

The Arab Gulf States
Institute in Washington
Building bridges of understanding



Gulf Countries Gear Up for a Net-Zero World
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About Petro Diplomacy

Now in its seventh year, AGSIW's Petro Diplomacy conference is a signature annual event that brings together stakeholders in the energy sector of the Gulf Arab states, global supply competitors in North America, analysts, and policymakers to discuss how changes in technology, fiscal priorities, and opportunities for growth continue to alter the relationship between politics and energy for both the region and the world.

About the Author

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Executive Summary

There has been a tectonic shift in the structure of the energy market and a realignment of the goals and business models of key stakeholders that dominate the oil and gas industry with huge implications for the petroleum producers of the Middle East. Measures to redesign the global economy that has for decades been sustained by hydrocarbons were in motion before the 2020 onset of the coronavirus pandemic, but the devastating health crisis and its economic impact prompted governments around the world to accelerate their environmental agendas with green recovery packages. More than 50 countries have announced their intention to transform their energy systems to reach net-zero emission targets by 2050 or 2060. Energy transitions are by their nature disruptive, but the pandemic has introduced a risk factor that might play out for years to come.

Introduction

The dramatic drop in energy demand and the price volatility that followed the first wave of the coronavirus pandemic is slowly reversing course. The global economy is on the mend as the rapid development of vaccines has allowed life to return to some semblance of normality in many, but not all, countries. Energy demand is picking up gradually, and most forecasts expect a return to pre-pandemic levels sometime in 2022. But some of the trends that have taken hold during the pandemic may be irreversible and will determine the course of energy demand growth further afield and have implications for the economies of the Middle Eastern oil producers.

The energy industry, which suffered sharp losses as a result of historic low prices for oil and gas in early 2020, responded by cutting capital spending and delaying or canceling carbon-intensive projects. Because of the long lead times needed to develop new oil and gas projects, this decline in investment will have a ripple effect and may lead to constrained supplies in the years ahead. At the same time, oil and gas companies are coming under increasing pressure from shareholders and climate activists to reduce carbon emissions from oil and gas production and adopt net-zero models. The majority have already incorporated renewable energy into their portfolios and pledged to become net-zero businesses by 2050, but some say the goals are unattainable because alternative energy sources are not yet available in sufficient volumes to fill the gap.

Developing fossil fuels is becoming more expensive as projects will need to comply with environmental, social, and governance standards to satisfy potential investors. This raises capital costs for oil and gas producers as well as higher carbon taxes that are now being considered by governments of industrialized countries.

This, argue oil industry executives, could make for a messy transition while ignoring the estimated 800 million people, mostly in sub-Saharan Africa, who lack access to basic energy.

The sharp decline in upstream oil and gas investments during the last oil price crash of 2014-15 was a preview of what might lie ahead for the industry, and there are signs that some producers are struggling to produce higher volumes of oil and gas as a result. The pandemic and environmental pressures forced a further cut to investments in new hydrocarbon

projects in 2020, and, given that it takes five to six years for new projects to go from concept to completion, the result could be a much tighter supply and demand balance before the end of the decade. The February Texas electricity blackouts during an unusual cold snap and the gas shortage in Europe in late September have been held up as examples of the disruptions that may occur when there are no safeguards built into energy systems to manage unforeseen events whether man-made or weather related.

Fossil fuels, which include crude oil, natural gas, and coal, still make up 80% of primary energy consumption today, a level that has remained constant in the past decade. Any disruption to oil supply in a tighter market has consequences and leads to more price volatility. U.S. oil prices surged to their highest level since 2014 in early October as hurricane activity in the United States' Gulf of Mexico cut production and damaged oil installations.¹

Although the 23 countries that make up the OPEC+ alliance of oil producers are in the process of gradually increasing supply after the dramatic production cut in 2020, when the group withdrew 9.7 million barrels per day of crude from markets, some producers were unable to meet their higher quotas because they had not invested enough in maintaining or raising their production capacity during the lean years. That left the market short and reinforced the reality of an energy system that is stretched too thin despite the growing share of renewable energy. Natural gas prices also set records as a combination of production outages, accidents, and lack of sufficient storage capacity pushed the price of liquefied natural gas sold on the spot market to record levels amid warnings that Europe might face a harsh winter of shortages.²

Fossil fuels, which include crude oil, natural gas, and coal, still make up 80% of primary energy consumption today, a level that has remained constant in the past decade.

Renewable energy sources, like wind and solar power, have a key role to play decarbonizing the global electricity sector, but electricity generated from solar and wind still makes up only 10% of the global electricity mix. It will take time and massive investments to build up. That is why many of the major international energy giants that have pledged to become carbon-neutral businesses see a continuing role for natural gas as a reliable transition fuel to maintain the integrity of electricity grids.

The transportation sector is another difficult area to decarbonize given that the majority of light and heavy vehicles on the roads are internal combustion engines that run on gasoline and will not be scrapped overnight. Heavy industry requires fuels with higher energy density to function and cannot run on solar or wind power.

Hydrogen, particularly green hydrogen produced from renewables and blue hydrogen produced from natural gas, offers a solution but is years away from becoming a global commodity. Hydrogen will need to be produced at scale and at far lower cost if it is to provide reliable and affordable energy, assuming that it can be transported safely. The Middle Eastern countries have the advantage of access to cheap feedstock and immense solar and wind

¹ Sabrina Valle and Apran Varghese, "U.S. Oil Losses From Hurricane Ida Rank Among Worst in 16 years," *Reuters*, September 8, 2021.

² Scott Disavino, "U.S. Natgas Volatility Jumps to a Record as Prices Soar Worldwide," *Reuters*, October 7, 2021.

potential that can be deployed to develop hydrogen economies. Saudi Arabia and the United Arab Emirates have taken the lead in diversifying their energy sources in expectation of the inevitable peak in oil demand sometime in the next decade or two and are investing heavily in hydrogen projects, both green and blue.³

For the Middle Eastern oil producers, all indications are that oil demand will peak sooner rather than later, though forecasts by energy companies and international organizations have different timelines for when this will come. A May International Energy Agency report delivered a shock to the industry when it presented its pathway to attaining the goal of net-zero energy systems by 2050.⁴ If the world is to have any hope of attaining that target, according to the report, there would be no need for new investments in new oil and gas projects and coal would have to be eliminated.

