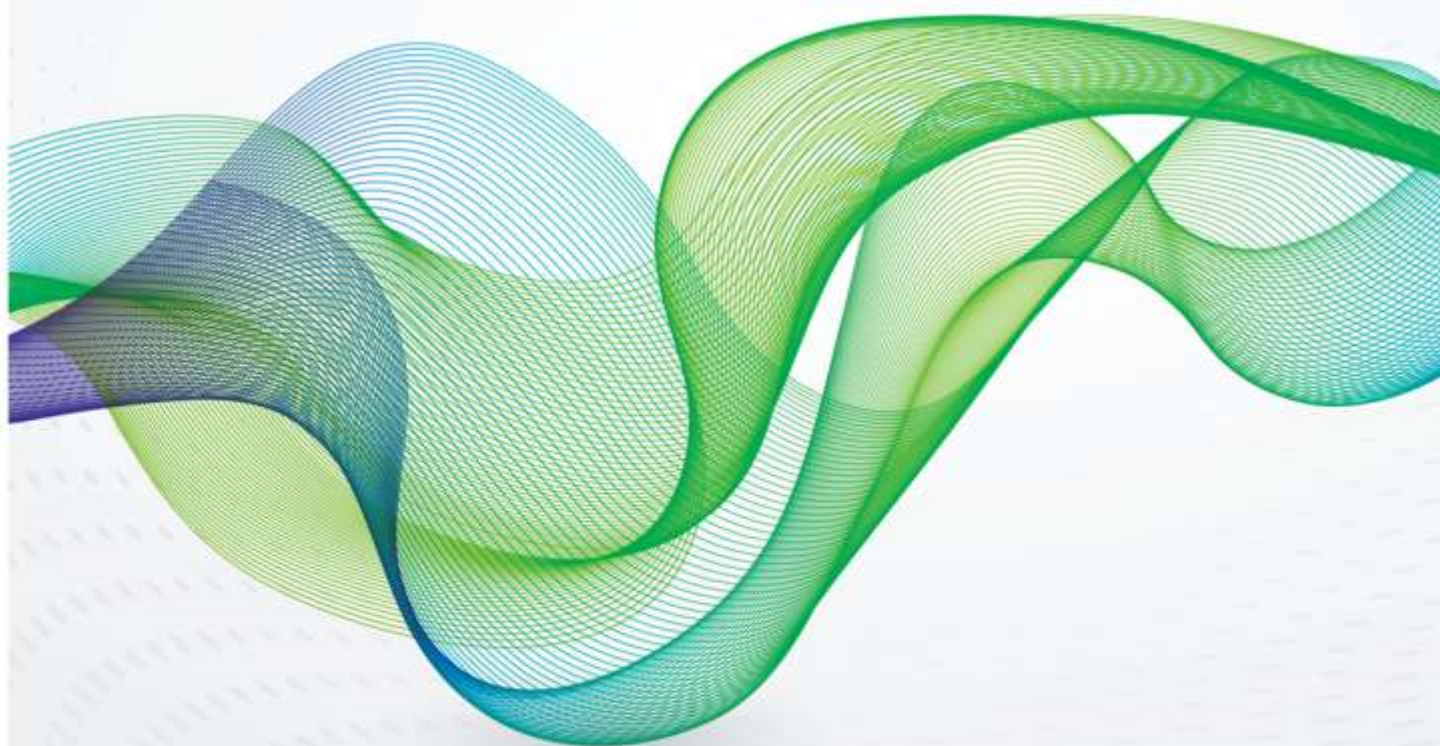
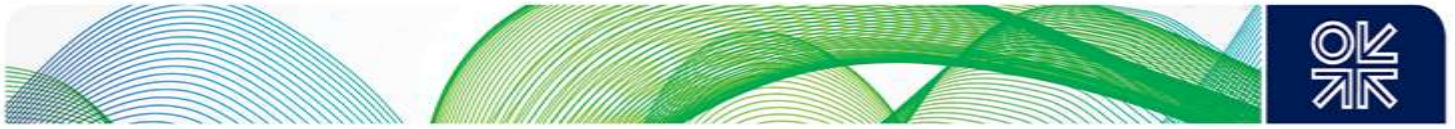


January 2024

Key Themes for the Global Energy Economy in 2024





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1. Introduction – Energy transition comes of age

Much has been made of the energy trilemma over the last decade, which positions three key drivers of the global energy system – security of supply, sustainability, and access – as the forces that drive energy policy and ultimately markets. The dominant argument in the wake of the Ukraine war and subsequent spikes in gas and power prices was that this three-pronged framework had leaned more heavily in favour of security of supply at the expense of sustainability.

This year's key themes suggest that not only are security and sustainability intractably linked, but that they have now become two sides of the same coin. Perhaps this requires reframing the trilemma as a dilemma, with security/sustainability on the one hand and the price of energy, as well as the important but developmentally separate issue of access, on the other. However it is framed, the scope for trade-offs between the objectives is limited and undermines growth, competitiveness, public acceptability, sustainable development goals, and energy access.

As such, our key themes for the year ahead in 2024 point in a new direction. The reality of the new versus the old energy economy, with its focus on decarbonization, electrification, and renewables is by now well understood. The energy transition has made great strides in some areas but is still struggling with the scale and scope of the global challenge, as the COP meeting in Dubai acknowledged. Hydrocarbon demand globally continues to rise, even as progress in new energy technology and the renewables build-out gathers steam.

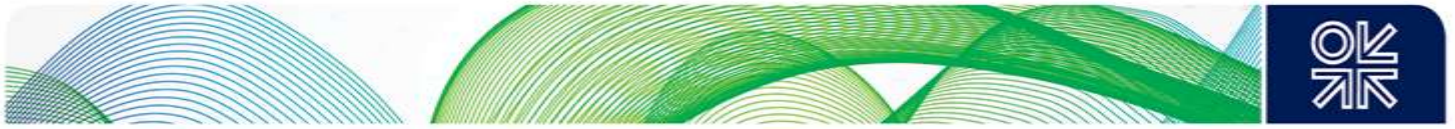
But the fact that oil and gas markets appear to be focused beyond near-term supply risk (oil) and tight fundamentals (European gas), suggests security of supply risks have been partially eclipsed and are no longer the sole dominant theme. Instead, sustainability through green energy is emerging as a key component of strategies that incorporate security of supply, industrial policy, climate diplomacy, and international relations.

For hydrocarbons, the fundamental picture is complex. While oil demand continues to grow globally, OECD consumption is mostly flat to falling and China and other emerging Asian economies account for the bulk of global growth. Global oil demand growth is set to ease year-on-year in 2024 as the impacts of recovery from COVID fade but remains robust and not far from its pre-COVID ten-year average. As electrification and efficiency eat into transportation fuels in most markets, demand is expected to flatten in the medium term though timing is uncertain. The extent to which petrochemicals replaces transport as the main driver of oil demand will dictate the long-term demand curve, something around which there is also plenty of uncertainty. European and other western sanctions on Russian liquids has shown up in changing trade flows but supply has been little changed – another victory for Russian resilience and oil market fungibility.

For gas, the huge dislocation created by the loss of Russian gas in Europe prompted a historic spike in prices. But again, the market resolved the deficit through LNG imports, storage management, and lower continental demand, which fell for a second successive year in 2023, easing the strain on balances. While we assess European gas fundamentals as tight and flexibility on both supply and demand has fallen, markets seem less concerned. Prompt gas prices and flat forward curves continue to look weak, helped in large part by Europe's success in refilling storage during summer months. Softer pricing seems to be at odds with the LNG outlook for 2024, which at best will see some 20 bcm of supply added this year into a market where demand could top that, especially if the remainder of the northern hemisphere winter plays out colder than recent years, implying a deeper drawdown in stocks.

While strong non-OPEC oil supply growth in late 2023 surprised many, it pushed OPEC+ to continue and deepen its balancing mission, creating in turn the OPEC spare capacity that in turn is helping to inoculate the oil market from the impact of geopolitical and supply risk. In short, despite a widening of the Israel-Gaza conflict, oil markets are surprisingly sanguine and price responses to supply threats have been small and short-lived. The packed election calendar during 2024 and the increasing weaponization of energy policy in democratic politics may yet test that resilience.

Where does this leave energy transition? The perennial refrain that governments and corporations need to back up their targets and commitments with action will continue of course. This will be important for

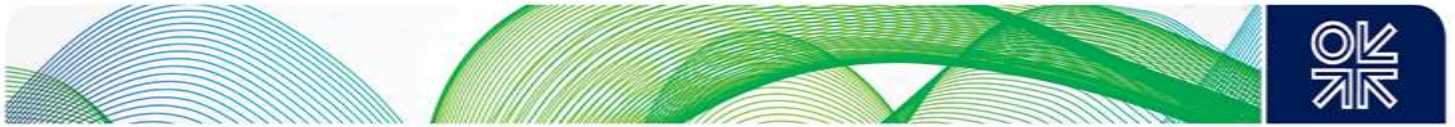


action on methane emissions, financing the transition, either through bespoke multilateral funds or through traditional banking, and of course new headline targets on renewables, efficiency, and scaling up decarbonization technologies. But governments are proving wise to the reality that major energy transition policy is also a driver for growth and competitiveness and, critics would argue, a new avenue for protectionist policies. Expect more tension between the industrialized economies, who by and large have the means to finance and subsidize transition investment, and the Global South, which is less able to.

In terms of some of the key elements of the transition, we see offshore wind, hydrogen, and carbon markets as the hot spots in 2024. Investors in offshore wind farms have baulked at cost inflation in 2023, forcing governments to look again at the fiscal playing field and whether they need to bring new incentives to the table, whether in terms of port logistics, raising the strike price offered for power offtake or helping to ease bottlenecks in the global supply chain for offshore wind components. For hydrogen, the story is one of perpetual running to catch up. Unrealistic, upgraded European targets on electrolytic and CCS-enabled hydrogen show little sign of being met which means that blue hydrogen derived from methane reforming will dominate the industry in Europe for longer. Carbon management and solutions remain critical to the push towards net zero especially in the hard-to-abate sectors. Limited progress on rules for a global carbon market will shift the focus to bilateral deals as a means of driving investment into carbon capture and storage (CCS) and carbon dioxide removal (CDR). The challenging task of boosting the quality and integrity of the carbon credits market may well create fresh momentum in 2024.

Of all these themes, the wildcard is China, which continues to play a dominant role across the energy industry, both as a major importer and consumer of hydrocarbons and as the world's leading supplier of energy transition technologies and components. While China is exposed to global markets on both sides of the trade ledger, its bullish regional and global foreign policies and the potential for fresh tensions in the South China Sea or in terms of trade relations with the US and Europe make it a global wild card. Beijing's foreign and energy policy will remain one of the most profound and uncertain forces moulding the global energy landscape in 2024.

