from current levels of around $5/kg, the chairman of Indian conglomerate Reliance Industries, Mukesh Ambani, said on Friday (IOD Jun.24'21).

"Efforts are on globally to make green hydrogen the most affordable fuel by bringing down its cost to initially under $2/kg," Ambani told the International Climate Summit. "India can set an even more aggressive target of achieving $1/kg within a decade," he added.

Ambani is seeking to raise India's renewable power generation capacity 450 GW by 2030 from 100 GW today. Reliance — whose businesses include refining and petrochemicals — has set itself a goal of having 100 GW of solar power capacity by 2030.

Prime Minister Narendra Modi wants to make India a major hub for production of green hydrogen, which is made by extracting hydrogen from water through electrolysis using renewable power. But analysts say the cost of green hydrogen needs to fall below $1/kg to make it competitive with hydrogen made from fossil fuels.

Coal India to Replace Diesel

India's state-owned miner Coal India is seeking to replace diesel with LNG in its dump trucks, used to transport coal from mines, to reduce its carbon footprint. The giant coal miner uses over 400 million liters of diesel per year, about three-fourths of which is consumed by its dump truck fleet, at a cost of 35 billion rupees ($480 million).

India seeks to mirror China by using LNG in long-haul trucks and mining equipment to cut carbon footprints and boost the use of gas in the energy mix. Based on the outcome of the pilot project, Coal India will decide on bulk use of LNG in heavy earth moving machines.

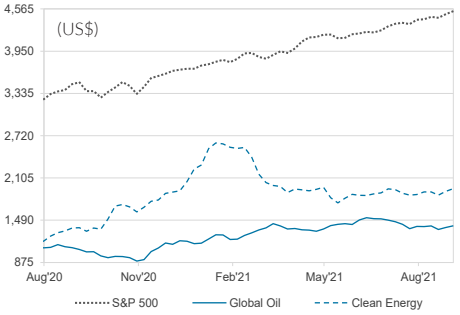
BP Carbon-Neutral LNG

BP has delivered a "carbon offset" LNG cargo to CPC at a terminal in southern Taiwan, marking the company's first such delivery in Asia. The UK major said it has measured the greenhouse emissions from wellhead to discharge terminal with its own quantification methodology. BP said its methodology has taken into account relevant international standards and incorporated input from third-party experts. Carbon credits for the cargo will be sourced from BP's trading portfolio.

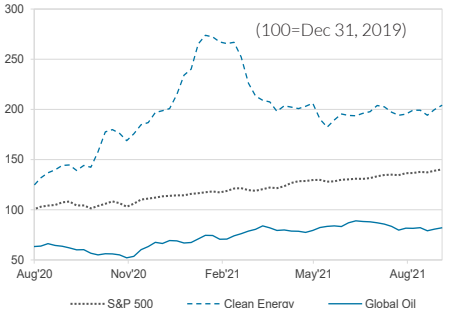
The CPC cargo follows BP's delivery of a "carbon offset" cargo to Sempra's Energia Costa Azul terminal in Mexico in July (LNGI Jul.16'21). More LNG suppliers and buyers have been jumping on the carbon-neutral LNG bandwagon as in their effort to decarbonize their gas assets and get to net-zero by 2050. CPC is not new to purchases of carbon-neutral LNG. It recently bought a carbon-neutral cargo from Eni and two from Royal Dutch Shell last year.

CLEAN ENERGY EQUITY MARKETS

Equity Index Values



Equity Class Performance



Source: Standard & Poor's

EI NEW ENERGY DATA

ENERGY FUTURES: REFERENCE PRICES

	Sep 7	Aug 31	Chg.
Carbon (€/ton)			
ECX EUA	61.95	60.72	+1.23
CME GEO ($/offset)	7.61	7.16	+0.45
Crude Oil ($/bbl)			
Nymex light, sweet	68.35	68.50	-0.15
ICE Brent	71.69	71.63	+0.06
Natural Gas ($/MMBtu)			
Nymex Henry Hub	4.57	4.38	+0.19
ICE UK NBP	18.48	17.57	+0.92
Coal ($/ton)			
McCloskey CSX	64.00	64.00	0.00
ICE Rotterdam	168.20	153.75	+14.45

