



THE POWER SHIFT

The impact of the low-
carbon transition on the
oil and gas economy

By
Yana Popkostova



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The *Chaillot Paper* series, launched in 1991, takes its name from the Chaillot hill in the Trocadéro area of Paris, where the Institute's first premises were located in the building occupied by the Western European Union (WEU). The hill is particularly known for the Palais de Chaillot which was the site of the signing of the UN Universal Declaration of Human Rights in 1948, and housed NATO's provisional headquarters from 1952 until 1959.

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EXECUTIVE SUMMARY

The world's reckoning with environmental degradation and climate change, which has emerged in particularly stark relief over the past three decades, has led to the low-carbon energy transition being embraced as the universal solution to the global climate challenge. However, enthusiasm for clean energy and low-carbon technological innovation has not always been matched by a commitment to relinquish the addiction to consumption-led growth. Policy incentives for radical decarbonisation and support to clean energy technologies have driven an unprecedented reallocation of capital and the reconfiguration of conventional energy systems. The ongoing war in Ukraine and the volatility that it has created in energy markets in Europe and beyond has only reinforced this trend. The policy dictum that equates the adoption of low-carbon energy sources as the dominant energy carriers with an unequivocal leap into a secure, environmentally sustainable and equitable energy economy has established itself as the prevailing policy narrative. But this vision is at times myopic, impervious to critical scrutiny, and oblivious to the advent of new challenges and the insidious risks that could arise from this new trajectory and derail the clean energy transition.

Unfortunately, the phasing out of conventional energy sources – oil, gas and coal – without a concerted and targeted effort to curtail overall energy demand and fossil fuel consumption in particular might lead to a major distortion in the economy and compromise, rather than enable, the net-zero transformation. In addition, while the adoption of clean energy solutions is warranted, embarking on a transition to a low-carbon economy without putting in place adequate resilience and stress-testing measures to gauge the ability to

balance security, sustainability and affordability priorities could create dangerous volatility and an avalanche of shocks that would pit climate ambitions against national security maxims. Ultimately, the radical decarbonisation trajectory, if not properly managed, will alter established power equilibriums, eroding the power of petro states while amplifying the influence of countries controlling green commodity value chains – a shift that might create new dependencies, rampant inequalities, and a new age of scarcity with serious repercussions for economic and social stability.

This *Chaillot Paper* examines the transformation of the energy system that is currently unfolding and the contingent macroeconomic impacts on the oil and gas sector, also shedding light on conflicting and contradictory policy signals and their unintended consequences. It identifies avenues of action for the major oil corporations and producing states, recognising the different pressures to which these stakeholders are exposed, as well as their differing priorities and agendas, but also highlighting divergent starting points and approaches as well as the weight of inherited structures and practices that might impact their ability to adapt to a carbon-constrained operational environment. Lastly, the paper presents a set of recommendations regarding strategies that these stakeholders could adopt in order to bolster their resilience and emerging risk management strategies. These have been formulated with specific reference to the energy crisis that has been engulfing Europe and the world for the past 18 months, and map both challenges and opportunities ahead. The recommendations propose a series of targeted measures that the EU might pursue in the short, medium and long term to enhance the bloc's strategic resilience⁽¹⁾.

(1) This *Chaillot Paper* was completed in autumn 2022 with some updates made in January 2023.

INTRODUCTION

THE RIP CURRENT OF CHANGE

The net-zero (r)evolution?

The 2015 Paris climate accord with its 196 signatories committed the world to limiting global warming to 2.0C, and preferably 1.5C, above pre-industrial levels; emissions reduction was espoused as the key tool to achieve this goal⁽¹⁾. The implementation of this agreement entails a colossal task of unprecedented economic transformation – encompassing and impacting all economic sectors, segments of society and political relationships⁽²⁾. The energy transition is not a linear process; it extends beyond the diversification of the energy mix and the ultimate replacement of hydrocarbons with renewable energy sources, and entails profound structural changes – from infrastructure and regulatory overhaul, to capital allocation, and permeating policies and politics but also social practices and behaviour. This makes gauging the process inherently challenging: agency is widely dispersed; governance and financial layers multiple; and

social and vested interests divergent within and across polities⁽³⁾.

Regional disparities abound as well: while the EU pursues aggressive net-zero emissions targets, others across the world seem set to lock in fossil-fuel intensive development models. Different sectors respond in a diverse manner: for instance, the decarbonisation of the power sector in Europe has been an unprecedented success; conversely, heat, agriculture, building, transport and heavy industry, together accounting for about 75 % of the bloc's emissions, have so far been immune to this trend⁽⁴⁾. This differentiated aspect makes the process conditional on multiple variables, hence uncertain⁽⁵⁾. The climate predicament adds an additional layer of complexity: the latest scientific consensus is unequivocal – the world has less than a decade to prevent a dangerous escalation of global warming, and large-scale ecosystem and livelihood destruction, a dire

- (1) Paris Agreement to the United Nations Framework Convention on Climate Change, T.I.A.S. No. 16-1104, 12 December 2015 (https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf).
- (2) Intergovernmental Panel on Climate Change (IPCC), *Global warming of 1.5°C*, Special Report, 2018 (<https://www.ipcc.ch/sr15/download/>).
- (3) The FT Interactive Climate Game demonstrates how immensely complex achieving net-zero emissions is in practice. See 'The climate game: Can you reach net zero by 2050?', *The Financial Times*, 21 April 2022 (<https://ig.ft.com/climate-game/>).
- (4) Eurostat, 'Greenhouse gas emissions by source, 2019' (<https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-4a.html?lang=en>).
- (5) Keay, M.R., 'How energy transitions happen and what they involve', in: Wood, G., Onyango, V., Yenneti, K. and Liakopoulou, M.A. (eds.), *The Palgrave Handbook of Zero Carbon Energy Systems and Energy Transitions*, Palgrave Studies in Energy Transitions, Palgrave Macmillan, Cham, 2022 (https://doi.org/10.1007/978-3-030-74380-2_27-1); Fattouh, B., Poudineh, R. and West, R., 'The rise of renewables and energy transition: what adaptation strategy for oil companies and oil-exporting countries?' Oxford Institute for Energy Studies (OIES), May 2018 (<https://a9w7k6q9.stackpathcdn.com/wp-content/uploads/2018/05/The-rise-of-renewables-and-energy-transition-what-adaptation-strategy-for-oil-companies-and-oil-exporting-countries-MEP-19.pdf>).

warning that logic suggests would serve to accelerate the decarbonisation curve⁽⁶⁾.

The radical decarbonisation agenda can be impacted by context as well: for example, the war in Ukraine, which has exposed the insidious relationship between fossil fuel dependency and security and precipitated an energy crisis and wider cost-of-living crisis across the globe; the Covid-19 pandemic and stimulus packages aimed at sustainable, green and future-proof recovery; as well as an increased cadence of watershed events related to historic record-breaking temperatures, aberrant weather conditions and environmental security deficiencies. Moreover, the political, social and economic upheavals provoked by these developments impose considerable structural adjustments on the energy sector, with potentially far-reaching repercussions for the oil and gas economy. Under Paris Agreement temperature thresholds, two thirds of proven fossil reserves must remain underground – the inability to monetise this endowment augurs a bleak future for hydrocarbon producers with associated impacts on political stability, on oil-producing states, and on global financial stability, where a collapse of the market

value of the hydrocarbon industry and assets exposed to transition risk would eclipse the mortgage crisis of 2009⁽⁷⁾.