French energy giant TotalEnergies recently forecast oil demand reaching a plateau by 2030 and declining thereafter.⁵ OPEC, in its 2021 World Oil Outlook that projects out to 2045, expects continued growth in demand for crude oil to 2035 followed by flat growth to 2045.⁶ In all long-term projections, there are always variations that could tilt the balance one way or another. Should policy measures supporting faster fuel substitution and more efficiency measures be implemented, oil demand could fall below the business-as-usual scenario presented by OPEC. However, there is a downside risk to supplies should the necessary investments fall short. With

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the international oil companies rebranding and reinventing themselves as broad energy suppliers and divesting from carbon-intensive projects, it will be up to the national oil companies, in particular the low-cost producers of the Middle East, to step up even at the risk of investing in what might turn out to be stranded assets. But a premature switch away from fossil fuels carries the risk of sharply higher prices across the energy spectrum and might lead to a backlash from consumers in the event of a costly and messy transition.

By comparing just these three reports, the disparity on the demand side is huge, ranging from OPEC's forecast of 108.2 mb/d by 2045 to 60 mb/d or even 40 mb/d in the two scenarios presented by TotalEnergies to 2050. For the IEA, a net-zero outcome has oil demand falling to just over one-quarter of 2019 demand of around 100 mb/d. Michael Cohen, chief U.S. economist for BP, said in a recent webinar that oil demand had already peaked in more than 50 countries and argued that global oil demand would peak this decade.⁷ BP has previously said that demand had likely peaked in 2019.⁸ That is the range of uncertainty that the industry

³ Jamie Ingram and Aydin Calik, "Mena Players Look to Tap Into Hydrogen Buzz," *MEES*, October 1, 2021.

⁴ International Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector* (Paris: IEA, 2021).

⁵ TotalEnergies, *Energy Outlook* (Paris: TotalEnergies, September 2021).

⁶ OPEC, *2021 World Oil Outlook 2045* (Vienna: OPEC, 2021).

⁷ Michael Cohen, Robert McNally, and Marianne Kah, "Debating the Future of Oil," Bain & Company webinar, September 22, 2021, 52:55.

⁸ BP, *Energy Outlook 2020 edition* (London: BP, 2020).

and particularly the Middle Eastern national oil companies will have to factor in to their future investment plans as they navigate a transition away from what has been their core business of producing oil and gas. At the same time, they need to generate revenue for their respective state owners and energy for their domestic market. Weaning petrostates off oil export revenue is a process that cannot be achieved overnight, and neither will the transition away from fossil fuels.

The major challenge is how to achieve carbon neutrality while avoiding shocks to the system and balancing the needs of an energy complex that has long been fed on a diet of fossil fuels. The industry needs to produce more energy while at the same time reducing greenhouse gas emissions and meeting the aspirations of developing countries and eradicating energy poverty in the process. It is a tall order that will require trillions of dollars in financing and a reality check before hasty policies are put in place that could widen the gap between rich and poor.

The industrialized countries grew wealthy thanks to decades of unfettered use of oil, gas, and coal. The developing countries will have to find ways to achieve economic growth with restrictions on their carbon emissions even as they account for the highest percentage of energy demand growth. How to manage an equitable transition will be a priority for the signatories to the 2015 Paris Climate Agreement as they gather in Glasgow, Scotland in November for the 26th United Nations Climate Change Conference, COP26. Without a global effort and the transfer of modern technology and financial assistance from the developed to the developing countries, the transition will be uneven and inequitable.

The energy companies, formerly known as oil and gas majors, and the big national oil companies, like Saudi Aramco, the Abu Dhabi National Oil Company, and the Kuwait Petroleum Corporation, have the capacity to develop megaprojects and access to the latest technologies, some of which they are developing themselves. The Middle Eastern producers also have some of the lowest carbon-intensive oil and gas assets that, combined with carbon capture and storage and an evolving circular carbon economy model, can be enablers of the energy transition.

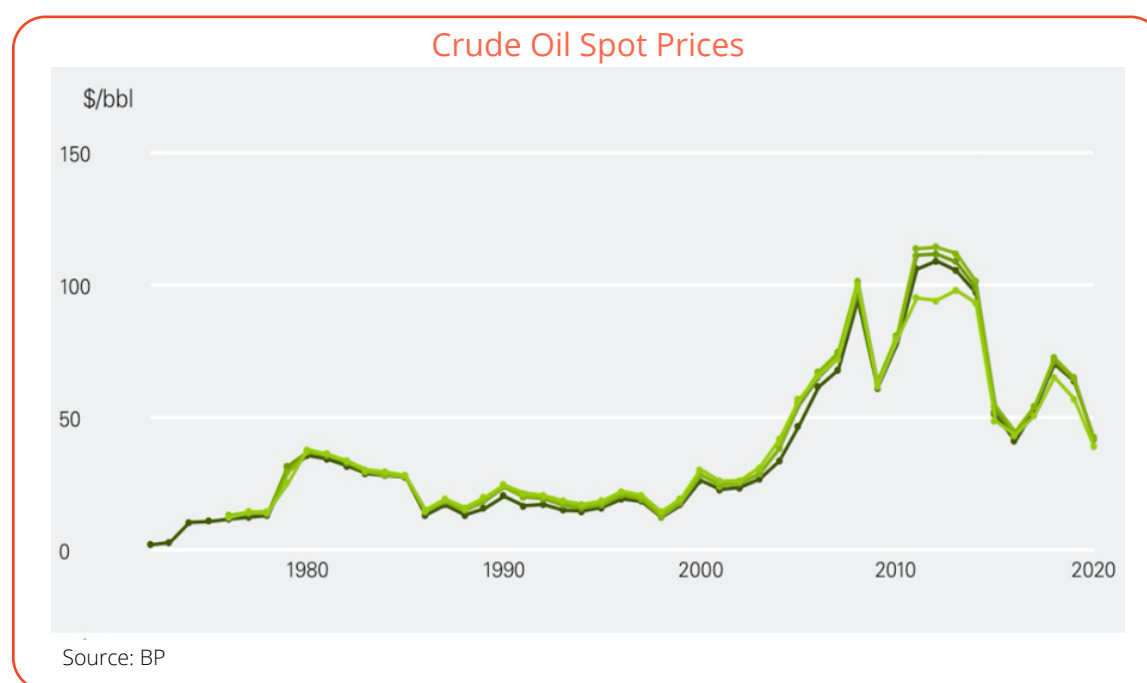
As Secretary General Mohammad Senusi Barkindo put it in presenting OPEC's 2021 outlook, the energy transition "should not be about picking one energy over another. It needs to be driven by science, industry facts, and hard data."⁹