All prices are 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

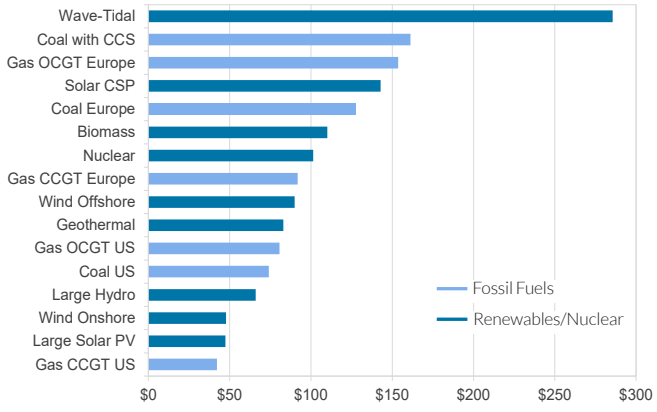
GLOBAL ELECTRICITY PRICES

	Sep 3	Aug 27	Chg.
Europe ($/MWh)			
Germany (EEX)	136.97	114.85	+22.12
France (Powernext)	132.19	109.38	+22.81
Scandinavia (Nordpool)	91.79	87.09	+4.71
UK (APX)	189.54	153.04	+36.50
Italy (GME)	159.72	136.50	+23.22
Spain (Omel)	159.49	137.63	+21.86
North America			
New England	39.25	75.15	-35.90
Texas (Ercot)	42.59	33.54	+9.05
US Mid-Atlantic (PJM West)	36.98	52.90	-15.92
US Southwest (Palo Verde)	54.78	67.99	-13.21
Canada (Ontario)	27.43	43.58	-16.15
Other			
Australia (NSW)	34.63	52.92	-18.29
Brazil (SE-CW)	112.75	111.05	+1.71
India (IEX)	53.44	100.54	-47.09
Japan (JPEX)	78.40	76.47	+1.93
Russia (ATS)	21.28	22.20	-0.93
Singapore (USEP)	114.91	79.60	+35.31

Weekly average of wholesale prices. Source: Exchanges

NEWBUILD POWER GENERATION COSTS

($/MWh)



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 (Jan-Jul 2021)	1,478,000
Total LDV sales (Jan-Jul 2021)	14,756,000
% LDV sales NEVs Jan-Jul	**10.02%**
NEV sales (Jul '21)	271,000
Total LDV sales (Jul '21)	1,864,000
% LDV sales NEVs Jul '21	**14.54%**
NEV fleet penetration	
Updated through Q2 '21	
NEV fleet (as of Jun 2021)	6,030,000
% fleet NEVs (as of Jun 2021)	**2.06%**
NEV fleet (as of end 2020)	4,920,000
% fleet NEVs (as of end 2020)	**1.75%**
Europe	
EV registration penetration	
EV registrations Q2 '21	574,565
% LDV sales NEVs	15.90%
EV fleet penetration	
Updated through Q4 2019	
EV fleet	1,417,355
% fleet NEVs	**0.50%**

US	
EV sales penetration	
EV sales (Jul '21)	52,114
% LDV sales NEVs	**4.04%**
Annual EV sales ('20)	297,939
Annual % LDV sales EVs	**2.06%**
EV fleet penetration	
Updated through Jan '21	
EV fleet	1,769,953
% LDV fleet NEVs	**0.57%**

NEVs = New Energy Vehicles. EVs = plug-in hybrids and full battery-electrics. LDVs = light-duty vehicles including cars, SUVs, vans and light pick-ups. *Sources for sales and fleet figures: China Association of Automobile Manufacturers, China Passenger Car Association, US Alliance for Automotive Innovation, US Energy Information Administration, European Automobile Manufacturers Association*

GLOBAL CARBON PRICES

	Sep 7	Aug 31	Chg.
Europe (€/ton)			
EUA Dec '21	61.99	60.76	+1.23
US ($/ton)			
CCA (Calif.) Dec '21	24.82	25.02	-0.20
RGGI (Northeast) Dec '21*	9.15	9.09	+0.06
New Zealand (NZ$/ton)			
NZU (spot)	65.25	59.00	+6.25
Asia ($/ton)	**Sep 3**	**Aug 27**	**Chg.**
China (National)	6.92	6.97	-0.05
South Korea	24.26	24.28	-0.03

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

EU CARBON FUTURES PRICES

(€/ton)

ECX front-month futures. *Source: ICE*