Simultaneously, and notwithstanding bold rhetoric on the net-zero transformation, implementation has been lukewarm. Greenhouse gas emissions are on the rise; the unprecedented market contraction induced by the Covid-19 pandemic has been followed by economic recovery marked by equally unprecedented levels of energy consumption; while stimulus funds committed to finance the clean energy transition are dwarfed by the amounts spent on activities that increase carbon emissions and are detrimental to the environment⁽⁸⁾. Declarations by technocrats and politicians exhibit a certain schizophrenic quality, not to say amnesia, at one point calling for a complete halt to new investments in fossil fuel production, only to appeal for an increase in such production a few weeks later⁽⁹⁾; or mandating a halt of oil and gas exploration on federal lands, only to subsequently threaten the imposition of fines on companies refusing to drill⁽¹⁰⁾; or yet, proclaiming the end of coal only to relocate local communities in order to open new mines (as has happened in

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- (6) IPCC, 'Climate Change 2022: Impacts, Adaptation, and Vulnerability', Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Pörtner, H.O., Roberts D.C. et al. (eds.)), Cambridge University Press, Cambridge, UK and New York, NY (https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf); 'IPCC issues "bleakest warning yet" on impacts of climate breakdown', *The Guardian*, 28 February 2022 (<https://www.theguardian.com/environment/2022/feb/28/ipcc-issues-bleakest-warning-yet-impacts-climate-breakdown>).
 - (7) About \$50 trillion of financial assets today are exposed to transition risk (only \$1 trillion of collateral debt obligation assets in 2007 caused the financial crisis). A loss of up to \$7 trillion by 2040 could accumulate for Saudi Arabia, the United Arab Emirates, Russia and Nigeria. For an excellent account of transition risk for both advanced and producer economies, see Semieniuk, G., Holden, P.B., Mercure, J.F. et al., 'Stranded fossil-fuel assets translate to major losses for investors in advanced economies', *Nature*, Vol. 12, 2022, pp. 532–538 (<https://www.nature.com/articles/s41558-022-01356-y>). For an assessment of the outlook for producer economies, see IEA, *Outlook for Producer Economies*, World Energy Outlook Special Report, IEA, 2018 (https://iea.blob.core.windows.net/assets/5798254b-0e2c-4104-91c4-d420f105863b/WEO_2018_Special_Report_Outlook_for_Producer_Economies.pdf).
 - (8) Only 6 % of G20 pandemic recovery funds are directed to emissions-reduction programmes. See Nahm, J., Miller, S. and Urpelinen, J., 'G20's US\$14-trillion economic stimulus reneges on emissions pledges', *Nature*, Comment, 2 March 2022 (<https://www.nature.com/articles/d41586-022-00540-6>).
 - (9) The International Energy Agency proclaimed in May 2021 that the net-zero ambition is not compatible with new investments in fossil fuels. The Agency reversed track a few months later, calling on producers in October 2021 to produce more. IEA, *Net Zero by 2050: A roadmap for the global energy sector*, May 2021 (<https://www.iea.org/reports/net-zero-by-2050>); Reuters, 'IEA's Birol says urges oil producers to increase output', 14 March 2022 (<https://www.reuters.com/article/energy-iea-idAFC6N2UP01P>).
 - (10) 'Joe Biden's climate-friendly energy revolution', *The Economist*, 20 February 2021 (<https://www.economist.com/briefing/2021/02/20/joe-bidens-climate-friendly-energy-revolution>); Pippa, S., 'U.S. Energy Secretary Granholm calls on oil and gas companies to raise output', CNBC, 9 March 2022 (<https://www.cnbc.com/2022/03/09/us-energy-secretary-granholm-calls-on-oil-and-gas-companies-to-raise-output.html>).

Germany in the commune of Lützerath)⁽¹¹⁾. On the whole, since autumn 2021, Western governments have defended net-zero, condemned fossil fuel investments and hydrocarbon-reliant development trajectories in emerging markets while at the same time dispatching diplomats to capitals ranging from Algiers to Dakar and Maputo to lobby for more gas exploration and infrastructure.

This creates a systemic uncertainty in markets with regard to the credibility of the political commitment behind the transition rhetoric, the pace of the transition itself, as well as capital reallocation trajectories. This impacts the strategies of oil and gas producers, companies and nations alike, and by default the global ability to achieve energy trilemma objectives of security, affordability and sustainability under net-zero. The energy predicament that Europe has been contending with since the autumn of 2021 clearly demonstrates the conflicting forces impacting energy markets as well as the acute vulnerabilities embedded in regional and global energy flows and policy and investment trajectories.

The present *Chaillot Paper* is structured in five chapters that collectively provide an overarching analysis of the transformation of the global energy system, and focuses on the contingent macroeconomic and societal impacts for hydrocarbon producers as well as the concrete implications for the European Union in terms of its energy and national security, strategic sovereignty, and geopolitical ambitions. The first chapter presents an in-depth analysis of the decarbonisation agenda and some

of its overlooked consequences. The chapter also sheds light on the contradictory signals from policymakers and markets and the uncertainty that those have generated within the energy industry and particularly for hydrocarbon producers. The next chapter builds on this analysis and identifies adaptation strategies for the oil majors and producing states, recognising the different pressures to which

these stakeholders are exposed as well as their divergent starting points and legacy practices. The paper presents a set of recommendations for these stakeholders to adopt in order to bolster their dynamic resilience and emerging risk management strategies. Chapter 3 adopts a foresight approach to gauge the chances of success; it also examines potential geopolitical fallouts, exploring the impacts

of the Ukraine invasion and the sanctions regime on European and global energy markets and geopolitical trends. Chapter 4 focuses on the energy crisis that has been engulfing Europe and the world since autumn 2021, utilising it as a case study and to test assumptions made in the previous three chapters. Using foresight logic and methodology, the chapter charts the evolution of the energy situation in the EU and identifies concrete approaches to boost the bloc's resilience to scarcity and price inflation in different timeframes; pragmatism and technological agnosticism guide the analysis. The key consideration is to prevent Europe from ever again experiencing such numbing paralysis in the face of acute geopolitical and market gyrations, which, as argued in a previous publication⁽¹²⁾, are likely to become a permanent feature of the geopolitics of energy in the decades to come.

Under Paris Agreement temperature thresholds, two thirds of proven fossil reserves must remain underground.

(11) Such contradictory signals and messages amplified in the course of 2022 – just months after collectively pledging at the COP26 to stop public financing for unabated hydrocarbon projects by 2023, in March US Energy Secretary Jennifer Granholm exhorted the industry to ‘drill, baby, drill!’; in June, the G7 pleaded with OPEC to increase output and encouraged the world to ramp up investment in LNG capacity; within the EU, despite an announced ban on petrol and diesel cars in a number of Member States, gas and nuclear were classified as green within the EU green taxonomy framework in July. For the story of the German village cleared to expand a massive coal mine, see Rueter, G., ‘Big coal and the battle for Lützerath’, DW, 9 January 2023 (<https://www.dw.com/en/big-coal-and-the-battle-for-l%C3%BCtzerath/a-64330168>).

(12) Popkostova, Y., ‘Europe’s energy crisis conundrum: Origins, impacts and way forward’, EUISS Brief No 2, January 2022 (https://www.iss.europa.eu/sites/default/files/EUISSFiles/Brief_2_Energy%20Crisis.pdf).