National Oil Companies Versus International Oil Companies: Changing Dynamics as Net-Zero Ambitions Multiply

The world's national oil companies, many of which are concentrated in the Middle East and North Africa, are either wholly or majority owned by the states in which they operate. Their primary role is to produce oil and gas and provide revenue to their respective governments and energy to the domestic market, often at subsidized prices. While the national oil companies

⁹ OPEC, "Launch of the 2021 World Oil Outlook: Opening Remarks by OPEC Secretary General," OPEC video conference, September 28, 2021, 22:47.

may not face the same type of pressure as the international oil companies to reduce their carbon footprint, they are having to adapt to an increasingly carbon-constrained world, one in which they will have to compete for a share of a much smaller oil and gas market as the transition gathers pace in the years ahead. The national oil companies represent around half of the world's oil and gas production, but the power they wield is likely to erode as the climate agenda gains traction. They will have to find a way to slot into a new energy landscape that is still evolving and that cannot be achieved without a radical readjustment of their corporate structures and a reallocation of capital. National oil companies have roughly the same architecture that incorporates upstream, midstream, and downstream businesses, but they are not all equal.



Saudi Aramco, which in 2019 became the world's most profitable company after a partial privatization, has both financial muscle and access to the world's second-largest crude oil reserves that can be developed at low cost and relatively low-carbon intensity per barrel. The UAE's Abu Dhabi National Oil Company is another stellar performer that has adopted a business model with a more diversified portfolio of assets both at home and abroad. Aramco and ADNOC in recent years have been monetizing their noncore assets while investing in alternative energy sources like hydrogen and solar. Although Kuwait Petroleum Corporation suffers constraints on its growth from internal political wrangling, it too is likely to survive the transition. Valerie Marcel of Chatham House, an expert on national oil companies, said that some national oil companies will lose their political power and become irrelevant as the value of the oil and gas they export falls. "The NOCs were the dominant players in the last 20 years, and now we will see a bit of a decline," she said in a recent interview on the sustainability of national oil companies.¹⁰

¹⁰ Economic and Corporate Governance Center, "EP32: What Role Does Governance Play in the Sustainability of National Oil Companies? Valerie Marcel," YouTube video, September 20, 2021, 31:42.

Aramco, ADNOC, and Qatar Petroleum have low-cost assets and are working hard to reduce emissions. Marcel suggested they will have a market for some time. Qatar Petroleum, a key global gas producer and leading exporter of liquefied natural gas, has taken control of some of its assets after ending long-term partnerships with foreign oil majors. It too is working to reduce emissions from its gas production and liquefaction plants in response to pressure on the industry to tackle methane emissions and is therefore well positioned for growth.

A February briefing by the Natural Resource Governance Institute categorized national oil companies in the Middle East and North Africa in terms of organizational maturity and market power. Aramco, ADNOC, and Qatar Petroleum were classified as mature global leaders that are partially or wholly integrated with solid organizational structures and global networks. Kuwait Petroleum Corporation and Sonatrach of Algeria were listed as established mid-tier producers with moderate financial strength and pockets of strong competence, but they need partnering to fill the gaps.¹¹

Aramco, ADNOC, and Qatar Petroleum have low-cost assets and are working hard to reduce emissions.

National oil companies burdened by high production costs, domestic political instability, and cash flow constraints, as is the case with Venezuela's PDVSA, may be casualties of the transition. Ben Cahill, senior fellow at the Center for Strategic and International Studies, posited in July that the shift away from fossil fuels poses an existential challenge to the national oil companies, some of which may become obsolete: "Given their outsized role in global oil and gas production, the evolution of NOCs has important implications for future supply, climate outcomes and the economic and fiscal health of oil-producing countries."¹² Among the national oil companies that may struggle to meet the challenges of the transition are the traditional operators like Algeria's Sonatrach, Mexico's PEMEX, Indonesia's Pertamina, Angola's Sonangol, and the Nigerian National Petroleum Corporation. "These companies may benefit if the oil and gas industry underinvests in exploration and production in the coming years," Cahill suggested. "But ultimately, the energy transition presents serious risks to their competitiveness or even their survival. As their resource base becomes less competitive and important technical and financial partners exit, these NOCs will be left exposed."

What the national oil companies all have in common, he added, is that they are "instruments of the state." That makes for complicated governance in that they are beholden to the state and need to put the demands of their governments ahead of minority shareholders.

This has not prevented Iraq from reviving plans to establish a national oil company, which it finally got off the ground in September after years of wrangling with lawmakers. Several years after it was first proposed, the Iraq National Oil Company has been set up to oversee day-to-day oil and gas operations in Iraq in place of the Ministry of Oil. Iraq relies almost exclusively on oil exports to finance its budget, but its ability to run an efficient energy sector has been stymied by government bureaucracy. Projects have been delayed due to a lengthy approval process, and a number of international oil majors have left the country because