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2. Time for Action after COP28

COP28 ended on 13 December with a fanfare around the inclusion of the phrase 'transition away from fossil fuels' in the final conclusions. This was hailed as a historic first mention of all fossil fuels in a COP document, but in fact there were enough caveats in the text that even the largest oil producers were not overly worried about their future. As a result, although it will be interesting to see how the future of fossil fuels is interpreted by different countries during 2024, there are in fact some far more concrete actions that emerged from the COP which are critical for the energy transition and that deserve a specific focus over the next 12 months. These include:

Action on methane emissions: One of the main themes of COP28 was the need to focus on cutting methane emissions sharply by 2030. A total of 155 countries have now signed the Global Methane Pledge to reduce emissions by 30 per cent by 2030, while 50 oil and gas companies (including 30 NOCs) signed the Oil and Gas Decarbonisation Charter with a pledge to reduce methane emissions to close to zero by the end of this decade. With so little time to take such significant action, companies must deliver results in 2024 and be seen to do so. As part of the monitoring process, a consortium led by the IEA and the Environmental Defence Fund will be providing data from various satellites to allow the 'naming and shaming' of key emitters in order to get the main stakeholders to demand positive action. It will be critical to see whether this process kicks into action and actually works this year.

Holding oil and gas companies to account: The oil and gas community was delighted to be back in the COP fold and made some bold promises to demonstrate their keenness to be part of the energy transition. As well as methane emission reduction, these centred around reducing Scope 1 and 2 emissions to zero by 2050, halting the routine flaring of gas and working hard to develop CCUS as a viable business. The industry must now demonstrate its willingness and ability to deliver on these promises. The most obvious short-term measurable goal is around flaring, so 2024 could be the year when routine flaring starts to decline sharply. Satellites will again play a key role in monitoring performance.

Changing role for the World Bank: There has been much criticism of the role that the World Bank has played to date in financing the energy transition in the developing world, as it has not found a way to prioritise the environment over economic returns. World Bank president Ajay Banga has promised that the share of climate finance in the Bank's portfolio will increase to 45 per cent (from 35 per cent), that terms for loans will be made more preferential and that pauses in repayments will be offered to the most vulnerable countries. The COP conclusion confirmed all this and also urged the Bank to play a greater role in reducing risk to allow more private investment in the Global South. 2024 will therefore be a year in which the World Bank has to reinvent its role or face an increasing challenge from its shareholders in the Global North.

Commitments to provide finance to the Developing World: Although climate finance is at the heart of all energy transition activities, three areas stand out in 2024 ahead of COP29 in Baku, which will certainly be known as the 'Finance COP'. Firstly, will the Loss & Damage Fund become a credible source of finance for the developing world? It has less than \$1 billion in it at present, and the rules for its use remain unclear. Its announcement at COP28 was seen as a triumph, but will it really work in 2024?

Secondly, will the developed world finally be seen to have provided the \$100 billion it promised in climate finance but has so far failed to deliver. Having missed the target in 2020 and 2021, an OECD report claimed it had been met in 2022, although many developing countries disputed the evidence. However, delivering in one year is just a start, if it can be proved. The same level needs to be achieved in 2023 and 2024.

Thirdly, can an agreement be reached on funding for the developing world from 2025? The 'New Collective Quantified Goal', as it is known, is being negotiated in 2024 and should be agreed at COP29, to go into force from Jan 1 2025. The final COP document identified a need for almost \$6 trillion in finance for the developing world in the period 2023-2030, implying a figure of c.\$850 billion per annum. Whether the countries in the Global North can pledge anything like this number is doubtful, but anything less than \$500 billion per annum from 2025 will leave the world significantly off target to reach its climate goals.

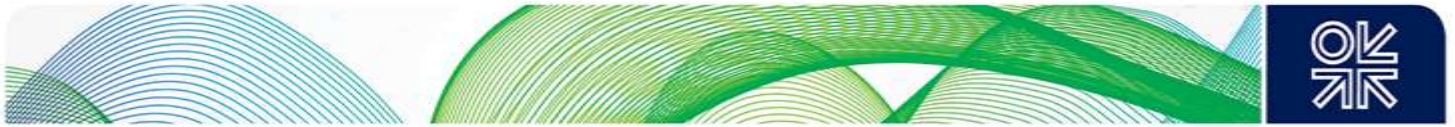
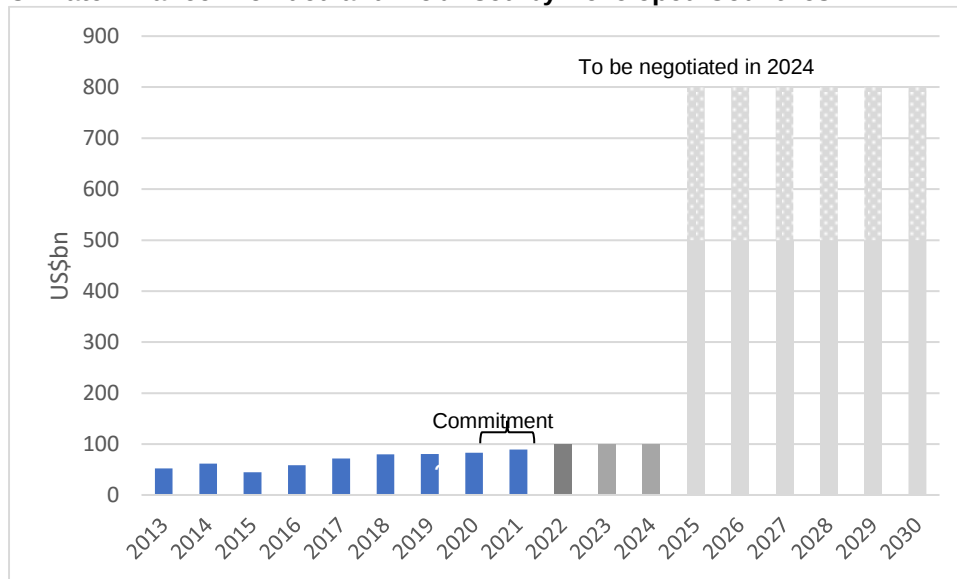


Figure 1: Climate Finance Provided and Mobilised by Developed Countries

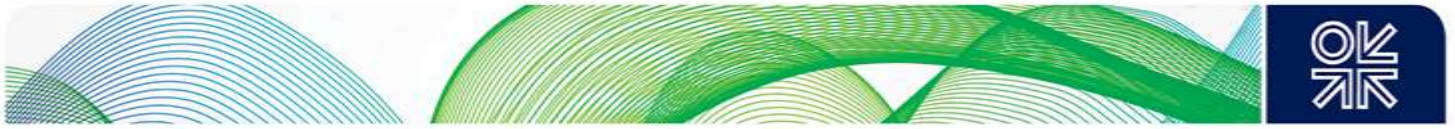


Source: OECD, OIES forecasts

Advances in renewables and energy efficiency: Two of the least controversial objectives set at COP28 involved the tripling of renewable energy capacity to 11,000GW by 2030 and doubling the global energy efficiency improvement from 2 per cent to 4 per cent per annum (as measured by unit of energy per \$ of GDP). These goals will be easy to measure but a challenge to achieve, and a good start is needed in 2024 to carry on the momentum from Dubai.

In conclusion, the world's long-term commitment to transition away from fossil fuels was set in Dubai, but in the short-term there are some much more specific targets which need to be met to keep the world broadly on track to meet its climate goals. These will have to be monitored carefully in 2024 to hold the companies and countries who have promised action to account, and if necessary to call them out at COP29 in November.

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3. Energy transition – When climate policy becomes protectionism

Energy transition pathways that do not address all elements of the energy trilemma – security (of supply), sustainability, and affordability – will struggle to gain public acceptance and the febrile public debate around energy transition is likely to intensify in 2024. Multiple elections across the globe means that climate policy will be scrutinized as a key plank of industrial, economic, and even social policy. The challenge of the trilemma is that room for trade-offs is very limited. Under-delivery on any of the objectives undermines the entire energy complex as well as other key objectives such as growth, competitiveness, sustainable development goals, and energy access.

Balancing the trilemma in 2024 and beyond will be critical. Energy is key to economic progress and development and therefore securing energy will always be a top priority among policy makers. But it is not enough to have secure sources of energy. Energy must be affordable to ensure multiple goals, including enhancing economic competitiveness, ensuring wide access to energy and promoting wide acceptance for the transition. Higher energy costs increase the burden on businesses and households, even in developed economies. In developing countries where incomes and energy access are low, affordability is an even more pressing issue. Energy must also be provided in a sustainable way and the energy system must be fit to meet climate targets.

The major theme in 2024 will be the swing away from markets towards a greater role of the state in energy markets and the rise of industrial policy in many parts of the world. In the west, the US arguably fired the starting gun with the 2022 Inflation Reduction Act (IRA), which has since heralded similar approaches from the EU and other major industrialized economies. While most accept that major state subsidy and investment as well as associated regulation are critical to the sort of progress that is needed for a range of transition technologies to advance beyond concept to delivery, there is also a fine balance between direct government aid to a strategic sector on the one hand and protectionism and onshoring on the other.

Industrial policies such as the IRA and the EU's Green Industrial Plan plus unilateral trade measures driven by climate change considerations such as the Carbon Border Adjustment Mechanism (CBAM) raise key questions about the changing nature of competition, the pace of technological diffusion and collaboration, and the impact this would have on countries that have the renewables and mineral resources but don't have the capability to join the technological race through offering subsidies and incentives for their industries. The election calendar means that these issues will come to the fore in 2024, weaponized by party politics.

Geopolitical competition between major global economies plays into this. China's success at dominating the global solar and key battery minerals supply chains through increasingly sophisticated industrial policy predates the IRA (see Figure 2), which itself was also a means of boosting the US industrial sector post-COVID. But the competition between nation states to control key elements of the low carbon supply chain and establish leadership in the new energies has the potential to actually slow global progress and become a drag on the transition itself especially if issues such as facilitating technology transfer, increasing the availability and reducing the cost of finance to the Global South, and managing trade relations are not addressed. The risk that transition technologies are siloed and international cooperation on new energy technology in a more geopolitically fragmented world declines, are already becoming real.