The last chapter envisages strategic direction for the future, assessing, firstly, the future for hydrocarbon commodities, and outlining the often overlooked limitations of hastily conceived and implemented clean energy upscaling strategies; secondly, the challenges and opportunities ahead for the EU energy trajectory, putting forward a set of concrete recommendations for the bloc to pursue to enhance its strategic energy security and avoid future shocks; and thirdly, the way in which Europe seems to imprudently transfer energy dependencies, exposing the severe limitations of new energy flows and strategic dependency dynamics. Lastly, the chapter places the emphasis on energy resilience within a wider framework that considers ecosystems and climate prerogatives, again indicating viable avenues of action that the EU could and should pursue.

The central ambition of the paper is to explore the various dimensions of the energy transition and provide a distinct perspective on the important yet often misconstrued debate related to the decarbonisation trajectory and its impact on the hydrocarbon economy, as well as the holistic future of global energy markets and the EU's energy systems as they emerge from the paroxysms that currently define the global and European energy landscape. Ultimately, this *Chaillot Paper* aims to provide an objective and pragmatic guide to policymakers and practitioners that will enable them to navigate the shifting sands of the energy transition and that will inform foresight, shape anticipatory policy and strengthen strategic sovereignty.

CHAPTER 1

THE FAUSTIAN PACT

The impact of decarbonisation on legacy fuels and energy security

The imperative to tackle climate change has prompted a wave of concerted action to promote a radical decarbonisation agenda. Hydrocarbon producers have been singled out as the main culprits for the unprecedented climate alterations and environmental devastation with which the world is grappling⁽¹⁾. The EU's ambition to lead by example has led it to don the mantle of global climate leadership – the Union enshrined the goal of climate neutrality in law and launched its Green Deal as the EU's 'moon-shot' moment in December 2019⁽²⁾. Since its arrival in office, the Biden administration in the United States has aspired to follow suit and make America a global climate leader. China has pledged to ensure that its carbon emissions peak by 2030 and to achieve a carbon-neutral economy by 2060. Today, 91 % of the global economy falls under some sort of

net-zero pledge and the ambition has spread from the political to the corporate sphere with listed companies and leading philanthropists adopting net-zero targets⁽³⁾. Radical policy shifts are underway, affecting both markets and society more broadly, imposing a reconfiguration of global economies along carbon metrics; the USD 275 trillion-by-2050 energy transition cost tag has been duly reflected in economic calculus, and public fund disbursement, including as part of the post-pandemic stimulus packages, made conditional on environmentally-friendly investments⁽⁴⁾. The strong policy signal has led to the tripling of market capitalisation of green energy companies such as Iberdrola and Enel, at the expense of conventional giants, whose returns have plummeted⁽⁵⁾.

(1) *Net Zero by 2050*, op.cit.

(2) When unveiling the European Green Deal at the end of 2019 European Commission President Ursula von der Leyen referred to it as Europe's 'man on the moon moment'. See European Commission, Press remarks by President von der Leyen on the occasion of the adoption of the European Green Deal Communication, 11 December 2019 (https://ec.europa.eu/commission/presscorner/detail/en/speech_19_6749).

(3) According to the Net-Zero Tracker database, 91 % of global GDP and 80 % of the global population is represented by net-zero targets: Net Zero Tracker, 'Net Zero Stocktake 2022', 13 June 2022 (<https://zerotracker.net/insights/pr-net-zero-stocktake-2022>). Notwithstanding, analysis by Wood Mackenzie demonstrates that only 16 % of global net-zero pledges have been translated into actual legislation: see Maade, D., 'Supply and demand on the road to net-zero', Presentation, Wood Mackenzie, 121 Mining and Energy Investment, Singapore, 8 October 2022 (https://www.youtube.com/watch?v=XcM9RWoC_nM).

(4) McKinsey & Company, 'The net-zero transition: What it would cost, what it could bring', January 2022 (<https://www.mckinsey.com/~media/mckinsey/business%20functions/sustainability/our%20insights/the%20net%20zero%20transition%20what%20it%20would%20cost%20what%20it%20could%20bring/the-net-zero-transition-what-it-would-cost-and-what-it-could-bring-final.pdf>).

(5) Eaten, C. and McFarlane, S., '2020 was one of the worst-ever years for oil write-downs', *Wall Street Journal*, 27 December 2020 (<https://www.wsj.com/articles/2020-was-one-of-the-worst-ever-years-for-oil-write-downs-11609077600>); Blunt, K. and McFarlane, S., 'The new green energy giants challenging Exxon and BP', *Wall Street Journal*, 11 December 2020 (<https://www.wsj.com/articles/the-new-green-energy-giants-challenging-exxon-and-bp-meet-nextera-enel-11607696660>). The reversal of fortunes triggered by the Ukraine conflict and the historic windfall profits of close to USD 200 billion accumulated by the industry in 2022 are explained later in this paper and can be considered as an aberration in the general trend of declining profits.

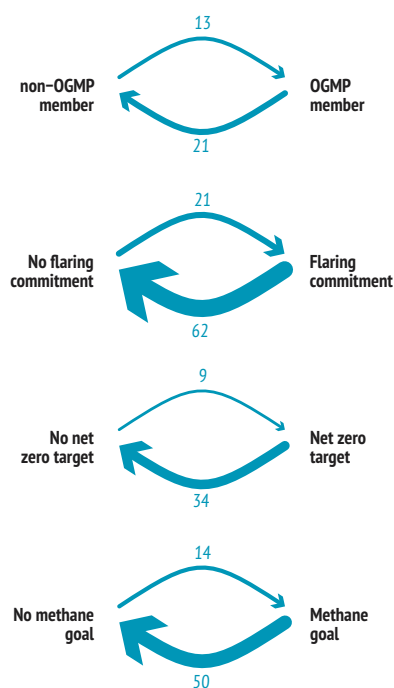
Reputational pressures and concerns about losing their social licence to operate have spurred unprecedented shareholder activism, pressuring oil companies to set emissions targets, report on product life cycle emissions, disclose their value-chain carbon footprint and allow scrutiny on adherence to Environment, Social and Governance (ESG) standards. Concurrently, divestment movements, where Ivy League university endowments, institutional investors, pensions funds and philanthropic and venture capital organisations systematically withdraw capital from high-carbon assets, have led to the largest shift of capital in recorded history. As observed in a report by the International Renewable Energy Agency, the Covid-19 pandemic ‘sharpened investors’ interest in sustainable assets’⁽⁶⁾. Landmark court cases against major oil and gas corporations (colloquially known as ‘Big Oil’) have also regularly featured in the headlines, only second to the newfound climate activism of Big Oil CEOs eager to promote their companies’ climate credentials⁽⁷⁾.

All of the above may be milestone moments for climate activism; however, closer scrutiny reveals that they do not mark a clear watershed for the decarbonisation agenda. Firstly, fear of public stigmatisation has triggered action among listed oil giants – the household names of Total, Eni, Shell and BP who control about 13 % of global output. But reduced exposure to ‘dirty assets’ by these firms does not eliminate the assets *per se*; those are often acquired by smaller, non-listed companies whose operations take place hidden away from public scrutiny and ESG mandates, and where only lip-service is paid to transparent accounting on ecosystem impacts and lifecycle carbon footprints (see diagram opposite). Paradoxically, public pressure on prominent listed companies to abandon their polluting assets has resulted in exploration practices that are more polluting

with less accountability regarding upstream emissions, flaring and methane emissions and lowered standards as regards labour, environmental and social requirements. Although this dimension does not seem to attract the attention of or bother climate activists, it is potentially critical if the world is to move forward with the net-zero agenda.