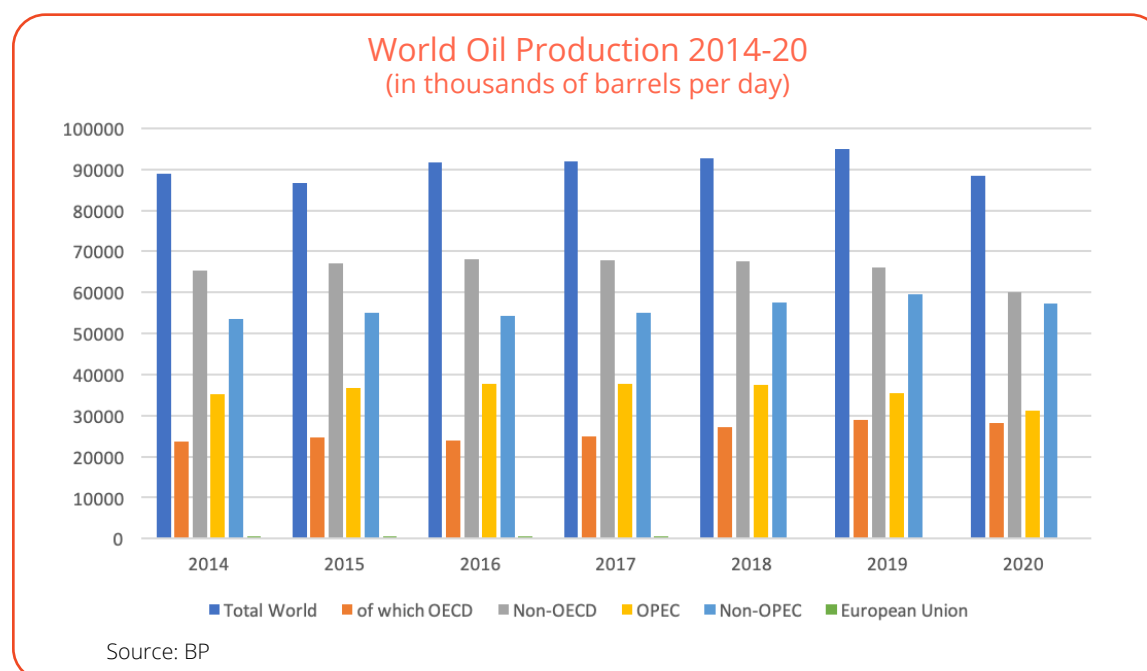
¹¹ Laurie Haytayan, Patrick R.P. Heller, David Manley, and Ben Potter, "National Oil Companies and Energy Transition in the Middle East and North Africa," *Natural Resource Governance Institute*, February 2021.

¹² Ben Cahill, "Pathways for National Oil Companies in the Energy Transition," *Center for Strategic and International Studies*, July 15, 2021.

of poor financial returns and an unfavorable working environment. Iraq's regional state oil companies will fall under the remit of INOC, which will likely have to take over operations of projects previously operated by foreign contractors. It isn't clear how much independence INOC will have and whether it will manage to thrive in a low-carbon environment. It may be that it joined the club of national oil companies a bit too late in the game at a time when its more established rivals in the region have set transition plans in motion.¹³

The fate of national oil companies and their future role in a restructured energy system will be determined by their ability to adapt to a new energy ecosystem. Some national oil companies, like Aramco, Qatar Petroleum, and ADNOC, with access to significant low-cost resources, may be able to self-finance even in a lower oil price environment. But the prospect of higher carbon taxes would affect their profitability and, by extension, the revenue of their respective governments.

According to the National Resource Governance Institute, governments in the Middle East and North Africa "need to reexamine the fiscal relationships between NOCs and the state, as long-held expectations about available fiscal transfers (of taxes, dividends and other payments by NOCs to their governments) may prove untenable."¹⁴ Governments also need to "examine public expenditure patterns, which may necessitate frank discussions about the prevailing social contract between citizen and state that has historically been underwritten by hydrocarbon revenues," it added. Aramco, for example, had to resort to borrowing in 2020 to meet its dividend obligations, the majority owed to the state, when it failed to generate enough cash flow after oil prices collapsed.



¹³ Lizzie Porter and Ben van Heuvelen, "INOC Launches, Aiming to Restructure Iraq's Oil Sector," *Iraq Oil Report*, September 4, 2021.

¹⁴ Laurie Haytayan, Patrick R.P. Heller, David Manley, and Ben Potter, "National Oil Companies and Energy Transition in the Middle East and North Africa," *National Resource Governance Institute*, February 2021.

Over recent years, Middle Eastern national oil companies have directed investments more into developing natural gas, where demand growth is forecast to be higher than for oil in coming decades, and integrated refining and petrochemicals. The petrochemical sector is set to be among the main drivers of oil demand growth as indicated in nearly all forward-looking scenarios. It is unlikely that alternative sources of energy will match earnings from oil and gas sales. Some national oil companies, like ADNOC, see the writing on the wall and are racing to ramp up production capacity to take advantage of the window of opportunity to grab market share before the decline. Aramco, which also has plans to increase oil production capacity by 1 mb/d by 2027, has put more faith in its analysis of markets and expects oil to remain a dominant fuel in a market where it enjoys a significant lead. At the same time, it has also diversified into solar energy and hydrogen production as part of its clean fuel strategy, but its new businesses will take years to mature and generate revenue to make up for any loss of income from oil sales. As things stand, Aramco has allocated 70% to 75% of its planned capital expenditure of \$35 billion in 2021 to upstream projects.¹⁵

Some national oil companies, like ADNOC, see the writing on the wall and are racing to ramp up production capacity to take advantage of the window of opportunity to grab market share before the decline.

Yet, while the Gulf national oil companies are still investing heavily in upstream oil and gas, some of which is necessary to replace natural decline from producing fields, capital has been moving out of the broader hydrocarbon business. All but a few major energy companies are cutting their exposure to carbon-intensive projects through divestments and a reallocation of funds into cleaner energy sources and technologies as part of a commitment to become net-zero businesses by 2050 and as part of a long-term hedging strategy to reduce risk on capital investment.

Some analysts fear that the switch away from hydrocarbons may come before energy systems have enough built-in resilience to cope, while others argue that shunning oil and gas companies is not a solution to the climate crisis without also tackling demand.

Jason Bordoff, founding director of Columbia University's Center on Global Energy Policy, argued that forcing the international oil companies from the picture may not necessarily speed up climate progress unless demand also falls. He wrote that, while climate activists had succeeded in forcing the hand of the oil majors, like ExxonMobil, Chevron, and Shell, to reduce their carbon footprint, there is no guarantee that this would translate into a "victory in the battle against climate change." He added that, "In a global oil market where supplies are freely traded and the big Western oil firms control only a small share of output, reducing these companies' production alone won't be enough. Without simultaneously reducing the demand for oil, it could create heightened economic, political, and geopolitical risks while failing to have as big an impact on emissions as necessary."¹⁶

The national oil companies do not face the same type of pressure from environmental activists and are positioning themselves to fill any supply gap that may emerge with the retreat of the foreign majors from the oil and gas business. That, said ADNOC Chief Executive Officer Sultan

¹⁵ Jamie Ingram, "Aramco Targets 13mn b/d Output Capacity By 2027," *MEES*, October 8, 2021.

¹⁶ Jason Bordoff, "Why Shaking Up Big Oil Could Be a Pyrrhic Victory," *Columbia, SIPA Center on Global Energy Policy*, June 3, 2021.