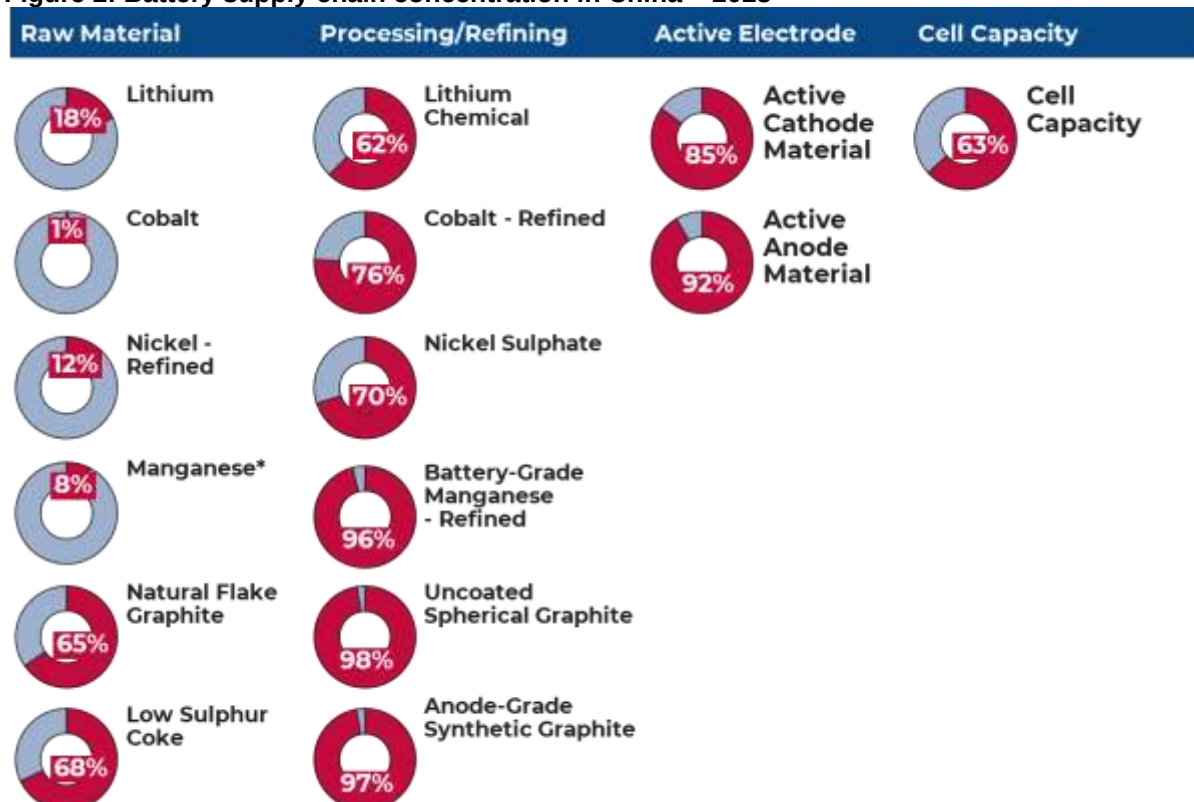
COP-28 crystalized inherent tensions in a multi-speed energy transition

Concerns about protectionism or 'unilateral trade measures' from developing nations as a negative impact on sustainable development and a 'just (energy) transition' were made by Brazil at COP on behalf of the BASIC group of countries (Brazil, China, India and South Africa). The group argued that some of the green measures – such as carbon border taxes – were incompatible with WTO rules. 'Parties should also collectively oppose any measures to restrict trade and investment and setting up new green trade barriers, such as unilateral carbon border taxes, with the pretext of addressing climate change, which are incompatible with multilateral rules under the World Trade Organization and the Paris Agreement's principle of equity and common but differentiated responsibilities and respective capabilities (CBDR-RC), in the light of different national circumstances,' it said in Dubai.



COP's ability to set even the broadest direction for policy will continue to be overshadowed by the industrial and trade policies of individual nations or groups of nations (in the case of the EU or the G7), which are now setting the pathway for decarbonization faster than overarching multilateral commitments. In other words, the argument for action now and the creation of 'climate clubs' with more ambitious climate targets (in December 2022 the G7 launched the G7 climate club) is overtaking the need for coordination and collective effort amidst the insistence of countries particularly in the Global South that global efforts to reach climate targets should be based on principles such as just energy transition, differentiated responsibilities, and taking into account countries' 'different national circumstances, pathways and approaches.'

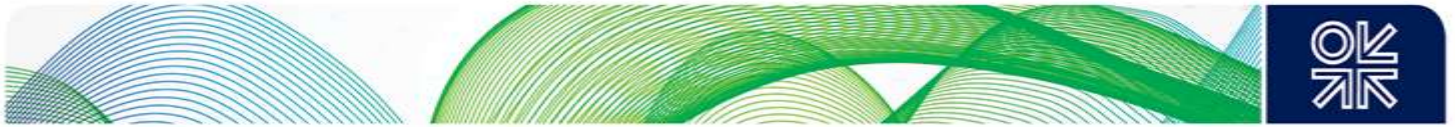
Figure 2: Battery supply chain concentration in China – 2023



Source: Benchmark Mineral Intelligence Ltd

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4. Geopolitics will test energy market resilience in 2024

The combination of a busy election calendar, a widening conflict in the Middle East, and Russia's ongoing war in Ukraine means that the intersection of geopolitics with energy markets and infrastructure will be at a multi-year high in 2024. The geopolitical horizon is certainly getting darker, with hot conflicts (Ukraine, Middle East) layering extra uncertainty on the existing frozen conflicts (North Korea, US-China) and new ones, such as Venezuela-Guyana emerging. Despite the geopolitical noise, a key takeaway from 2023 has been that energy markets were broadly resilient, with trade flows adapting to conflict, sanctions, and other threats. Oil price spikes have been short lived and natural gas prices continue to fall towards historic averages after the price shock seen in mid-2022.

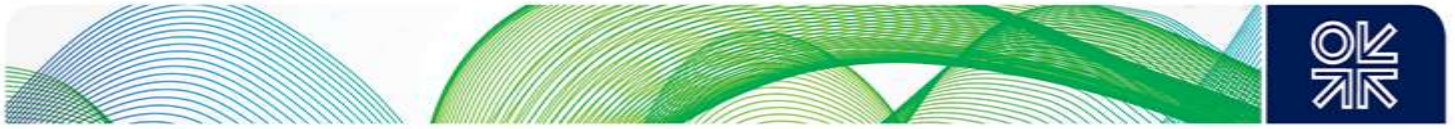
Understanding the difference between headline risk and the less well understood political developments in Europe and the Middle East is crucial. In terms of the Ukraine war, Russian gas exports to Europe are now limited to some transit flows through Ukraine and via Turkey. On balance, the Ukraine transit volumes are unlikely to be renewed when the current contract expires in December 2024, which will force central eastern European consumers of those volumes to rely on LNG landed at Mediterranean terminals or European gas supplied from further west. But the major loss of Russian supply in 2022 has been fully absorbed by the market. On the oil side, the European ban on Russian crude and products has forced Russian sellers to redirect flows, mostly to Asia. But this has been achieved, albeit with a revenue cost to Moscow, with little net loss to global balances. A political resolution in Ukraine looks unlikely in 2024, especially with Western support for Kyiv increasingly uncertain. What seems more likely is that the conflict drags on, possibly at a lower intensity, and Russian gas is unlikely to play a bigger role in Europe in the foreseeable future.

In the Middle East, the military conflict in Gaza had a limited and temporary impact on Israeli gas production and export levels. But the spread of the conflict to Israel's northern neighbours and attacks by Yemen's Iran-backed Houthis on Red Sea shipping is increasingly a supply risk for oil and LNG tankers using the Suez route to access the Mediterranean and Atlantic Basin markets. Even here though, the physical trade has demonstrated resilience, with ship owners and charterers diverting cargoes via the Cape, optimizing alternative supply already available in the Atlantic basin and major economies establishing an international naval force to protect shipping in the Red Sea. The concentration of major oil and gas producers in the Gulf is a perennial risk, but this risk has barely jolted oil markets in recent years.

As energy markets have become sanguine about supply risks, they have focused more on two other critical market drivers: GDP and climate policy. Elections in 2024 will be significant to both – although actual policy change from those votes will be felt more in 2025 and beyond. Since G7 central banks are expected to start to loosen monetary policy in 2024, economies that are flirting with recession should be able to turn the corner back to growth, even if that is relatively tepid in 2024. Whether this will translate into trend growth for oil and gas long-term depends upon the speed of transition. We still see global oil demand growth of 1.4 mb/d in 2024, close to the pre-COVID trend for the past decade.

Decarbonization policy will also be elevated as a top election issue in many countries. A loosening of climate targets can be expected on the populist right, although even centrist and left parties will likely also have to slim down their climate commitments given the fiscal and debt challenges that have become ubiquitous across major economies. This in turn could keep the share of oil and gas in the energy mix dominant for longer as the build-out of renewable energy and low carbon alternatives takes longer than government targets allow.

Energy policy will also loom large in 2024. In the EU, accelerated plans to decarbonize the energy sector will collide with the harsh limits of private investment, incoherent fiscal subsidies and, principally, a lack of infrastructure, particularly for handling CO₂ and decarbonized gases. In the UK, decarbonization is a mixed bag; while the UK is a global leader in offshore wind, the electrification of the vehicle fleet has been held up by insufficient charging infrastructure, while the increased demand on power grids will also start to weigh on capacity. In China, structural economic weaknesses around debt levels have yet to take the shine off a dominance in renewable power and EV supply chains but the risk is rising. Finally, many developing countries find themselves short of investment, technology, and manufacturing for the new energy economy – a toxic recipe that will continue to hold them back.



In summary, established energy markets have been resilient in the face of an array of risks including COVID and European conflict so far this decade. Markets have resolved oil and gas supply-demand imbalances and the argument for domestically-generated renewable energy versus imported fossil fuels has gathered momentum. But 2024 could test that resilience. Elections will mean public scrutiny of energy policy like never before and a gloomy geopolitical horizon shows that even though markets have been good at looking through threats, the energy economy requires some stability for successful trade and investment. Longer routes avoiding hotspots will increase the cost of doing business, another sucker punch for a global economy that has yet to find its feet post-COVID.

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5. China in 2024: Overcapacity looms large

China remains the world's largest consumer/importer of fossil fuels and more recently has risen to the top ranks in manufacturing and exporting new energy components and goods (solar panels, electric vehicles, wind turbines). But it is doing so in the context of an uncertain economic outlook - where Beijing needs to support domestic growth while also limiting emissions - and a strained international environment. For Beijing, this means a focus on self-sufficiency in energy and technology but given the macroeconomic wobbles, further expanding domestic production portends an oversupply of fuels and products. This, in turn, suggests cheaper exports that could fuel protectionist policies in importing countries, exacerbated by the 2024 election politics that will dominate the year. And for Beijing, that will only reinforce the need and desire to be number one.