When high-carbon divestment pollutes

Changes in environmental commitments from asset transfers, 2017 - 2021



Data : Malek, G., ‘Transferred emissions: How risks in oil and gas M&A could hamper the energy transition’, Environmental Defense Fund, 2022

Secondly, the focus on the decarbonisation of the energy supply has not been coupled with a systemic demand curtailment. Public pressure, government directives and shareholder

(6) International Renewable Energy Agency (IRENA), ‘The post-COVID recovery: An agenda for resilience, development and equality’, June 2020 (<https://www.irena.org/publications/2020/Jun/Post-COVID-Recovery>).

(7) While lawsuits against fossil fuel companies are more widely reported, the opposite is occurring as well: in 2021, RWE and Uniper sued the Dutch government for ‘anticipated unfair losses’ due to its decision to discontinue coal use after 2030; similar lawsuits were pursued in Slovenia and Italy. An excellent log of climate-related litigation is available at Columbia University’s Sabin Center for Climate Change Law: a database with about 2,000 cases in 40 countries (<https://climate.law.columbia.edu/>). See also *The Economist*, ‘Lawsuits aimed at greenhouse-gas emissions are a growing trend’, 23 April 2022 (<https://www.economist.com/international/2022/04/23/lawsuits-aimed-at-greenhouse-gas-emissions-are-a-growing-trend>).

activism have constrained investment in new exploration – today oil and gas investment is 75 % lower than at its peak, while demand has skyrocketed in recent months. A curtailed market leads to price surges. Today, Europe is far from being at the tail end of such a price surge crisis, provoked by multiple factors, among them public pressure to divest from high-carbon assets that occurred prior to the pandemic and the Ukraine invasion. The much-heralded demise of domestic fossil fuel production and reserves within the EU, the relegation of coal to the annals of history, and experts' discourses about the inexorable decline of hydrocarbon production have all ignored signals pointing to emerging energy security challenges, and the empowerment of autocratic rentier economies supposedly in terminal decline. These are processes that started long before the Ukraine war and for which Russia cannot be blamed. According to freemarket economic dictums, rising demand and curtailed supply creates liquidity problems, and leads to price surges, market volatility and intensified competition for scarce resources – all developments that exacerbate inflationary pressures, and in combination with other systemic risks could augur a major cost-of-living crisis, (geo)political fragmentation and fiscal deficits. The EU, and the world more widely, is compelled to contend with these dynamics today and for the foreseeable future; dynamics that could also stall the green transformation trajectory and jeopardise the EU's credentials as a foresight actor or climate leader⁽⁸⁾.

Indeed, at the time of writing coal production has registered its highest rate of year-on-year

growth, oil demand growth is robust and the competition for scarce gas reserves has catapulted prices to historic levels, amplifying the dissonance between rhetoric and practice and making business model recalibration strategies for oil and gas even more a matter of guesswork and conjecture.

Public pressure, government directives and shareholder activism have constrained investment in new oil and gas exploration.

Finally, the world has also been hedging for the future on the basis of an inbuilt optimistic bias – betting on emissions reductions from technologies that are yet to be imagined⁽⁹⁾, drawing scenarios for a future with more people and higher living standards all across the globe, yet less energy demand, or oblivious to the Herculean task of building a new

Bhadla Solar Park each day by 2050⁽¹⁰⁾. Meanwhile, the climate crisis is intensifying as ominously indicated by the latest series of Special Reports issued by the Intergovernmental Panel on Climate Change (IPCC), but the failure to curb demand for fossil fuels in the hope that it will miraculously disappear has also exposed critical energy security vulnerabilities in energy systems in Europe and beyond and significantly undermined Europe's hard security while accentuating the climate of uncertainty for oil and gas producers. This spells a gloomy future ahead for hydrocarbon producers and makes the energy transition even more of a challenge for the world.

(8) For an in-depth analysis of the energy crisis, see 'Europe's energy crisis conundrum', op.cit.

(9) IEA, *Energy Technologies Perspectives 2020*, 2021 (https://iea.blob.core.windows.net/assets/7f8aed40-89af-4348-be19-c8a67df0b9ea/Energy_Technology_Perspectives_2020_PDF.pdf). 75 % of the technologies needed to achieve net zero are yet to be invented. (Just 25% of the emission cuts needed to meet net-zero can be achieved by mature technologies, such as wind, solar, nuclear, as well as by energy savings; 41 % will have to be addressed by technologies currently at the early adoption phase, and 32 % by technologies still at a prototype phase).

(10) The Bhadla Solar Park in India is the world's largest solar park as of 2022 (https://en.wikipedia.org/wiki/Bhadla_Solar_Park). According to the IEA, *Net-zero by 2050*, op.cit., one such park needs to be built each day by 2050 for the world to satisfy solar energy projections.

CHAPTER 2

ADAPTING TO A CARBON-CONSTRAINED REALITY

Options for hydrocarbon producers

OIL-PRODUCING NATIONS: WINNERS AND LOSERS

The net-zero transition presents a challenge of existential proportions to the oil- and gas-producing nations, potentially undermining their budgetary stability. Hydrocarbon rents constitute an important share of these countries' GDP, exceeding 50 % in some states, and accounting for up to 90 % of fiscal revenue and 95 % of exports ⁽¹⁾. The process can destabilise the implicit social contract in many of these societies whereby citizens grant support to undemocratic regimes in return for hefty welfare subsidies ⁽²⁾. This would have serious repercussions for development prospects, social cohesion, and leadership stability. In certain oil-producing states, particularly in the Middle East and North Africa (MENA)

region, this might converge with and mutually reinforce existing tensions, entrenched governance deficits, acute youth unemployment and chronic economic difficulties. In addition, projected temperature increases would compound water stress, exacerbate natural hazards, and lead to soil erosion and crop failures that would fuel further degradation of economic and social conditions. These processes can catalyse energy and food inflation, intense competition for resources along ethnic or religious affiliation lines, in-country, regional or trans-continental displacement and migration, and conflict that would impact regional stability, disrupt trans-regional value chains and trade routes, and ultimately threaten the resilience of the EU, given its geographical proximity to the region ⁽³⁾. The necessity of undertaking economic reforms in hydrocarbon-producing nations has been widely articulated in existing literature, with increased frequency since the 2014 oil price slump and the subsequent Paris accord,

-
- (1) In 2014, oil accounted for 63 % of the GDP of Kuwait; 56 % in Oman, 51 % in Qatar and 43 % in Saudi Arabia. In the same year, oil revenue accounted for 97 % of fiscal revenue in Iraq; 71 % in Saudi Arabia and 60 % in Algeria. Oil accounted for 90 % of total exports in Algeria and Iraq and 80% in Saudi Arabia. BP, *Statistical Review of World Energy*, 2021 (<https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf>); International Monetary Fund (IMF), *Economic Diversification of Oil-Exporting Arab Countries*, 2016 (<https://www.imf.org/external/np/pp/eng/2016/042916.pdf>); The World Bank, 'Oil rents as % of GDP', 2020 (https://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS?name_desc=false); The Global Economy, 'Natural Resource Income – Oil Revenue – Natural Gas Revenue', Country Rankings (https://www.theglobaleconomy.com/rankings/Natural_resources_income/); CIA, *The World Factbook* (<https://www.cia.gov/the-world-factbook/>).
- (2) In 2017, Saudi Arabia and Russia disbursed around \$37 and \$22 billion respectively for fossil fuel subsidies, amounts dwarfed by Iran which disburses the largest such subsidies in the world estimated to reach \$45 billion or 10 % of its GDP. *Outlook for Producer Economies 2018*, op.cit.
- (3) Popkostova, Y., 'What if...climate neutrality is not enough?', Chapter 2, in Gaub, F. (ed.), 'What...if not? The cost of assumptions', *Chaillot Paper* no. 172, EUISS, January 2022 (<https://www.iss.europa.eu/content/what-if-not-cost-assumptions>).

committing the world, without distinction between developed and developing nations, to a trajectory of sharply curtailed emissions and the transformation of energy systems from high to low-carbon energy sources. Projections that peak oil production would occur in the late 2020s/early 2030s timeframe, with the International Energy Agency (IEA) estimating revenue loss of up to 40 % by 2040 for producing states, bolstered the calls for reforms⁽⁴⁾.