Ahmed Al Jaber, is an opportunity for his company. “We see the writing on the wall and see opportunity from decisions being taken from other companies,” Jaber told *Financial Times* in a January interview.¹⁷

Saudi Minister of Energy Prince Abdulaziz bin Salman is also confident that the kingdom and Aramco will retain leadership roles in the transition as suppliers of all forms of energy. “We are low cost in producing oil, low cost in producing gas, low cost in producing renewables, and will definitely be the least-cost producer of hydrogen,” he said in June. He continued, “I urge the world to accept this as a reality. We are going to be winners.”¹⁸

The Role of Gas and Renewable Power Generation in a Carbon-Constrained World

The race to net zero has begun and more than 50 countries have announced their ambitions to transform into net-zero carbon economies by 2050 or, in China’s case, 2060. The transition away from polluting fossil fuels had been in progress before the coronavirus pandemic struck and delivered a shock to the energy system. Demand for oil and gas sank to levels not seen since World War II as lockdowns forced a large proportion of the global population to reduce their travel and activities and work from home. The impact on oil and gas prices was immediate with oil prices in the United States plunging into negative territory for the first time and gas prices also hitting record lows in 2020, taking energy company profits down with them. The oil and gas majors had to write off \$69 billion worth of assets and tighten their belts, which resulted in an estimated 30% decline in overall upstream investments in 2020. All this will have far-reaching consequences for supply side dynamics, particularly for natural gas.¹⁹

The IEA, in its April 2021 *Global Energy Review*, addressed the effects of the gradual recovery from the coronavirus pandemic on energy demand and carbon dioxide emissions.²⁰ It forecast energy demand would rebound in 2021, increasing by a projected 4.6% after contracting by 4% in 2020. But while oil demand will remain subdued at levels below 2019 levels, natural gas demand is set to grow by 3.2%, driven by demand from Asia, the Middle East, and Russia. But three-quarters of this demand will go to industry and the buildings sector, while gas for electricity generation will remain below 2019 levels, according to the report.²¹

The IEA singled out renewable energy sources, including solar and wind power, as “the success story of the Covid-19 era.” Demand for renewable energy grew by 3% in 2020 and is set for a further rise in 2021 with demand from the power sector set to rise by more than 8%, which it said was “the largest year-on-year growth on record in absolute terms.” China will account for roughly half of the demand for renewables, followed by the United States, the European Union, and India.²²

¹⁷ Anjali Raval and Simeon Kerr, “Adnoc Defies Retreat From Oil With Push to Pump Up Output,” *Financial Times*, January 17, 2021.

¹⁸ Jamie Ingram, “Saudi Arabia: ‘We Are Going to Be Winners,’” *MEES*, June 4, 2021.

¹⁹ James Cockayne, “Majors Write Off \$69bn in Year to Forget,” *MEES*, January 8, 2021.

²⁰ IEA, *Global Energy Review 2021* (Paris: IEA, April 2021).

²¹ Ibid.

²² Ibid.

The report was issued before Europe and Asia experienced an energy crisis, with gas prices on the spot market soaring to record levels in September. Coal and electricity prices also shot up due to a combination of factors that are not directly related to the switch to renewable energy for power generation but offer a preview of the havoc that can be expected if there is an imbalance between supply and demand. In early 2021, LNG prices in Asia also surged as a constellation of planned and unplanned outages coincided with strong demand from Japan, China, and Korea.

At the end of September, natural gas prices in Europe traded at \$26 per million British thermal units, which is equivalent to \$150 per barrel in oil terms, a contra-seasonal increase since gas prices are normally higher in the winter, said Anne-Sophie Corbeau of the Columbia Center on Global Energy Policy. This was due to low European inventories because the slump in demand in 2020 meant gas supplies were restricted and have not caught up with the demand recovery after a cold winter season. Delayed maintenance at gas plants also played a part as did strong demand from Asia, which drew LNG cargoes away from Europe. Russia, the biggest supplier of pipeline gas to Europe, kept exports at contractual levels and did not supply additional volumes, partly because it too had to replenish its own inventories, as required by law, and carry out delayed maintenance.

European gas demand was recovering at a time when other energy sources like wind and nuclear were underperforming. At the same time, indigenous gas

Indigenous gas production across Europe is on the decline and likely to fall further as the EU has set strict new climate goals in its Green Deal, which includes phasing out fossil fuels from its energy system by 2050, including natural gas.

production across Europe is on the decline and likely to fall further as the EU has set strict new climate goals in its Green Deal, which includes phasing out fossil fuels from its energy system by 2050, including natural gas.²³ While this specific crisis is not related to the European energy transition agenda, it highlights the problem of moving too fast in shifting away from hydrocarbons in the pursuit of net-zero targets.

Fatih Birol, the IEA's executive director, said on October 4 at an industry event that the recent volatility in gas prices could not be blamed on the transition to clean energy but has more to do with the weather, strong economic growth, and some production shutdowns. "This volatility has almost nothing to do with clean energy. The drivers are completely different. There were outages one after the other around the world, and there was a lot of maintenance work ... Many things came together, but I would be surprised if the high gas prices we have now continue for a very long time."²⁴

As noted, fossil fuels – oil, gas, and coal – account for 80% of primary energy supply, a level that has been constant for the last decade. Yet even in the most ambitious scenarios, oil and gas will continue to make up more than half of the energy mix in the decades ahead. Any supply shortfall due to a lack of sufficient and timely investment will inevitably cause sporadic price spikes.

²³ "A European Green Deal," European Commission, accessed October 13, 2021.

²⁴ Nick Coleman, "Low-Carbon Energy Switch Not to Blame for Gas Market Volatility: IEA's Birol," *S&P Global*, October 4, 2021.