A complicated domestic situation

The Chinese economy, while forecast to grow by 4.5-5 per cent in 2024, continues to be plagued by a weak real estate sector and, if the domestic stock market sell-off in early January is any indication, weak consumer confidence. While the government will continue to introduce policy support to ensure economic expansion, it will be cautious about large stimulus programmes that could undermine efforts to de-risk the property and financial sectors. In 2023, investments in new energy manufacturing and electrical machinery helped offset some of the weakness in the real estate market, but they remain energy- and commodity-intensive growth drivers. At the same time, 2024 is the mid-point of China's 14th Five-Year Plan. China's own interim assessment indicates the country is falling short on key targets on energy consumption per unit of GDP, CO₂ emissions per unit of GDP, and good air quality days. China's decision-makers will therefore need to support growth while limiting energy intensity. In 2023, GDP growth of around 5 per cent entailed an estimated 12 per cent y/y increase in oil use, an 8 per cent rise in gas consumption and a 5 per cent rise in coal demand¹. For 2024, even as oil, gas and coal demand growth weaken from 2023 levels, they will remain robust.

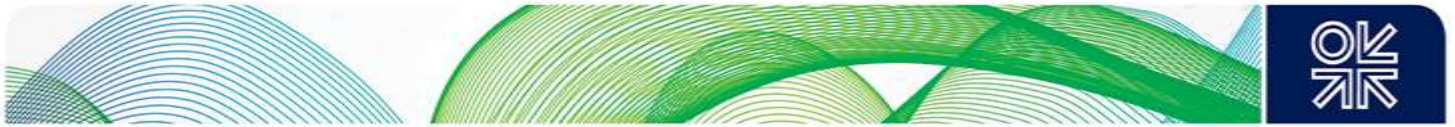
A challenging international environment

Securing access to fuels, ores, and export markets will remain critical. But the domestic economic challenges are compounded by elections around the world: Taiwan went to the polls on 13 January, elections in Indonesia and India are forthcoming, followed by EU parliamentary elections this summer and culminating in the US presidential race in November. The election calendar will, at the very least, drive debate around China's role as a partner, client, or investor in these jurisdictions, but it could also result in policy changes in some of its most significant trade partners. China is already the biggest seller of EVs to India. Envision, China's second largest wind turbine OEM, has recently become India's top turbine supplier, displacing incumbents such as Siemens Gamesa. But if cautious attitudes toward China toughen in India, de-risking policies could become even more prominent and complicate opportunities for Chinese investors. Similarly, in Indonesia, where Chinese investors account for 60-70 per cent of nickel mining, a new administration could introduce additional policies aimed at retaining more value-added in Indonesia or targeting China's footprint in the country in other ways. The EU and the US are already implementing various trade bans and restrictions on Chinese goods and investments, but more could be forthcoming.

Being number one has advantages and disadvantages

For energy policies, these trends reinforce the country's need for security and resilience. The hostile external environment, along with the need to ensure adequate supplies of all forms of energy during times of peak demand, point to a greater urgency to be self-sufficient in energy as well as technology. For oil, gas, coal, and increasingly for critical materials, Beijing is emphasizing domestic production and stockpiles. China is already the world's largest importer of oil and coal and in 2023 it surpassed Japan as the world's largest LNG buyer, a position it will consolidate in 2024. China remains exposed to global markets. In addition to building stocks, Chinese traders will also look to optimise those stocks and re-sell excess volumes, as they have been doing in LNG markets. But in the medium term, new technologies and electrification are key. China already leads the world in deployment of renewable

¹ These are all estimates as final data has yet to be published.



energy. It will next seek to cement its position as the world's top manufacturer and producer of components and equipment, and strive toward technological self-sufficiency. In 2023, China is estimated to have added more than 250 GW of wind and solar capacity. It is also planning to add over 200 GW this year.

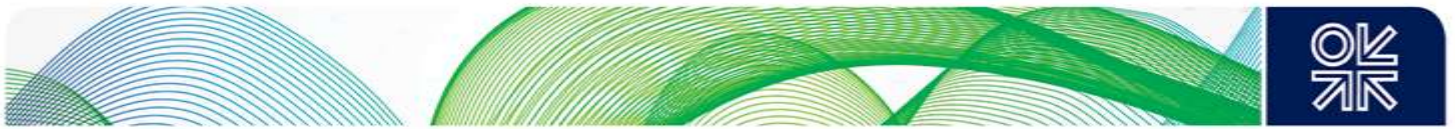
Overcapacity looms large

As China continues to expand the scale of its production, not only is it set to top the charts, it is also likely to do so at lower costs because of overcapacity. While China remains the world's largest oil importer, its refining capacity is on track to surpass the US and it is now focusing on chemicals rather than refined products. With a slowing economy, production of base chemicals in China is largely outstripping demand, leading to higher outflows.

At the same time, China's traditional impulse to generate growth through industrial activity - which increasingly relies on new energy components and equipment - means its installed capacity for wind turbines, solar panels, batteries, and electric vehicles largely outstrips its demand. And as provinces and industry leaders compete for market share, they exacerbate the existing overcapacity and drive down costs. This inevitably leads to boom-bust cycles, forcing smaller companies out of business. But the survivors continue to export.

This also has knock-on effects on minerals. Slowing domestic EV sales growth in China has led to a short-term crash in lithium and battery mineral prices globally, as Chinese and other mining companies expanded upstream production too rapidly. Lithium prices, for instance, fell by an estimated 80 per cent in 2023. Polysilicon prices have also fallen by about 65 per cent since January 2023. These price drops limit investments in new mining, mainly by non-Chinese companies, thereby effectively reinforcing China's centrality to the supply chain. In 2024, especially if the economy continues to slow, China will export more products, further fuelling protectionist instincts at a time of electoral contention. And as threats of protectionism rise, Beijing's instinct will be to focus more fervently on self-sufficiency and supply-chain dominance.

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6. European Gas Market Flexibility Waning in 2024

The European (EU-27 plus UK) gas market has traditionally benefitted from flexibility of supply and demand to balance the market. But market-balancing flexibility is on the wane in 2024, implying higher price volatility. The loss of Russian pipeline supply and the need to maintain start-of-winter stocks has eroded some of the supply-side flexibility, just as the loss of coal/gas switching and the rising share of intermittent renewables in electricity generation has eroded some demand-side flexibility. Given that lack of supply-demand flexibility is a significant contributor to both higher prices and greater price volatility, the key question remains: where can Europe find the flexibility to balance the market in 2024?

Supply Flexibility

Flexibility in European gas supply should be seen in the broader context of Europe's growing gas import dependency over the past several decades. The share of imports in European gas consumption grew from 40 per cent in 1992 to just under 50 per cent in 2002, climbed to 64 per cent in 2012, and reached 80 per cent in 2022. With Europe's gas production now operating at close to maximum capacity almost year-round, the only substantial flexibility in supply is derived from imports and storage injections/withdrawals. Yet even from those two sources, flexibility is being lost.

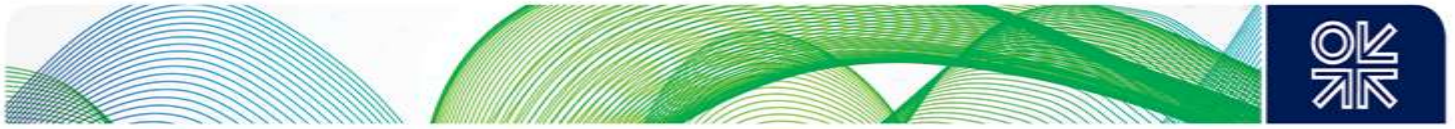
Prior to 2022, pipeline supply from Russia included both the flexibility of offtake nominations embedded in long-term supply contracts and Gazprom acting as a significant supplier to the European spot market outside those contracts. With Gazprom having withdrawn from the European spot market, and many of its long-term contracts suspended,² that flexibility has been lost. Supply from Russia is now constrained to volumes available under long-term contracts, within a corridor of limited upside and downside.

The supply-side flexibility offered by other pipeline suppliers to Europe (Norway, Algeria, Libya, and Azerbaijan) is limited. Pipeline supply from Libya, Algeria, and Azerbaijan is provided largely at the limits of productive capacity relative to domestic demand (Libya and Algeria) or pipeline capacity (Azerbaijan). In summer 2022, pipeline supply from Norway exceeded the usual summer volumes, but in summer 2023 that Norwegian supply was heavily impacted by delayed maintenance and unplanned outages. Summer 2024 may see 'normal service' being resumed.

In parallel, flexibility around European storage utilisation rates has also been lost. Since April 2016, EU gas storage capacity has stood at around 106 Bcm, up from 58 Bcm in 2011. Prior to 2022, stocks held at the beginning and end of winter varied substantially year-on-year, with lower summer refills and start-of-winter stocks in times of tight markets and higher utilisation rates absorbing oversupply, as in 2019-2020. The need to accommodate both the large-scale loss of Russian pipeline supply and the dynamics of the global LNG market (where supply can be redirected to non-European markets, as in Q1 2021) make it imperative that Europe begins each winter with storage as full as possible. This will particularly be the case in 2024, with the Russia-Ukraine gas transit contract set to expire on 31 December. If full stocks by 1 November 2024 are to be achieved, summer stock replenishment must take place to its fullest extent, regardless of summer market tightness.

Supply-side flexibility in Europe therefore lies in LNG supply and the ability to utilise large winter storage stocks, but with the caveat that stock utilisation is dependent on Europe's ability to replenish those stocks in the summer. That replenishment, in turn, depends on LNG as the marginal source of supply. European LNG imports reached record volumes in 2022 and remained at a similar level in 2023. The prospects for a year-on-year increase in European LNG imports in 2024 remains uncertain, as analysed by Mike Fulwood later in this Key Themes document (LNG - How much more in 2024 and where will it go?)

² Due to the refusal of some European counterparties to accept the demand to pay in rubles and/or the effective closure on pipelines to north-western Europe (Nord Stream and Yamal-Europe)



Demand Flexibility

The other source of flexibility is on the demand side. Gas consumption declined by 13 per cent in 2022 and 8 per cent in 2023 driven by a mix of factors impacting the residential and commercial sector, the industrial sector and, last year, the power sector. However, should the European gas balance tighten again over the coming months, it is less than certain that a demand-side response would replicate such flexibility.

The most pressing issue is how much gas Europe will use this winter, for which the largest variable remains space heating in the residential and commercial sector. Colder temperatures invariably mean higher gas demand with limited (short-term) flexibility. That said, energy-saving measures last winter saved as much as 10 Bcm, but this unprecedented demand-response was facilitated by a combination of factors (mild temperatures, continued record-high gas prices, and government conservation campaigns) that are unlikely to be replicated to the same extent in 2024 - at least not in time for gas storage replenishment. This is likely to induce a rebound in gas use for heating that we estimate at 2.5-3 Bcm in January-March 2024 (and potentially up to 10-15 Bcm in a much colder winter than last year).