Blazing the trail: Saudi Arabia and the UAE

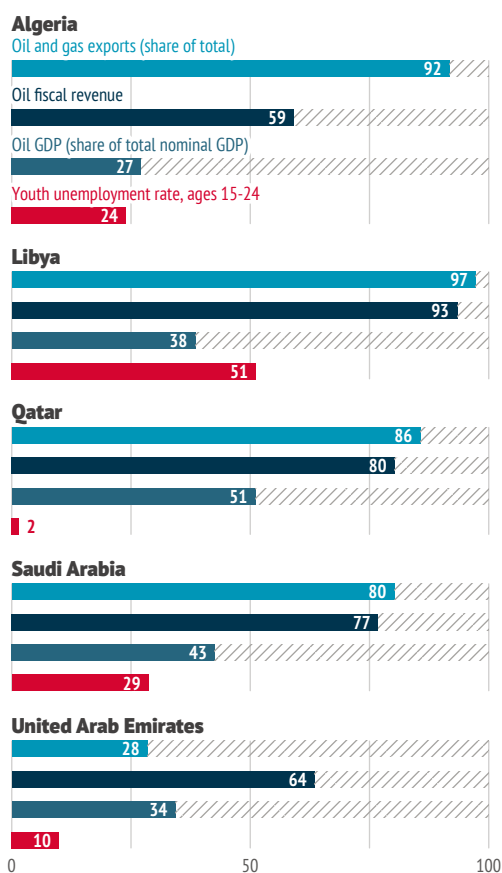
Despite these sobering scenarios, the process of transformation among key producing states has not been uniform or always driven by a sufficient sense of urgency, with some oil-producing nations making significant advances, while others appear to disregard the need for transformation, whether deliberately or due to lapses of strategic vision and leadership. Saudi Arabia and the United Arab Emirates (UAE) have blazed the trail; the two countries embarked on shrewd economic diversification strategies in the aftermath of the 2014 oil price implosion and are positioned, already today, to garner considerable first-mover advantage yields. Ambitious reforms anchored on the redirection of capital towards clean energy assets, and the adoption of domestic decarbonisation policies, have been critical to cushion their economies against a risk of revenue destruction, liquidity shocks and fiscal imbalances stemming from curtailed hydrocarbon rents. Gradual economic rewiring has been taking place for the past decade to recalibrate taxation, overhaul social welfare models and eliminate wasteful subsidies. Special financial vehicles have been created to foster the emergence of robust private and smart-tech sectors while creating much-needed new employment opportunities for a young and well-educated workforce. The two countries have also beefed up their sovereign wealth funds, and have

amassed among the largest financial reserves in the world⁽⁵⁾.

The holistic reform agenda was firstly set out in the Vision 2030 strategy released, with remarkable prescience, by the Kingdom of Saudi Arabia (KSA) in 2016. The policy framework was buttressed by a special financial vehicle – a lavishly endowed Public Investment Fund (PIF) with flexible asset allocation protocols ranging from global unicorns (it has recently acquired shares in Uber, Amazon and Google) to football clubs (the fund bought the English

The real weight of the barrel

The importance of oil in national economies (selected countries), 2014



Data: International Monetary Fund (IMF), 'Economic Diversification of Oil-Exporting Arab Countries', 2016

(4) Ibid.

(5) Global Sovereign Wealth Fund database (<https://globalswf.com/ranking>).

Sovereign wealth funds of selected countries: who has the wallet to adapt?

Sovereign wealth funds of selected countries, \$ billion, 2023

China

3 326

United Arab Emirates

← other Dubai Abu Dhabi 1 906

Saudi Arabia

713

Qatar

450

Russia

151

Iran

139

Libya

68

Azerbaijan

67

Nigeria

3

Angola

3

Egypt

2

Algeria

0

Data: Global Sovereign Wealth Fund Institute, Global SWF, 2023

Newcastle United football club in 2021)⁽⁶⁾. The key architect of this transformative framework was Crown Prince Mohammed bin Salman (MBS). The kingdom under the aegis of MBS also took the lead in defining the decarbonisation agenda for oil-producing states and the region: Saudi Arabia launched the flagship Circular Carbon Economy concept as the cornerstone of its economic transformation focusing on the reduction, reuse, recycling and removal of carbon; invested in petrochemical expansion; pioneered an Oil Sustainability Programme; and started the construction of the first global net-zero megapolis – NEOM – a futuristic venture costing USD 500 billion⁽⁷⁾.

MBS aggressively positioned his kingdom as a global hub in the hydrogen economy and pledged leadership in this still nascent market – aiming to make Saudi Arabia the largest hydrogen exporter in the world. Under his guidance, USD 5 billion worth of investments in hydrogen fuelling stations and export capacities have been made during the past 2 years, with the KSA recently striking important deals with China's Petroleum & Chemical Corporation Sinopec on hydrogen and Carbon, Capture, Utilisation and Storage (CCUS) but also oil and refined products. On 30 January 2023, Saudi Arabia also announced plans to invest more than a quarter trillion USD by 2030 to expand its power grid and clean energy generation capacity⁽⁸⁾.

In 2008 the UAE released the Abu Dhabi Economic Vision 2030 (as did some other states in the region, albeit with a more modest ambition and implementation plan) echoing the Saudi emphasis on economic diversification⁽⁹⁾. It created the clean energy pioneer Masdar underpinned by the Mubadala sovereign wealth fund, and has entered into agreements to export green hydrogen to Japan and more recently Germany, thereby also aspiring to a leading role in the development of hydrogen supply and trade chains. Masdar is exploring renewable energy project investment across Africa, with recent solar and wind projects in

(6) Lucente, A., 'Saudi Public Investment Fund acquires shares in Amazon, Google, Uber', Al Monitor, 16 August 2022 (<https://www.al-monitor.com/originals/2022/08/saudi-public-investment-fund-acquires-shares-amazon-google-uber>); Turak, N., 'Saudi Wealth Fund buys England Newcastle soccer team after months of wrangling', CNBC News, 07 October 2021 (<https://www.cnbc.com/2021/10/07/saudi-wealth-fund-buys-englands-newcastle-united-soccer-team.html>).

(7) NEOM online presentations (<https://www.neom.com/en-us>). Dubbed 'a civilisational leap for humanity' by MBS, the city which is about the size of Belgium would be powered by the largest green hydrogen power plant in the world and have its own ski resort. See 'MBS: Despot in the desert. A volatile millennial wields absolute power in Saudi Arabia. What will he do next?', *The Economist*, 28 July 2022 (<https://www.economist.com/1843/2022/07/28/mbs-despot-in-the-desert>).

(8) AFP, 'Saudi to invest \$266 bn in 'cleaner' energy: Minister', 30 January 2023 (<https://www.barrons.com/news/saudi-to-invest-266-bn-in-cleaner-energy-minister-01675099209>).

(9) The roadmaps (variations of 'Economic Vision' to 'National Development Plans' until the 2030–2040 horizon) focus on economic diversification, an improved business environment and increased share of the private sector in the economy, enhanced productivity, employment opportunities and energy efficiency. Such roadmaps exist *inter alia* in Algeria, Bahrain, Iran, Iraq, Kuwait, Qatar.