Shell's LNG Outlook 2021 showed just how far investments in new LNG projects fell in 2020. Final investment decisions were made on just 5 million metric tons per year of LNG projects, the lowest in at least a decade, while it had expected to see investments move forward on around 60 million metric tons per year.²⁵

What all this points to is a tightly balanced market that is likely to persist in the near term at least with gas demand growth expected to outstrip demand for crude oil. OPEC's 2021 World Oil Outlook forecasts demand growing by 21.6% over 2020-45, taking global gas demand up to 85.7 mb/d of oil equivalent from 64.2 mb/d of oil equivalent, making it the second-largest component of the energy mix.²⁶ In the Middle East, gas demand is projected to increase by 100 billion cubic meters per year to 2025 with Iran and Saudi Arabia the largest contributors to demand growth, accounting for up to 70% of the total increase in consumption, according to the IEA's Gas 2020 outlook to 2025. More than 60% of the net demand increase in the region will come from the power and desalination sectors.²⁷

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Saudi Arabia has made boosting natural gas production a priority and is investing \$100 billion to develop its Jafurah unconventional gas reserves. The UAE, which still relies on natural gas for power generation despite having the largest penetration in the region of solar power as well as nuclear power generation, is developing sour gas reserves as part of an effort to achieve self-sufficiency. It currently imports natural gas from Qatar through the Dolphin gas pipeline, which also serves Oman.

But the natural gas industry is under pressure to curb methane emissions, which are the second-largest contributors to global warming. Tracking methane emissions by using satellite technology has become a growth business while tighter standards, introduced by the EU and some Asian consuming countries, on the carbon content of imported natural gas is likely to transform the industry in the years ahead with demand for carbon-neutral LNG cargoes set to increase in response to consumer demand. Qatar Petroleum has already shipped one carbon-neutral cargo of LNG to Singapore and will be incorporating carbon capture, utilization, and storage technology in its LNG expansion plans as well as the use of electricity from solar power for LNG production. Further action will be needed to lower emissions from the LNG value chain from production to combustion of gas at the end-user side.

There is a school of thought that high oil and gas prices will hasten the switch to renewables, where costs continue to fall. Yet the intermittency of solar and wind power means that natural gas cannot be excluded until adequate storage solutions are found to ensure continuity. Nor can solar and wind power heavy industries like steel or cement manufacturing.

²⁵ "Shell LNG Outlook 2021," Shell, accessed October 13, 2021.

²⁶ OPEC, *2021 World Oil Outlook 2045* (Vienna: OPEC, 2021).

²⁷ IEA, *Gas 2020* (Paris: IEA, 2020), 34.

The Gulf states have a geographic advantage when it comes to developing renewable energy and more so as costs have come down by 82% since 2010, according to the International Renewable Energy Agency. But penetration of renewables is relatively small when compared to the global average and limited to a small number of Middle Eastern countries.²⁸

The Middle East and North Africa relies almost entirely on hydrocarbons for electricity generation with low-carbon sources accounting for just 11.1% of electricity generation, the lowest of any region in the world.²⁹ By contrast, global power production from renewables reached 27.3% in 2020 and is expected to rise to 38% by 2030, according to IRENA. BP's Energy Outlook 2021 suggests the energy mix in the Middle East will diversify considerably to 2050, with renewables growing about 10% per year faster than the world average, although oil and gas retain between 79% and 37% of primary energy supply in all three of BP's scenarios – business as usual, rapid, and net zero.³⁰

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The UAE continues to have an edge when it comes to a diversified energy mix, having commissioned the Arab world's first nuclear power plant in 2020. In October, it became the first Arab petrostate to declare a net-zero target by 2050, just one month before the U.N. Climate Change Conference, COP26, in Glasgow, Scotland in November. Saudi Arabia has embraced the concept of the circular carbon economy, whereby the carbon emissions of its upstream oil and gas operations are captured, stored, and reused in products that lock in the carbon content. Yet that technology is still costly and will need to be developed at large scale to be an effective decarbonization technology. According to the IEA's Net Zero by 2050 report, the failure to develop carbon capture, utilization, and storage for fossil fuels "would substantially increase the risk of stranded assets and would require around USD 15 trillion of additional investments in wind, solar and electrolyser capacity," which is used for hydrogen production, "to achieve the same level of emissions reductions."³¹

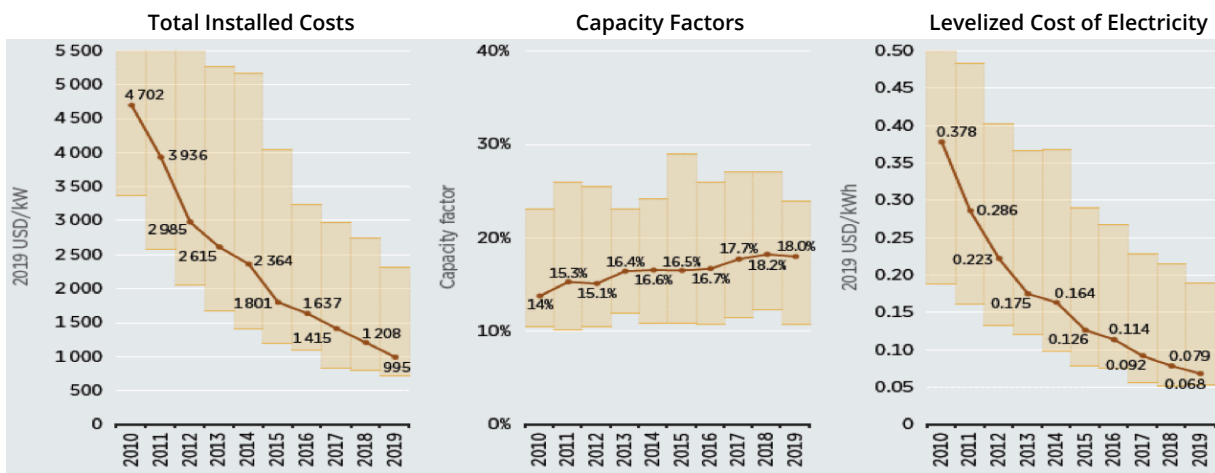
²⁸ International Renewable Energy Agency, *Global Energy Transformation: A Roadmap to 2050, 2019 Edition* (Abu Dhabi: IRENA, 2019).

²⁹ Paasha Mahdavi and Noosha Uddin, "Governance Amid the Transition to Renewable Energy in the Middle East and North Africa," in *Low Carbon Energy in the Middle East and North Africa*, eds. Robin Mills and Li-Chen Sim (London: Palgrave Macmillan, 2021).

³⁰ BP, *Energy Outlook 2021* (London: BP, 2021).

³¹ IEA, *Net Zero by 2050: A Roadmap for the Global Energy Sector* (Paris: IEA, 2021).