Another unknown is the amount of gas use in the industrial sector and by small businesses, sectors that have been showing signs of recovery since Q3 2023. The extent to which gas demand could be affected by (potentially) higher gas prices in 2024 is not straightforward and depends on contractual arrangements, hedging, and access to alternative supply. Investments in new LPG systems are likely to have increased flexibility and price responsiveness but the extent of this phenomenon remains unclear and linked to LPG/gas prices.

The power sector has traditionally been the main source of short-term gas demand flexibility in Europe with the ability to switch between coal and gas. With the rise of renewables (and coal on the way out), the use of gas plants is more and more determined by the availability of wind (days with low wind availability invariably provoke a short-term spike in gas demand). In other words, gas use for power generation is no longer an easy source of flexibility for the gas market and in 2024, it will be determined by (rising) electricity demand, the pace and extent of the French nuclear recovery, and finally, the availability of renewables.

To conclude, the fundamentals suggest an overall weaker flexibility (scale and timing) of gas demand in 2024 than experienced over the past couple of years, with the main drivers not determined by factors exogenous to the gas market (temperatures, wind, rainfalls, LPG, etc.), and therefore, largely beyond the control of the gas industry.

The limits of supply-demand flexibility in 2024

In 2024, the key metric will be the end-of-winter stocks on 31 March, and by extension, the volume of replenishment required in summer. In Q2-3 2022, European net storage injections totalled 64 Bcm, falling to 43 Bcm in Q2-3 2023. In this context, end-of-winter stocks of around 50 Bcm would appear to be a reasonable benchmark, although this would imply an increase in summer injections in 2024 of 10 Bcm more than those made in 2023. Higher stocks at the start of summer will make it easier to reach storage targets by the start of winter. Stocks substantially lower than this would seem to imply a tight summer 2024.

If the European summer storage replenishment requirement is (for example) 10 Bcm higher year-on-year, this could be met by Norwegian pipeline supply rebounding to 2022 levels. In view of the limits of upside flexibility both from other pipeline suppliers and Europe's own gas production, any year-on-year increase in summer 2024 gas consumption can only be met by additional LNG imports. Given the analysis of the global LNG market in 2024, this would imply higher prices to attract cargoes in a global market that remains tight. Given these limits to supply and demand flexibility in Europe, storage stocks at the end of winter 2023/24 will provide forward visibility for the market in summer 2024, while progress towards full stocks by 1 November 2024 will provide a forward view for winter 2024/25.

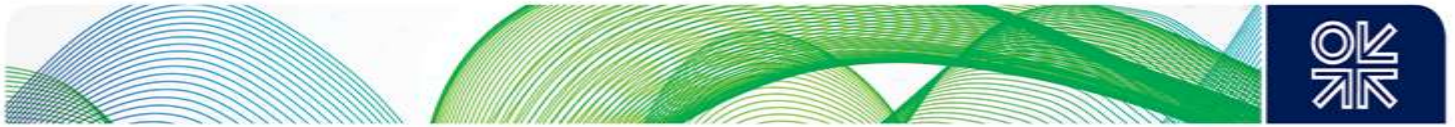
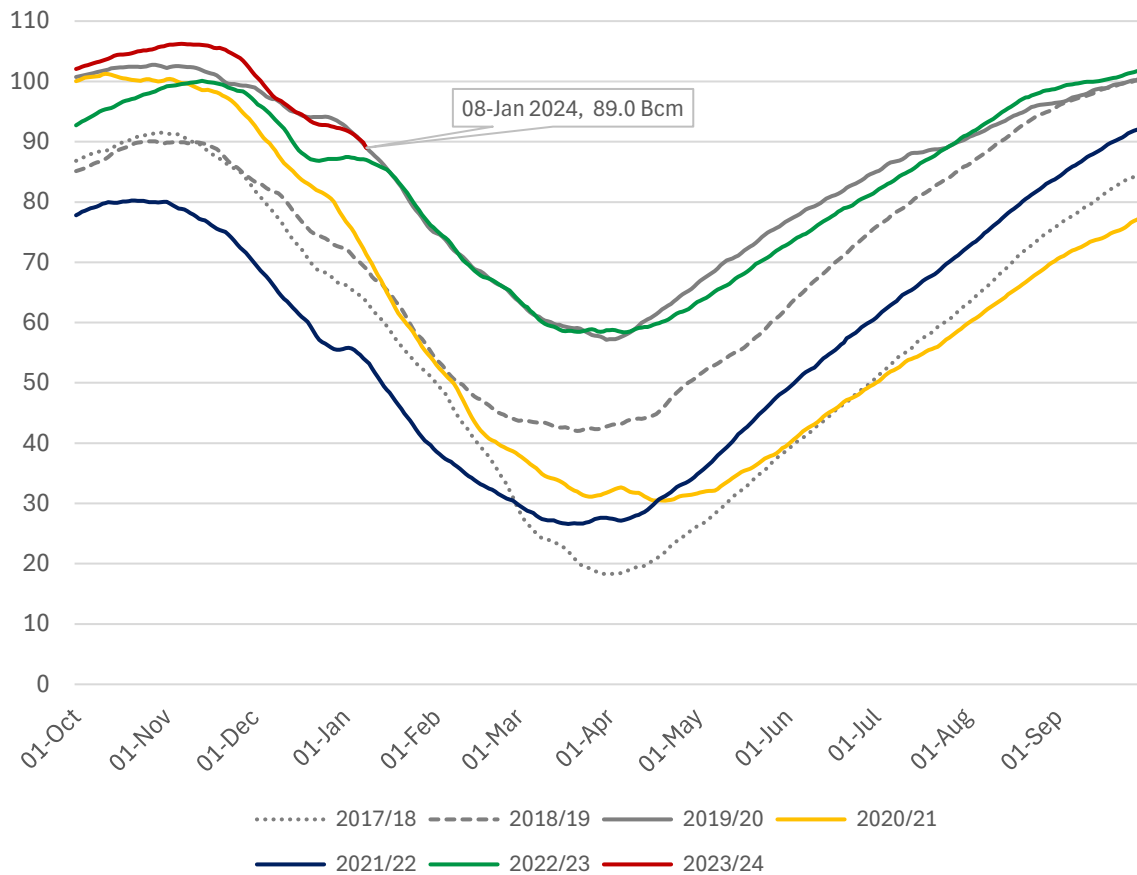


Figure 3: EU-27 Gas Storage (Bcm)



Source: Gas Infrastructure Europe (GIE) aggregated Gas Storage Inventory (AGSI+). <https://agsi.gie.eu/data-overview/eu>

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7. LNG - How much more in 2024 and where will it go?

The last five years has been a rollercoaster ride for the LNG industry. As described in the information box below, the rollercoaster has seen the market balancing in times of surplus by Europe absorbing the LNG in storage and/or the US turning down flexible LNG. In times of a tightening market, Europe has released gas from storage and/or other markets, especially in Asia, have reduced demand for various reasons with ultimately some countries being priced out of the market.

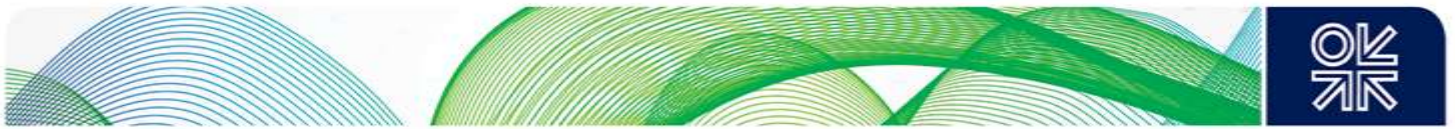
The LNG rollercoaster could be set to continue on yet another white-knuckle ride in 2024. The prospects are for LNG export capacity to rise by just under 20 bcm. This growth in capacity in 2024 comes with a full year of Freeport and new projects in Tangguh T3 (Indonesia), Arctic 2 T1 (Russia) and Greater Tortue (Senegal/Mauritania) later in the year, plus smaller projects in Mexico and Congo. A recovery in feedgas supply in Nigeria and Trinidad and Tobago will also support growth. On the downside, Australia may lose some capacity as Darwin closes and Northwest Shelf prepares to close a train. The just under 20 bcm rise remains uncertain, however, as we have seen before, because of unexpected technical issues, feedgas problems, and unscheduled maintenance, plus export capacity can be impacted. Arctic 2 T1 is now also the subject of force majeure (FM) being called by the project participants, as a result of the sanctions imposed by the US. However, the FM seems more likely to reduce utilisation of Train 1, rather than stopping the project completely.

If the full increase in capacity is delivered, where might the extra supply go? **China** was the largest driver of growth in 2023 and, at least in the early part of 2024, this may continue, but year-on-year growth is likely to slow as the year progresses, given the high base levels achieved in the second half of 2023. **Southeast Asian** growth is set to continue, especially with Vietnam and Philippines joining the LNG importers club. Providing prices remain subdued, the pick-up in **India, Pakistan, and Bangladesh** is also set to continue. It seems plausible that these three areas of Asia could absorb all of the 20 bcm forecast growth. **Japan, South Korea, and Taiwan** could fall further if Japan's phased nuclear restart continues, but Korea and Taiwan should be stable.

Growth in other areas of the world, outside Europe, may be limited to **Central and South America**, with the smaller Caribbean and Central American importers showing some growth. However, the biggest swings in LNG imports are often seen in Brazil, with LNG imports balancing volatile hydro power capacity. An El Nino-induced drought could lead to a surge in LNG imports into Brazil as seen in 2021. In the absence of any surge in Brazil, LNG imports into **Europe** in 2024 could remain close to 2023 levels, which should enable Europe to refill its storage over the summer months if excessive amounts are not withdrawn this winter, as discussed in our article on European gas market flexibility in 2024.

Overall, the prospect of a nearly 20 bcm increase in LNG supply in 2024 may be just enough to meet anticipated demand growth for LNG imports. However, if there are one or more unexpected events – supply curtailments and/or surges in demand – how will the market balance? As noted above, European storage and flexible US LNG have done the heavy lifting in the past, helped latterly by weaker demand in China and Japan. However, weakness in LNG demand in any area of the world seems less likely this year. In any case, there is no spare LNG export capacity waiting to be utilised in 2024.

As ever, the European winter will be a key driver in 2024. While EU storage levels were some 5 bcm above the 1 October target in 2023 at 95 bcm, temperatures for the remaining months of the winter will determine how much of that storage buffer remains and needs to be refilled in the summer months. A mild winter would allow for some flexibility in European LNG demand. If, as discussed in the key theme on European gas market flexibility in 2024, gas in storage in Europe at the end of March is some 50 bcm, then the need to fill up some 45 bcm by October 1 should not require any more LNG imports, (and even possibly fewer) than in 2023. As also noted in the key theme on European gas market flexibility, on the flipside, colder weather in Europe and, especially, in Northeast Asia could lead to significantly higher withdrawals from European storage. In which case the need to refill storage will compete with the rising demand in Asia. In such a scenario, supply would be rationed by rising prices, leading to gas being priced out of some markets in Asia, especially India, Pakistan, and Bangladesh, and also in the power and industry sectors in Europe.