Tanzania, as well as the Caspian and Central Asian region. It aims to reach an overall 100 GW portfolio by 2030, and capture 5 million tonnes (mt) of carbon annually by 2030. The UAE hosts the International Renewable Energy Agency (IRENA) – symbolically signalling to the world its intention to transform from a petro-state to a green commodity superpower. At the beginning of September 2022, the UAE was also the only Gulf state and one of the few countries globally to bolster its 2030 climate targets by ramping up emissions reductions, accelerating the displacement of coal and increased nuclear and solar generation⁽¹⁰⁾. The Emirates will also be hosting the COP28 in 2023.

These reforms place the two countries in a favourable position even in the context of the transition to a low-carbon global economy. The UAE and the KSA are today the lowest cost solar producers in the world with solar generation prices in the Saudi 300 MW Sakaka plant for example at \$0.0236/kWh (compared to the €0.18/kWh cap proposed by the European Commission in October 2022)⁽¹¹⁾.

Notwithstanding the pivot towards clean energy, these countries fully intend to capitalise on their hydrocarbon endowment, which provides their economies with additional leverage. As the influential Abdulaziz bin Salman, the Saudi energy minister, has reportedly proclaimed, the kingdom ‘will be the last man standing,

and every molecule of hydrocarbon will come out’⁽¹²⁾. The Saudis’ determination to leverage the country’s natural resource endowment underlines their leadership and positioning within the OPEC+ grouping, conceived together with Russia to exert collective control over global markets. The kingdom is the *de facto* leader of the group, the world’s lowest-cost and lowest-carbon producer and the largest spare capacity holder, putting it in a strong position to regulate the market – a position fortified in the current context.

Russia

Russia’s positioning and role in the changing global energy landscape is also worthy of examination. The country has been adhering to a maximalist approach of resource monetisation based on the premise that even under a strict emissions regime, the world would continue to need hydrocarbons, a conviction shared with the KSA and the UAE⁽¹³⁾. Russia’s remit will remain important, at least in the short to medium term, despite lacking the spare capacity and sovereign wealth of its Saudi

partner. Russia’s leverage and enduring importance in global oil and natural gas markets has been amply exemplified by the recent crisis. Uncertainty and panic at the prospect of cuts and disruptions in its supplies has been a fundamental cause of energy price rallies

In the current market context, the world simply could not manage without the Russian oil supply.

- (10) Bardsley, D., ‘UAE sets more ambitious targets to cut greenhouse gas emissions’, *The National News*, 12 September 2022 (<https://www.thenationalnews.com/uae/environment/2022/09/12/uae-sets-more-ambitious-targets-to-cut-greenhouse-gas-emissions/>). Notwithstanding the clean energy ambition, the UAE remains the world’s fourth-largest per capita carbon emitter and it is assessed as ‘highly inefficient’ in meeting its emission targets by The Carbon Action Tracker. See: World Bank, ‘CO2 emissions (metric tons per capita) – United Arab Emirates’ (https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=AE&most_recent_value_desc=true); Climate Action Tracker, ‘UAE – Country Summary’, November 2022 (<https://climateactiontracker.org/countries/uae/>).
- (11) Bellini, E., ‘Saudi Arabia’s 300 MW Sakaka solar plant comes online’, *PV Magazine*, 27 November 2019 (<https://www.pv-magazine.com/2019/11/27/saudi-arabias-300-mw-sakaka-solar-plant-comes-online/>); Santoz, B., ‘EU proposes €0.18/kWh price cap on solar, wind’, *PV Magazine*, 14 September 2022 (<https://www.pv-magazine.com/2022/09/14/eu-proposing-e0-18-kwh-price-cap-on-solar-wind/>).
- (12) Kennedy, C., ‘Saudi Arabia wants to pump “every last molecule of oil”’, *Oil Price News*, 22 July 2022 (<https://oilprice.com/Energy/Crude-Oil/Saudi-Arabia-Wants-To-Pump-Every-Last-Molecule-Of-Oil.html>); Wilson, T., ‘Saudi Aramco bets on being the last oil major standing’, *The Financial Times*, 12 January 2023 (<https://www.ft.com/content/513b770b-836b-472b-a058-3e4a95437c69>).
- (13) This theory is very much supported by the IEA.

across the world. While the focus has been mainly on gas and Europe's efforts to wean itself off its dependence on Russian gas, oil is also a critical resource, and in the current market context the world simply could not manage without the Russian oil supply, amounting to about one tenth of global volumes, leading to the imposition of dubious price controls rather than an outright embargo on Urals trading. Driven by the logic of resource capitalisation, the country has resorted to currency depreciation to avoid market volatility, built up foreign exchange reserves and introduced more flexible taxation since 2014 to cushion its oil producers from price depreciation⁽¹⁴⁾. Impervious to warnings about stranded assets and peak oil projection, the country has also invested in new megaprojects and pivoted to the Asia market, concomitantly exploring rerouting options to transport more energy to Africa, Latin America and the Pacific, as well as to include the China-bound Power of Siberia gas pipeline and the Sakhalin-Khabarovsk-Vladivostok pipeline in the Russian unified system of gas supplies (thus making it possible to switch supplies from Europe to Asia)⁽¹⁵⁾. Deliberately or by coincidence, the Power of Siberia 1 pipeline, which is able to export 38 bcm/y from East Siberian gasfields to China, was agreed in 2014 (it has been operational since 2019) in the wake of Russia's annexation of Crimea, and the Power of Siberia 2 pipeline in February 2022 (projected to deliver 50 bcm/y from Western Siberia via Mongolia by 2030), days before the military intervention in

Russia's leading position in global energy markets will come under duress in the coming decade.

Ukraine. Gas exports to China rose by 60 % year-on-year in 2022, and trade with Beijing is now settled in yuan or roubles⁽¹⁶⁾. In its 'Energy Strategy 2035' Russia also signals its intention to position itself more aggressively in the global liquefied natural gas (LNG) markets (currently LNG represents less than one fifth of Russian gas exports and Russia accounts for less than one tenth of global LNG supply).

The invasion of Ukraine and the swift imposition of sanctions and other measures to condemn the aggression and weaken the Russian Federation will dramatically change the prospects ahead for Russia as a global energy player.

While Russia has the natural resource endowment to maintain its energy market prowess, the country's leading position in global energy markets will most probably come under duress and be eroded in the coming decade. In the short term, however, the outlook is different. In the course of the conflict to date the impacts have been more pronounced on the

imposing nations' side with Russian oil output 'exceeding expectations' as announced by the IEA on 29 August 2022 – six months after the start of the war and six sanctions packages later⁽¹⁷⁾. Latest figures show that overall crude export volumes have registered almost no change, with seaborne crude still flowing at around 7.4 mb/d compared to 8 mb/d prior to the war, with Russian export revenues skyrocketing⁽¹⁸⁾. About 1.5 mb/d have been rerouted from US, UK, EU, Japanese and Korean

(14) Barbuscia, D. and Korsunskaya, D., 'Russia vs Saudi: How much pain can they take in oil price war?', Reuters, 9 March 2022 (<https://www.reuters.com/article/us-opec-oil-policies/russia-vs-saudi-how-much-pain-can-they-take-in-oil-price-war-idUSKBN20W21S>).