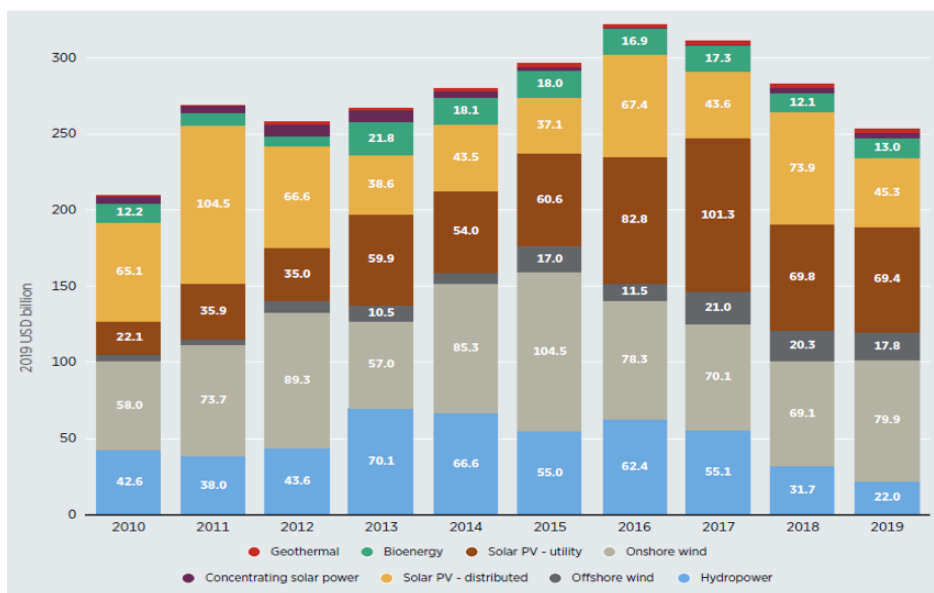
Global Weighted Average Total Installed Costs, Capacity Factors, and Levelized Cost of Electricity for Solar PV, 2010-19



Source: IRENA Renewable Cost Database

IRENA's Global Landscape of Renewable Energy Finance 2020 report suggests that annual investments will rise from around \$300 billion in recent years to \$800 billion by 2050 to fulfil key global decarbonization goals, which are set to be more ambitious after Glasgow, where signatories to the Paris Climate Agreement are expected to declare higher decarbonization targets for their economies. That will require strong policy support from governments, access to finance, and investment in technologies, some of which have yet to be developed.³²

Investment Value of New Renewable Capacity Added By Year, 2010-19



Source: This report for total installed costs and IRENA, 2020a for deployment statistics

³² IRENA, *Global Landscape of Renewable Energy Finance 2020* (Abu Dhabi: IRENA, November 2020).

In the 2019 edition of its *Global Energy Transformations: A Roadmap to 2050*, IRENA suggested that by 2050 electricity could become the “central energy carrier,” growing its share of final consumption from 20% to almost 50%. In such a scenario, renewable energy would satisfy almost 86% of electricity demand, primarily from the transportation sector, where IRENA expects 1 billion electric vehicles on the road and increased use of electricity for heat along with renewable hydrogen.³³

“The level of additional investments needed to set the world on a more climate-friendly path above current plans and policies is \$15 trillion by 2050,” IRENA noted, echoing the IEA cost estimate, but added that, while this was a big sum, the required investments had fallen because of the steep decline in the cost of developing renewable energy. In all, total investment in the energy sector would need to reach \$110 trillion by 2050 or around an average 2% of annual gross domestic product over the period.³⁴

The IEA, in what has become a controversial report tracing the pathway to net zero by 2050, suggested cheaper renewable energy technologies will give electricity the edge in the race to zero. This scenario calls for scaling up solar and wind power rapidly in the current decade with annual additions of 630 gigawatts of solar photovoltaic installations and 390 gigawatts of wind power by 2030, four times the record levels set in 2020.³⁵ For solar, this would be equivalent to installing the world’s current largest solar park roughly every day. That is a high mountain to climb if renewable energy is to be scaled up sufficiently to displace oil and gas.

Geopolitics and the Future of the OPEC+ Alliance

The OPEC+ group of oil-producing countries led by Saudi Arabia and Russia has defied expectations and held together as an effective market management mechanism since early 2017. But it has not always been a smooth ride for the 23-member alliance. In early 2020, a bruising battle for market share between Riyadh and Moscow sank oil prices as demand slumped. The dispute was over the timing of a production cut to balance markets and was eventually settled with an agreement in April 2020 to slash supply by 9.7 mb/d along with small contributions from producers outside the group. The action became a global effort underwritten by the G-20 group of leading developed and developing countries, which at the time was chaired by Saudi Arabia.

The OPEC+ members have largely adhered to their quotas throughout, though there have been some adjustments made to accommodate the changing power dynamics and capacities within the group. The UAE, which has been ramping up its oil production capacity, objected to baselines used to calculate the original cuts and held up an agreement in July, scuttling a consensus that would have seen a gradual tapering of the cuts as a demand recovery was underway. It took three weeks of diplomacy to end what was an unusual rift between the UAE and Saudi Arabia – two Gulf neighbors and allies. The UAE had argued that the October 2018 baselines used to calculate the pro-rata output cuts were no longer aligned with its higher production capacity, an argument that could also apply to Iraq, the second-largest oil

³³ IRENA, *Global Energy Transformation: A Roadmap to 2050, 2019 Edition* (Abu Dhabi: IRENA, 2019).

³⁴ Ibid.

³⁵ IEA, *Net Zero by 2050: A Roadmap for the Global Energy Sector* (Paris: IEA, 2021).

producer and exporter in OPEC after Saudi Arabia. The UAE's boosted capacity has brought it to third place in the OPEC rankings while former number two producer Iran has been locked out of markets due to sanctions.

The next big challenge for OPEC+ will be how to accommodate Iran's return, now widely anticipated in 2022 unless talks with the United States over Iran's nuclear development program are derailed.

When OPEC and non-OPEC producers came together at the end of 2016, the oil market was reeling from the oil price shock of 2014-15, when prices soared above \$170 per barrel in the middle of 2014 only to slump by 60% by the start of 2015. It became obvious that OPEC could no longer manage markets on its own considering its share of the global market was shrinking as U.S. shale oil surged higher and the United States no longer relied on OPEC oil imports to meet domestic demand. It was Prince Abdulaziz bin Salman, who was then the assistant Saudi oil minister, who convinced Russia and other non-OPEC producers to join OPEC in what later became a formalized alliance.