THE LNG ROLLERCOASTER RIDE – 2019 to 2023

Up to **2018** – maybe the last normal year – LNG imports were growing steadily mostly in Asia, with some growth in the Middle East and Egypt, while Europe offered a stable baseload level of demand. Supply was growing in the US and Australia, plus PNG and latterly Russia through the Yamal project. The market has balanced in times of surplus by Europe absorbing surplus LNG into storage and/or the US turning down flexible LNG exports. On the flip side, market deficits have prompted Europe to release gas from storage, while other markets such as Asia have reduced demand and ultimately some countries have been priced out of the market.

2019 was the first year of signs of upheaval in the market. Available LNG export capacity grew by almost 80 bcm led by the US, Australia, and Russia (as Yamal ramped up). Rising demand in Asia soaked up some of the rising supply but Europe balanced the market by absorbing part of the surplus in storage, as prices fell, and some capacity remained unutilised.

In **2020** COVID hit and global gas demand declined sharply. LNG imports fell slightly in the context of a continuing rise in LNG export capacity of another 20 bcm – all from the US. This combination led to a further decline in prices and the shutting-in of US LNG exports, which balanced the market.

2021 was not just the first COVID recovery year but also saw a cold northern hemisphere winter, and LNG imports rebounded sharply in Asia, especially China, and also in Brazil as hydro power was hit by a drought. However, available LNG export capacity actually declined as a backlog of maintenance and technical issues hit capacity. The US managed to increase supply year-on-year, utilising the spare capacity from 2020 and Europe drew down its storage as LNG was diverted to Asia.

In 2022, the Russian invasion of Ukraine was the main market driver. The rapid decline in Russia's pipe flows to Europe saw prices soar. Europe met the fall in Russian flows by sharply reducing demand and increasing LNG imports, in part from a return to growth in LNG export capacity – some 20 bcm – but also by diverting flows away from Asia, especially China, where demand for LNG plummeted on the back of Covid-induced lockdowns, and Brazil where improved rainfall boosted hydro.

2023 was a comparatively calm year compared to the previous four. LNG export capacity rose but only by some 13 bcm or so, largely in the US as Freeport returned and other projects ramped up. Extended maintenance at some terminals, feedgas restrictions and delays to the start-up of new projects meant that capacity growth undershot expectations. Europe LNG import volumes were largely flat year-on-year. China volumes rebounded strongly after a weak 2022, Southeast Asian growth continued and India, Pakistan and Bangladesh recovered. The market balanced as demand in Japan and Korea dropped by some 13 bcm.

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8. Geopolitics and oil demand uncertainty complicate the OPEC+ balancing act in 2024

There is precious little consensus on the outlook for oil demand in 2024 amid an ever-more complicated array of macro and emerging structural transition drivers. After robust non-OPEC supply in 2023, this will complicate the OPEC+ market balancing mission in the year ahead. Despite a worsening geopolitical picture in Europe and the Middle East, oil markets seem increasingly ready to look through short-term supply risks. But the 2024 election calendar is crowded which could also set new policy directions later in the year and into 2025, so politics remains a significant wild card.

Notwithstanding a mid-year foray above \$90/bbl, the past year saw oil prices largely rangebound between \$75-85/bbl and the global oil market close to balance, despite a plethora of moving parts on both sides of the ledger. For demand, 2023 was the year that oil finally almost recovered the ground lost during COVID (jet fuel demand is still 13 per cent below its pre-Covid level), coming in at a robust 2.1 mb/d of growth. China's easing of COVID restrictions helped this and the country's oil demand hit an all-time high of 16.2 mb/d.

On the supply side, Russia completed the re-routing of crude and product exports to Asia and other destinations, which meant that sanctions and the G7 price cap had only limited impacts on Russian supply, although trade optimization has come at the cost of longer routes and higher costs. Limited supply disruptions combined with a robust non-OPEC crude supply growth of 1.5 m/d in 2023, as well as a more pro-active approach by OPEC to market management, contributed to the OPEC+ decision to deepen its voluntary production cuts by 2.7 mb/d compared to the start of the year.

Looking ahead to 2024, the following three themes will shape market balances in 2024.

Theme 1: Oil demand uncertainty

The lack of consensus on global oil demand expectations for 2024 is elevated for a second consecutive year (see Figure 4). Drivers of this uncertainty are macro themes and the divergent views about the pace of the transition. On the monetary front, central banks have signalled a pathway for rate cuts in 2024 as the inflation challenge eases. The timing of the start of the cutting cycle will drive markets and reframe GDP forecasts later this year.

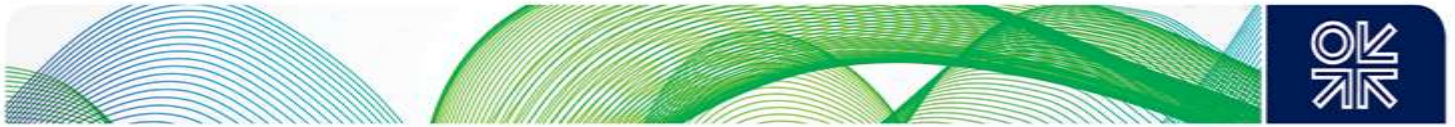
But it is the pace of the transition away from oil in transportation and other sectors as well as efficiency gains that offers the greatest vector of uncertainty in the medium term. For example, the IEA expects global gasoline demand growth to flatten in 2024, and has cut its OECD gasoline forecast by 340 kb/d with the major transportation fuels gasoline, jet fuel, and diesel/gasoil contracting by 200 kb/d, 30 kb/d, and 170 kb/d respectively.³ Conversely, OPEC expects transportation fuels to drive global demand growth in 2024, forecasting oil demand growth of 2.25 mb/d versus the IEA's forecast of 1 mb/d.⁴ With COVID impacts almost in the rear mirror, it should be easier to gauge the impacts of energy transition on fuel demand.

Theme 2: The OPEC+ balancing act

The OPEC+ market balancing mission is complex. The group agreed to an output plan for 2024 which sees 3.7 mb/d of cuts which have been progressively carried over since November 2022 being extended to the end of 2024. It also committed to an additional 1.5 mb/d voluntary adjustments, with Saudi Arabia doing the heavy lifting on these extra cuts that will last at least through 1Q24. This blend of cuts will amount to a total of 5.1 mb/d in 1Q24, which for reference is more than 50 per cent of the historic 9.7 mb/d cut enacted in 2020 in response to COVID (nearly all of those cuts were reversed in the summer of 2022 - see Figure 5). The prospect for unwinding current cuts will depend upon the trajectory of actual demand and whether non-OPEC supply can sustain the level of gains seen in 2023, which we think is unlikely. We expect growth in non-OPEC crude supply to ease to 940 kb/d in 2024.

³ IEA, Oil Market Report, December 2023.

⁴ OPEC, Monthly Oil Market Report, December 2023.



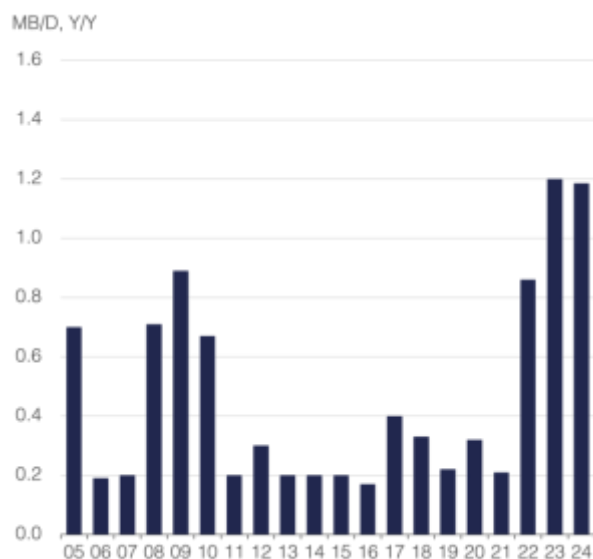
Theme 3: Geopolitics and elections

The two ongoing wars in Europe and the Middle East threaten oil supply in different ways, although for Ukraine the impacts of sanctions and the price cap have been mostly sidestepped by Moscow. A broadening of the Gaza conflict that involves impacts on seaborne oil and products in the Red Sea is now dominating the supply picture. Although the potential for disruption elsewhere in the region should not be discounted, the market seems to be attaching little weight to these risks for now.

November US elections will also play a key role in oil markets. Despite sanctions on several major oil producers, the White House will want to avoid any risk of rising gasoline prices in an election year. In turn this implies that sanctions breaches will be overlooked and that the SPR could once again be deployed to address any short-term supply disruptions and limit upside price impacts. Iran's oil exports will likely remain elevated in 2024, but are close to their technical limit. US efforts to allow higher Venezuelan oil exports meanwhile will have a limited impact due to chronic underinvestment and mismanagement in the country's oil industry. The US has also thrown its weight behind Guyana, a new source of supply growth, in its territorial dispute with Venezuela.

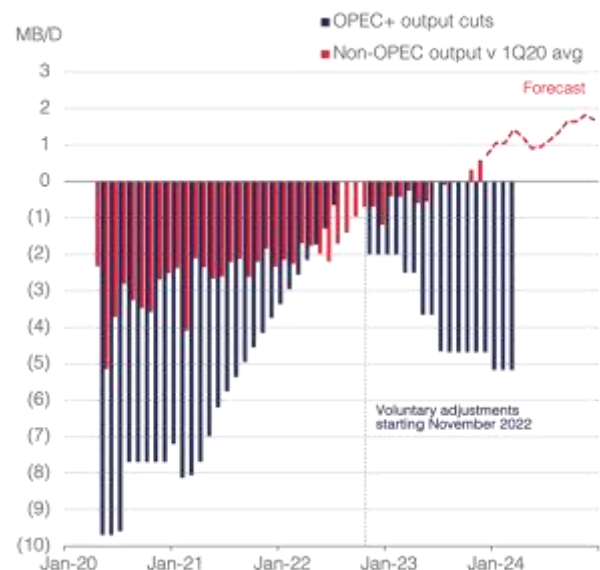
Prospects for US oil production are also a major moving part of the global supply side and a potential political lever in the US elections. US production surprised on the upside in 2023 reflecting productivity gains, improved project execution, the large drawdown in drilled but uncompleted wells (DUCs) and rising well completions. A big uncertainty is whether the efficiency gains in US shale will continue into 2024 to offset the decline in the rig count.