(15) Litvina, A., 'Russia prioritises new projects at expense of brownfields', *Realnoe Vremya*, 11 November 2020 (<https://realnoevremya.com/articles/4937-russia-prioritises-new-projects-at-expense-of-brownfields>); Euractiv, 'Putin tells Europe: You still need Russian gas but we're turning east', 15 April 2022 (<https://www.euractiv.com/section/global-europe/news/putin-tells-europe-you-still-need-russian-gas-but-were-turning-east/>).

(16) Seddon, M., 'High gas prices help Gazprom compensate for supply cuts', *Financial Times*, 9 September 2022 (<https://www.ft.com/content/6e86c7ff-4a01-433b-84d9-a6115adca0c1>).

(17) IEA, *Oil Market Report 2022*, August 2022 (<https://www.iea.org/reports/oil-market-report-august-2022>).

(18) Browning, N., 'Russian oil and fuel revenue up even as exports fall – IEA', Reuters, 15 June 2022 (<https://www.reuters.com/business/energy/russian-oil-fuel-revenue-up-even-exports-fall-iea-2022-06-15/>); IEA, 'Russia's oil and gas export revenues from the European Union' (<https://www.iea.org/data-and-statistics/charts/russia-s-oil-and-gas-export-revenues-from-the-european-union>).

markets to China, India and Türkiye, with export revenues amounting to USD 21 and USD 19 billion in June and July respectively, with India becoming a key export market, absorbing much of the rerouted flows. In 2022 Russia accounted for almost 13 % of India's oil imports, compared to about 2 % in 2021. Flows to Europe have been at 3.3 mb/d on average with spikes up to almost 3.8 mb/d in April, with an additional approximately 1 mb/d flowing directly via the Druzhba pipeline⁽¹⁹⁾. Russia's oil and condensate production registered a slight increase in July, averaging 10.7 mb/d due to production increases by Russian majors (all production sharing agreement projects, notably the massive Sakhalin-1 project operated by Exxon, have halted production almost completely). Under the OPEC+ agreements, Russia is expected to produce 10.8 mb/d (prior to the deal, the country was producing 11.2 mb/d of oil and condensate) which theoretically provides for about 700 000 b/d of spare capacity⁽²⁰⁾. According to OPEC forecasts, the country will produce close to 10.1 mb/d by 2027⁽²¹⁾. From 5 December, the EU started implementing an embargo on seaborne Russian crude imports, albeit with some minor derogations. A price cap on Russian crude was also introduced by the EU, Australia and G7 nations on the same date. These will impact the exports and oil revenue of the Russian state. The start of the refined products embargo on 5 February will lead to a particularly consequential reconfiguration of oil trade routes and markets and might have a more significant impact on the future of Russia's energy sector than the crude oil ban and price cap (see section on 'The future of oil and gas' in chapter 5).

Notwithstanding the robust performance of the Russian energy industry in the face of harsh sanctions, curtailed access to technology, the

exit of oil services providers and the trading houses' ban if maintained will likely do irreparable harm to Russia's position as an energy power. Moscow's pivot to the East will not suffice to compensate for the enduring loss of its largest export market in the long term and its production capacities will be damaged permanently. The price cap on Russian oil, which G7 nations started implementing from 5 December 2022, if successful – which is far from certain and which might just provoke OPEC+ to remove further volumes from the market in 2023 – is likely to further weaken the country's position on global markets. In addition, the Western sanctions regime, initiated already in response to the annexation of Crimea and sternly ramped up in the aftermath of the Ukraine invasion, will also cripple Russia's LNG ambitions and the domestic industry's ability to upgrade and compete on an equal footing with other producers such as the United States and Qatar, despite its LNG potential being substantial and able to compete on cost with Qatar⁽²²⁾. Domestic LNG technology has been accelerating since 2014 with Novatek's 'Arctic cascade' liquefaction technology already applied in the Yamal and Oskyr LNG projects, but loss of access to key materials, technical expertise and equipment would likely impede this industrial ascent⁽²³⁾. The country has also been seeking to explore its vast shale oil resources (estimated to amount to 74 billion barrels compared to 78 billion in the United States, and thus the second-largest in the world) but with no significant success so far, and the sanctions regime would likely make it impossible for Russia to access the know-how as well as the markets needed to develop and utilise these resources. This being said, in the coming decade, Russia is set to ramp up gas exports to Türkiye. Türkiye will likely earmark some of these volumes for LNG

(19) Cockayne, J., 'Russia ships record volumes to India, China, & Italy', MEES, 27 May 2022 (<https://www.mees.com/2022/5/27/opec/russia-ships-record-volumes-to-india-china-italy/c5e32800-ddb8-11ec-b12e-d95e413b8596>).

(20) Reuters, 'Russia's July oil and gas condensate output rises to 10.76 mln bpd – stats office', 24 August 2022 (<https://www.reuters.com/business/energy/russias-july-oil-gas-condensate-output-rises-1076-mln-bpd-stats-office-2022-08-24/>).

(21) OPEC, *World Oil Outlook 2045*, 31 October 2022 (<https://woo.opec.org/>).

(22) Nakhle, C., 'Russia's energy plans derailed', Crystol Energy, 2 May 2022 (<https://www.crystolenergy.com/russias-energy-plans-derailed/>).

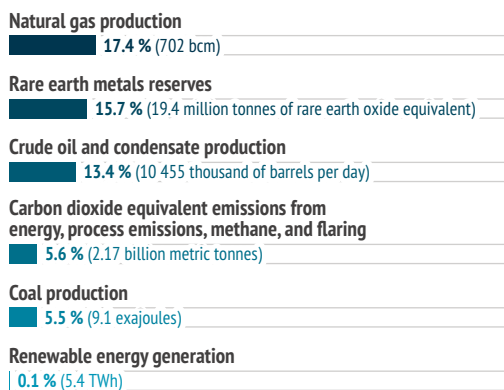
(23) Ibid.

export, where it will be difficult to attribute the origin of the gas, hence circumventing potential future sanctions on natural gas originating in Russia. Such an arrangement would be in the interest of both countries as it would serve Russia's need to find more export outlets for its natural gas reserves, given that it is currently unable to expand its domestic LNG production capacity, while also strengthening Türkiye's emerging role as a regional gas hub.

Russia can be considered a case apart, due to the circumstances around the invasion of Ukraine and its relegation in the long term to the status of a global energy pariah. Apart from Russia, Saudi Arabia and the UAE are racing ahead with their respective economic transformation and adaptation strategies and poised to reap important gains even in a carbon-constrained context. The outlook for the majority of remaining rentier states remains bleak however.

Russia: the demise of an energy superpower

The ostracisation of Russia will radically reconfigure global energy markets with repercussions extending beyond the current decade



Data: BP, 2022

Bleak outlook for other producing states

While the reasoning behind the ongoing need for oil and gas even under net-zero is indeed sound, in a context of radical decarbonisation only the lowest-cost producers will be able to remain commercially viable, meaning that higher-cost producers such as Angola, Libya, Nigeria, and even Azerbaijan where economic diversification strategies are largely absent or cosmetic, are susceptible to adverse macroeconomic pressures and curtailed budgetary streams. Bureaucratic inertia, rigid governance structures or impotent institutions still reeling from the legacy of conflict or hampered by inefficient processes, might explain the lack of significant reform momentum. The inherent difficulty of overhauling the dominant social contract can also be a factor. Ultimately, non-trivial challenges related to (lack of) leadership vision, human capital, technical and regulatory capacity, bank capitalisation and multi-dimensional regional crises compound the process and hinder capacities to develop new value chains.