The policy of holding back supplies and easing them back on to the market in gradual increments has paid off with prices now more than double the lows of April 2020. But in holding fast to its policy of not releasing incremental barrels as supplies fell short of market requirements in October, OPEC+ proved itself impervious to calls from the United States, which urged action to cool high global crude oil prices. In sticking with its roadmap, with plans to release the last of the withheld barrels to the market by

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September 2022, OPEC+ has signaled that it is looking beyond the broader market trajectory. Yet in allowing prices to rise (U.S. oil futures in October rose to their highest level in seven years) the group that accounts for 40% of total global supply appeared to signal that it did not deem prices high enough for action. The producers might also be making the point that, for all the predictions of peak demand, oil remains an essential component of the energy mix and is likely to remain so in coming decades.

This is borne out by OPEC's own outlook to 2045, which, as noted, projects continued growth in demand for oil to 2035, when OPEC expects it will plateau to the end of the forecast period. The outlook expects global oil demand to rise from 90.6 mb/d in 2020 to 108.2 mb/d by 2045. This reflected a 1 mb/d downward revision for 2045 demand from the latest edition, which takes into account growth in renewables.³⁶ This contrasts with the September 2021 outlook by French energy major TotalEnergies, which expects demand for oil to peak by 2030.³⁷

The producers are adopting different approaches in dealing with the peak demand scenario and not all their economic priorities are aligned. Recent reports and remarks by Russian officials suggest that Moscow would prefer to see lower prices to discourage U.S. shale and other high-cost producers from eroding its market share. Saudi Arabia, on the other hand,

³⁶ OPEC, *2021 World Oil Outlook 2045* (Vienna: OPEC, 2021).

³⁷ TotalEnergies, *Energy Outlook* (Paris: TotalEnergies, September 2021).

seems satisfied with higher oil prices, which it needs to drive its economic diversification program. The UAE, meanwhile, seems determined to take advantage of the narrowing window of opportunity to maximize its oil production even as it sets higher decarbonization targets.

What is clear is that, even if demand peaks and stays flat beyond 2030 or 2035, the industry cannot afford to hold back on investment in upstream projects if only to make up for natural declines from producing fields, where estimates range from annual declines of between 4% and 6%. According to OPEC's outlook, from 2021-45 total investments of \$11.9 trillion will be needed, of which \$9.2 trillion should be dedicated for the upstream.³⁸

The UAE, meanwhile, seems determined to take advantage of the narrowing window of opportunity to maximize its oil production even as it sets higher decarbonization targets.

Barkindo warned of the danger to market stability if investment falls short. "The investment requirement clearly underlines that any talk of the oil and gas industries being consigned to the past and the need to halt new investments in oil and gas are wrong-headed," he said. "If the necessary investments are not met, it could have knock-on implications as viewed in current gas developments in Europe and elsewhere around the world, leaving long-term scars not only for producers but consumers as well."³⁹

Conclusion

The world's energy composition is changing rapidly but the rates of transition vary across regions and continents, and there is no single energy source that can provide solutions to decarbonization. Recent events have demonstrated how any supply shortage of any of the primary fuel base can be disruptive to supply and demand fundamentals and cause price dislocations.

Solar and wind power are making huge strides in electricity generation across the globe, but renewable energy alone cannot meet the demands of heavy industry and transportation. The Middle Eastern countries rely almost exclusively on fossil fuels to generate electricity and even the UAE, the first Arab country to have nuclear power capacity, still relies heavily on natural gas, some of it imported from Qatar. Momentum is building in the renewable sector across the Arab world, but its share of the overall energy mix is small and far below the global average. Oil exports continue to generate the majority of revenue in the oil-producing states, which are determined to preserve their role as suppliers of oil and other types of energy, including hydrogen and low-carbon gas and oil. But the window for maintaining these high revenue levels from the sale of oil is closing as dozens of countries and businesses have adopted net-zero targets, and financing fossil fuel projects has become difficult and more costly.

All but a few major international energy companies are cutting their exposure to carbon-intensive projects through divestments and a reallocation of funds into cleaner energy sources and technologies as part of a commitment to become net-zero businesses by 2050.

³⁸ OPEC, *2021 World Oil Outlook 2045* (Vienna: OPEC, 2021).

³⁹ OPEC, "Launch of the 2021 World Oil Outlook: Opening Remarks by OPEC Secretary General," OPEC video conference, September 28, 2021, 22:47.

That will provide a window of opportunity for the national oil companies, many of which are concentrated in the Middle East, to increase their market share but they will need to adapt to more restrictive carbon mandates, which can be achieved with carbon capture, utilization, and storage technology. But that remains costly, and few projects have been developed at the scale needed to bring emissions from the industry to acceptable levels. Higher carbon taxes that are expected to come into force in major consuming countries will also add to costs, some of which may have to be borne by consumers, which carries the risk of a social backlash.

With various forecasts pointing to a peak in oil demand in the next 20 years, the next few years may provide the last window of opportunity for the petrostates to capture value from their oil assets while further diversifying their oil-based economies. Natural gas will have a slightly longer shelf life as a cleaner transition fuel, but the industry faces increasing pressure to curb methane emissions, a harmful greenhouse gas that is one of the main contributors to climate change.

The onset of the coronavirus pandemic and the slump in demand and energy prices led to a 30% decline in energy investments, most of which were in the upstream sector.

The IEA, a strong advocate for carbon neutrality, estimates that for net-zero targets to be attained by 2050, a new solar power facility equal to the world's largest solar park must be installed roughly every day until then. IRENA, the renewable energy agency, estimates that \$15 trillion in additional investments are needed to set the world on a more climate-friendly path.

While more investments are being directed into renewable energy, failure to invest in new upstream oil and gas projects, if only to maintain production at current levels and compensate for natural declines, would have repercussions in the near term. The onset of the coronavirus pandemic and the slump in demand and energy prices led to a 30% decline in energy investments, most of which were in the upstream sector. Several oil and gas projects have been delayed or scrapped altogether with approvals for new LNG plants far lower than pre-pandemic levels.

The deep freeze in Texas, hurricane-related disruptions in the United States, and gas shortages in Europe and Asia are recent manifestations of an energy system that has yet to reach maturity and partly the consequence of the sharp decline in energy investments between 2014 and 2016. All this shows that, in a tightly balanced market, the margin for error is very slim.