Figure 4: Difference between key agencies' global oil demand growth forecasts



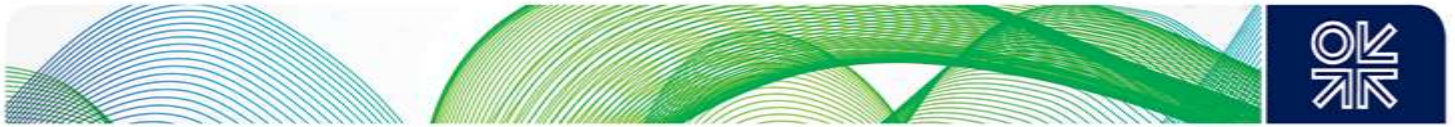
Notes: Difference between the 1-year ahead global oil demand growth forecasts from IEA, US EIA and OPEC based on December reports of the previous year.
Source: IEA, US EIA, OPEC, OIES

Figure 5: OPEC+ cuts vs non-OPEC output



Notes: Crude oil only.
Source: OPEC, IEA, OIES

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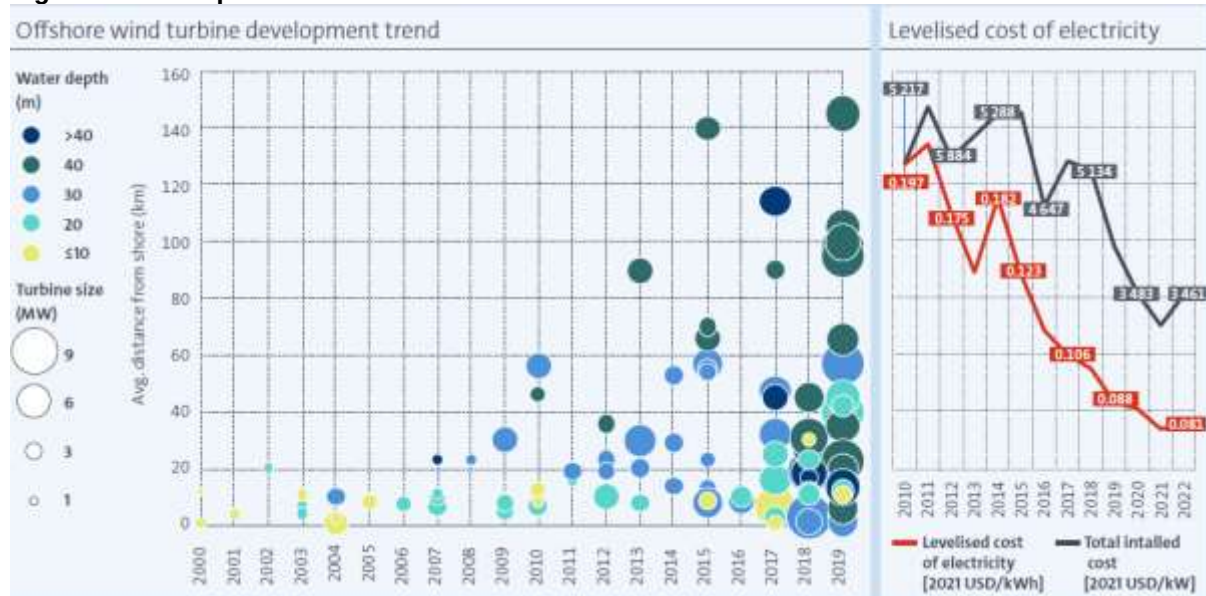
9. Offshore wind power: growth, challenges, and navigating the future

In recent years, offshore wind deployment has increased significantly. Installed capacity has risen, contributing to a cleaner energy mix globally. Europe and the UK specifically have been at the forefront of the trend, while in recent years, the Asia-Pacific region, led by China has made impressive strides. From a decarbonization perspective, the expansion of offshore wind has undoubtedly been a positive development. But looking ahead to 2024, the industry will need to overcome broad challenges, from grid connection and permitting to auction rules and electricity market design. While growth will continue, offshore wind is now set to enter a period of consolidation and stabilization.

The strong growth in offshore wind has not been without its problems. In the last couple of years, the industry has been facing significant inflationary price pressures for materials, labour, and services with implications for various elements of the supply chain and overall project costs. Cost inflation is partly driven by post-COVID economic recovery, the energy crisis, and burgeoning geopolitical conflicts. The supply chain crunch, characterized by a shortage of components and delays in deliveries, is partly due to the rapid scaling up of the industry, which has outpaced the ability of the supply chain to keep up. The COVID-19 pandemic has also had a significant impact, causing disruptions in manufacturing and logistics worldwide.

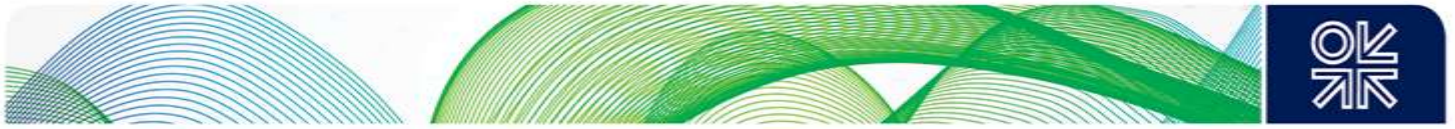
On top of that, capital costs have been affected by factors such as the need for more sophisticated technology for larger turbines, deep water installation, and more remote geographical locations. There has been an increasing need for specialised vessels and infrastructure for installation and maintenance, vessels which are limited in number and thus more expensive to procure. The growing size of turbines demands larger ports and upgraded facilities, yet these critical resources remain scarce. The UK's port infrastructure, for example, has been cited as a bottleneck which hinders the expansion of the industry. This, coupled with the complexities of floating wind farm development has created a difficult dilemma in the sense that larger turbines offer greater efficiency but require more robust infrastructure, which is currently scarce or unavailable.

Figure 6: Development of the offshore wind in the last two decades



Source: International Renewable Energy Agency (IRENA). Offshore wind energy patent insight report November 2023

There is also the issue of grid interconnection. In many markets, especially mature markets, grid systems have been unable to keep pace with offshore wind targets because of grid congestion, limitations in transmission capacity or the high cost of additional grid investment. For new offshore wind markets, however, there is an opportunity to proactively address these grid-related challenges through 'whole systems approach planning', thus avoiding the pitfalls experienced by more mature markets.



Another challenge has been the issue of inadequate and inefficient permitting and licensing rules, which have resulted in extended project timelines or delays, increasing uncertainty and financial risks for developers. In some cases, it has even resulted in indefinite stalls in offshore wind projects. This is exacerbated by inflexible regulatory frameworks in some jurisdictions or lack of harmonisation across different regions. In some regions, local content requirements have been introduced in the auction with the aim of boosting domestic industry, but it has resulted in increased project costs and complexity, especially in places where local supply chains are not yet mature enough to meet demand.

The combination of factors mentioned above has in some cases forced developers to review the financial and operational feasibility of their projects under these new conditions. In some instances, this has led to the halting of project development or the withdrawal of bids in competitive auctions.

The UK's 2023 CfD auction, where no bids were submitted for new offshore wind projects, highlighted the widening gap between government support mechanisms and market realities. This necessitates a re-evaluation of policy frameworks, with a focus on adaptability and long-term sustainability.

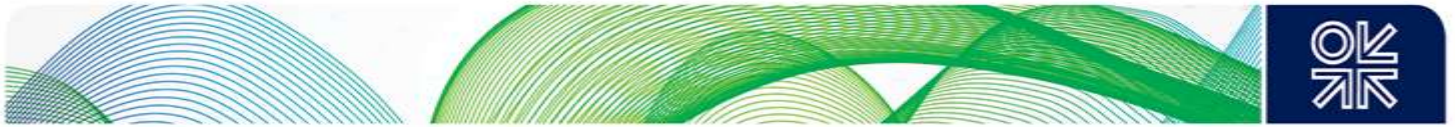
This is not just an issue in the UK. Across the Atlantic, the US offshore wind sector is also at a crossroads. Industry leaders question the economic feasibility of the Biden administration's ambitious 2030 target of 30 GW goal of offshore wind, citing financial strains on turbine manufacturers and the potential impact of the Inflation Reduction Act. This uncertainty reflects the global trends of rising costs and policy challenges and will force a strategic recalibration of expansion plans.

Government policies play a critical role in removing barriers to the expansion of the offshore wind sector. First, policymakers need to facilitate investment in grid infrastructure to ensure that an increased capacity of offshore wind can be integrated into the energy system effectively. Auction design also need to provide a balance between competition, speculative bidding, and industrial strategy. When the non-delivery penalty is low, the auction turns into an option for developers who bid with the expectation that technology costs will decline. In recent years, aggressive bidding in auctions for new projects has led to slim margins which have made it challenging for developers to maintain profitability and reinvest in technology and infrastructure.

As we set sail into 2024, the offshore wind industry is expected to continue navigating these turbulent waters. The UK government's recent decision to increase the CfD strike price for this year's auction demonstrates a willingness to acknowledge the economic realities of the sector and respond flexibly. But this is only one of an array of challenges that should be the focus of any policy rethink. For this reason, the coming years are likely to witness a period of consolidation and stabilization. Economic viability and sustainability will become paramount concerns for offshore wind developers. Standardization in turbine sizes, alongside the development of more resilient business models are likely to become the focus of the industry.

While the current condition of the sector presents serious challenges, there are grounds for optimism. The offshore wind industry has proven to be resilient and has the potential to transform the energy landscape. With adaptive strategies, appropriate government policies and a better focus on economic viability, it can continue its vital role in powering a cleaner future.

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10. 2024: A make-or-break year for carbon markets and solutions

By its conclusion, COP28 had left climate proponents with a bittersweet feeling. On a positive note, for the first time the final COP text explicitly noted the need to transition away from fossil fuels and for the urgent deployment of carbon management solutions such as carbon capture, utilization and storage (CCUS) and carbon dioxide removal (CDR). This comes as no surprise as developments in the CCUS/CDR space had been gaining steady momentum throughout 2023, following enactment of national and regional supportive policy frameworks in the form of tax credit enhancements under the US Inflation Reduction Act (IRA), and promising long-term plans for a CCUS/CDR market embodied in Europe's Net-Zero Industrial Act (NZIA) and the UK's recently announced 'CCUS Vision'.

More specifically, and in recognition of carbon management as an integral part of the climate action toolkit, the international community launched the Carbon Management Challenge (CMC) at COP28. This laudable milestone represents a call to action by countries to advance carbon management and is a culmination of several years of collaborative effort to place carbon management solutions on track to reduce and remove emissions in the gigatonne order by the 2030s, consistent with net-zero targets. This was in almost perfect sync with another announcement on demand-side policy, where a number of governments, including the UK, US, Canada, and Germany, pledged to procure low-carbon steel, cement and concrete – a feat which may well drive the business case for CCS adoption in hard-to-abate sectors.

COP28 was expected to be the 'Carbon Markets COP', yet its failure to operationalise an international carbon market mechanism under Article 6 led to widely voiced disappointment amongst market experts, leaving much work to be done in 2024. One major point of contention was whether emission avoidance projects should be eligible under the mechanism, with concerns that this may open doors to lower-quality projects displacing others with real and additional climate impact, such as carbon removal projects. Yet, on removals themselves, concerns remained regarding the rigour of presented guidance and on methodologies, particularly in relation to addressing reversal risk. Countries also expressed reservations over the authorisation of sold credits (whether they to be allowed to be revoked by host countries), which could raise issues of double-counting if credits were already traded.

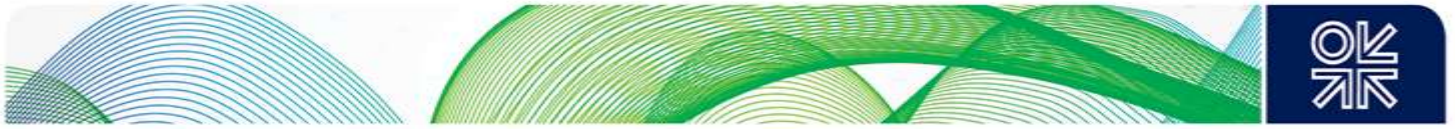
Despite the stalemate, two positives can be taken away. First, it is now clear that quality, however it is defined, matters over operationalisation; and second, in the absence of a centralised Article 6.4 mechanism, the focus should shift back to bilateral agreements under Article 6.2 and the voluntary carbon market to drive investment into key climate mitigation projects, including CCS and CDR.

On the former, the voluntary carbon market endured a turbulent 2023 with many questions raised regarding the quality of carbon credits – and ultimately the integrity of carbon markets as a genuine climate tool. In response, industry standards bodies came together to delineate best practices that defined 'high-integrity' credits, resulting in several packages of voluntary frameworks, most notably by the Integrity Council for the Voluntary Carbon Market (ICVCM) and the Voluntary Carbon Markets Integrity Initiative (VCMI).

These efforts resonated with a subsequent launch at COP28 by six of the world's leading independent crediting programmes of a collaboration on an integrity framework, as well as a joint proposal by governments at COP28 for an international framework that avoids greenwashing and helps formulate clear claims in relation to the use of carbon credits – a theme which is set to be a key one to follow in 2024.

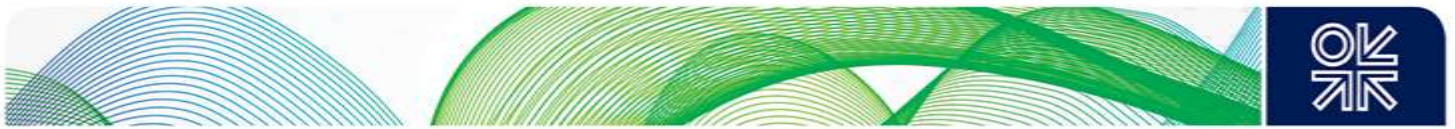
Indeed, there is a notion of a 'new' and rejuvenated voluntary carbon market moving forward, where demand is expected to increase for credits labelled with the ICVCM's Core Carbon Principles (CCP) stamp of high-quality approval while on the other hand, fall for older vintage credits not subject to the same quality standards. This is already evident in recent credit transactions that show prices of older vintage credits tumbling to less than \$1 while correspondingly-adjusted credits are valued in double-digit figures.

It is clear that decarbonizing economies cannot be attained solely through commodity markets and, despite the setbacks, carbon markets will remain one of the few vehicles available to deliver real impact and monies to frontline communities, especially in the Global South. Alongside a continued focus on



integrity, carbon markets are also increasingly experiencing a shift towards procuring carbon removal over avoidance/reduction credits, as they are widely regarded as higher quality, more future-proof, and are much less contested. However, it is important to ensure that this shift is equitable and just, and that it does not disrupt the flow of capital from the Global North to the Global South which has been a key feature and advantage of carbon markets. It remains to be seen whether the promising announcements made at COP28 will result in substantive change, coherence, and collaboration, with better definitions expected around what net-zero truly means.

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11. Hydrogen – China leading Europe and US on green projects

European renewable hydrogen presents one of the clearest examples of the gap between energy transition policy targets and the harder reality of investment and approvals, a lag that could worsen in 2024 or force the adoption of more realistic targets. EU plans published in July 2020⁵ set out a vision to install at least 6GW of renewable hydrogen electrolyzers by 2024, on the road to 40 GW of capacity by 2030. Having missed the 2024 target, this nascent industry will have to run hard if it is to have the slightest chance of making its target of 40 GW of capacity by 2030, let alone the more aggressive targets set subsequently.

As we start 2024, it is instructive to review developments since then and a key theme as we progress through the year will be to review progress in scaling up electrolytic and CCS-enabled hydrogen globally.

Europe's energy transition targets were strategically revisited following the Russian invasion of Ukraine in 2022. The European Commission's policy package in response to the invasion, REPowerEU,⁶ raised the target to 10 million tonnes of renewable hydrogen production within EU by 2030, and an additional 10 million tonnes of imports. The document did not translate this into GW capacity, but an OIES paper at the time⁷ (confirmed by multiple publications subsequently) calculated that this would require 125-250 GW (depending on annual full load hours) of electrolyser capacity together with associated additional renewable power generation within the EU by 2030.

According to the latest IEA hydrogen production database published in October 2023,⁸ Europe now has nearly 3 GW of electrolyser capacity which is at FID or under construction, although just 200 MW is operational. Much of the capacity under construction is not expected to be operational until 2025 or 2026. So it is clear that Europe is far off track on even the targets set in 2020, let alone the significantly higher targets set in 2022. It will be important during 2024 to track whether delivery falls further behind or whether policy is sufficient to stimulate new FIDs.

There are some encouraging signs of progress, with increasing realism about the issues of bringing significant investments to fruition, which is clearly far more challenging than merely announcing an intended project. The establishment of the European Hydrogen Bank, which is starting subsidy auctions, is a further important development. In the UK, progress is being made on government negotiations with project developers and some significant FIDs are likely in 2024. There is also a growing recognition among EU policymakers that it will be very challenging to rely only on electrolytic hydrogen given the need for large-scale deployment of both renewable power and electrolyzers. This is leading to a growing acceptance, both at EU level and within member states that so-called blue hydrogen (from fossil fuels, typically natural gas, combined with CCS) will also be important at least for a transition period. Some potentially significant CCS projects in Europe have either taken or are close to FID: in Norway, Northern Lights is under construction and expected to start operations in 2024, in the Netherlands the Porthos project in Rotterdam announced FID in October 2023 and further projects in the UK and Denmark are expected to take FID in 2024. Scale is still a challenge, however, as these projects would capture and store a total of only around 10 million tonnes CO₂ per year, equivalent to the emissions of just 1 million tonnes of hydrogen manufactured via steam methane reforming.

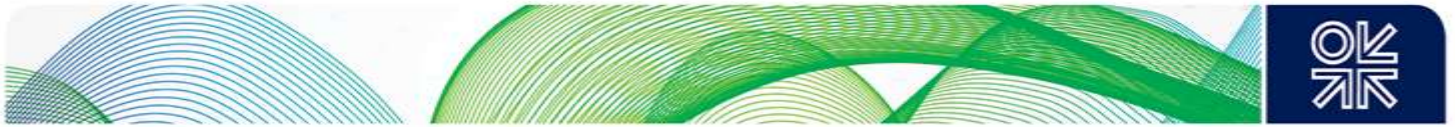
Outside Europe, the US Inflation Reduction Act boosted its hydrogen policy with a \$3/kg tax credit for the lowest carbon hydrogen production. After an initial flurry of investor interest, progress has been slowed by a lack of clarity on the methodology for calculating emissions in order to qualify for the credit. The US government is expected to announce the detailed methodology early in 2024. Current indications are that the rules under development may prove somewhat disappointing for potential investors, but there should be much more clarity on both the rules and the resulting investor response as 2024 progresses.

⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0301>

⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0230>

⁷ <https://www.oxfordenergy.org/publications/repowereu-can-renewable-gas-help-reduce-russian-gas-imports-by-2030/>

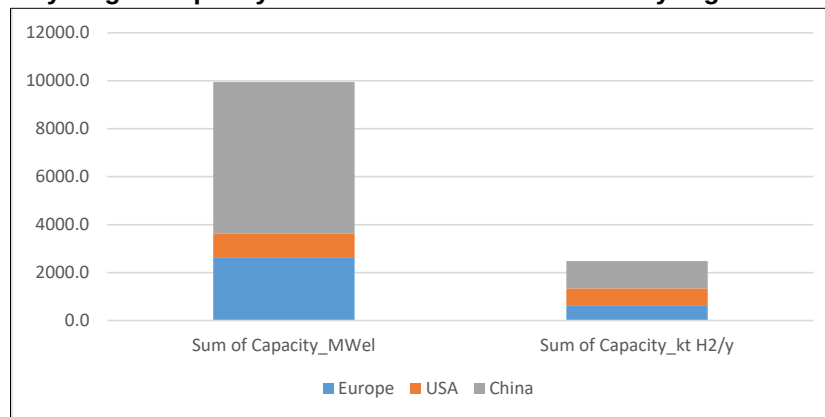
⁸ <https://www.iea.org/data-and-statistics/data-product/hydrogen-production-and-infrastructure-projects-database>



In China, analysis of the IEA database indicates that while just 500 MW of electrolyser capacity is operational, 6.3 GW of capacity is at FID or under construction. While data from China may be less reliable than elsewhere, this does indicate significant progress in renewable hydrogen production capacity. It is also significant that some reports indicate that by end-2024, China will have more than 40GW of electrolyser manufacturing capacity, well over half the global total of 71GW.⁹

So while Europe continues to fall behind its unrealistically ambitious targets, and the outlook for US developments remains uncertain, 2024 may be the year when China starts to dominate in renewable hydrogen, as it has come to dominate in solar PV installations and manufacturing. More speculatively, this could also be an indication that China will prove more able to deliver on its Net Zero targets than its western competitors.

Figure 7: Green Hydrogen Capacity at FID – Under Construction by region



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⁹ <https://www.hydrogeninsight.com/electrolysers/interview-china-is-overbuilding-hydrogen-electrolyser-manufacturing-capacity-and-may-have-to-shut-some-of-it-down-citigroup/2-1-1506515>