In addition, three fundamental issues could explain the slow transformation of some of the rentier states. First, economic factors have not favoured the uptake of renewable energy sources (RES) in these economies – renewable energy does not yield the same returns as hydrocarbons, especially under current conditions of an unprecedented rise in the price of hydrocarbon fuels. Second, due to Intellectual Property Rights (IPRs) access to clean energy technology is constrained for some of these nations, making it prohibitively expensive to access and at times impossible to operate these technologies. Lastly, as mentioned in the previous section, uncertainty as to how the process will unfold, and conflicting signals and messages on the need for hydrocarbons, have curbed enthusiasm for diversification. Alas, the failure to transition to a new economic architecture poses problems to private sector development, job creation and capacity building, locking the countries into a vicious cycle of revenue destruction and social instability. The latter can be of particular concern if ineffective

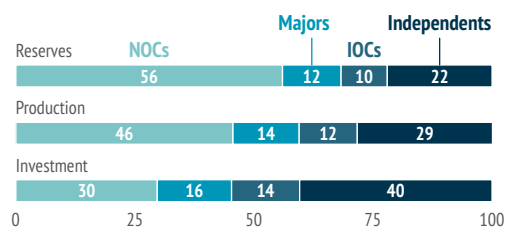
public subsidy schemes for healthcare, education and energy are axed due to empty coffers or if taxes are introduced in societies not accustomed to paying them ⁽²⁴⁾. With countries across the key hydrocarbon producers' region having among the youngest populations in the world (apart from Russia, the median age across oil-producing states is about 28), the prospect of diminished employment opportunities and reduced subsidies might present a breeding ground for instability ⁽²⁵⁾.

These processes can be compounded by the climate challenge – the latest IPCC reports clearly indicate that temperature increases will present a considerable challenge to many of the concerned states such as drought, water scarcity and soil erosion, major hydrological cycle alterations, changes to the biosphere, and more frequent and extreme weather events.

Reserves, production, investment

Share of oil by company type

The ongoing consolidation of the industry would increase the grip of NOCs over global oil markets with contingent impact on arbitraging volumes and global energy geopolitics.



Data: IEA, 'Share of oil reserves, oil production and oil upstream investment by company type', 2018

Tackling emissions from resource exploration would thus become even more urgent for many of these economies. Today, apart

from the Brazilian Petrobras and Colombia's Ecopetrol where emissions have stabilised, all of the remaining national oil companies (NOCs) exhibit inadequate progress with only about 5 % of capital being directed on average to decarbonisation (compared to 15 % for IOCs) ⁽²⁶⁾. The worst performing such companies are in Africa and Latin America, where production emissions are four times higher than those of Saudi Aramco or flaring tenfold the amount of Qatar ⁽²⁷⁾. As global standards progress and public pressure intensifies, more capital and technology will flee away from the worst-performing states, further weakening their comparative position and increasing the clout of the few state behemoths with the lowest cost and emission portfolio, and most enduring endowments, such as the KSA, UAE, Qatar, and potentially Russia. This will have important security implications and give these few remaining NOCs considerable leverage in arbitraging volumes. The assets of Nigeria's National Petroleum Corporation (NNPC), Angola's Sonangol and Algeria's Sonatrach run a high risk of becoming stranded in the next decade with a risk of contagion threatening wider regional economic stability. The security implications of such processes are far-reaching and, as examined previously, might serve to fuel or enable conflicts, reinforcing existing tensions, converging with climate-related impacts and leading to violent national, intra- and inter-regional conflicts. Given the geographical proximity of some of these states to the EU, but also the historic or economic interests of European nations and companies in these countries, such instability will pose a threat to the EU's own security outlook, amplifying migration flows, disrupting supply chains and trade routes and requiring EU military, stabilisation or reconstruction aid.

⁽²⁴⁾ For an excellent treatise on rentier states as well as the relationship between mineral wealth and enduring fragile governance and institutions, consult the seminal work of Karl, T.L., *The Paradox of Plenty – Oil booms and petro-states*, University of California Press, 1997. See also: Mahdavi, H., 'Patterns and problems of economic development in rentier states: the case of Iran', in Cook, M.A. (ed.), *Studies in the Economic History of the Middle East*, Routledge, 1970.

⁽²⁵⁾ World Data, 'Median Age by Country' (<https://www.worlddata.info/average-age.php>).

⁽²⁶⁾ Electrifying operations has reduced Petrobras's production emissions by 40 %. Executives' pay is linked to emissions target achievement, and the company has recently secured a billion dollar loan, whose interest rate is indexed to the level of carbon emissions. *The Economist*, 'State-run oil giants will make or break the energy transition', 25 July 2022 (<https://www.economist.com/business/2022/07/25/state-run-oil-giants-will-make-or-break-the-energy-transition>).

⁽²⁷⁾ Ibid.

In an extreme scenario, ethnic and religious grievances might be compounded by curtailed budgets and the shortage of basic staples, leading to a rise in terrorist activity impacting key EU outlets on the ground or spilling onto European soil. Such grievances can also be exploited by third parties for geopolitical gains. In this context the increased (economic and military) presence of Russia, China and Türkiye in key hydrocarbon-producing states should not be ignored.

RECOMMENDATIONS

In the current environment characterised by high international hydrocarbon prices, a compelling strategy for these nations would be to invest excess profits in renewable energy projects to satisfy rising domestic demand and increase the amount of hydrocarbons available for export. Given the high insolation rates in many rentier states (across the MENA and Gulf region), such an investment would be low-risk and position them to both capitalise on the current high hydrocarbon price environment but also on sources of clean energy or green energy carriers in the future (green hydrogen in particular), thus providing durable and reliable revenue streams in the rapidly changing energy market landscape. If such a strategy is pursued, Algeria for instance can expand its gas exports to the EU, an option that the EU executive is touting as one potential source of new gas supplies in light of the war in Ukraine. If the country capitalises on its Saharan territory (which has among the highest solar irradiation rates in the world) to generate solar power for domestic consumption, this will both lead to cost-optimisation domestically, and allow expansion of gas volume

exports to the lucrative and thirsty European markets⁽²⁸⁾. The alternative, in current market conditions, would be delusional (see chapter 5 for further discussion regarding the limits to Algeria's capacity extensions). The development of low-carbon hydrogen production capacity should be linked not only to the export of green hydrogen to third markets, such as the EU, but to the development of local manufacturing industry for energy-intensive products, like steel, aluminium, zinc, etc. This would give a major boost to the economies of these countries, including for human capital and skills development and the modernisation of production capacities, as well as increase their attractiveness as foreign direct investment destinations. It would also minimise the wastage and costs associated with hydrogen transport and facilitate the holistic decarbonisation of these nations' economies.

In addition, indications in the various countries' Vision and Development plans of their commitment to improve the business environment and the share of small and medium-sized enterprises (SMEs) in the GDP is critical for financial stability but also to avoid wide-ranging deficits and potential debt defaults, as well as to generate valuable employment opportunities⁽²⁹⁾. Today, many of the petro states have low rankings on the World Bank's *Ease of Doing Business* index. Access to financing is a key issue here, as is the cumbersome regulatory environment.⁽³⁰⁾ Foreign assistance and facilitation projects on this axis should be developed and capitalised to help shape an enabling legal, regulatory and fiscal environment that allows the private sector to emerge and consolidate. One potential avenue is public finance conditionality – where financial assistance from international banks or EU aid is conditional on emissions reduction or investment in clean energy activities. Also,

(28) Bailek, N. et al., 'A new empirical model for forecasting the diffuse solar radiation over Sahara in the Algerian Big South', *Renewable Energy*, Vol. 117, 18 March 2018 (<https://www.sciencedirect.com/science/article/abs/pii/S0960148117310418>).

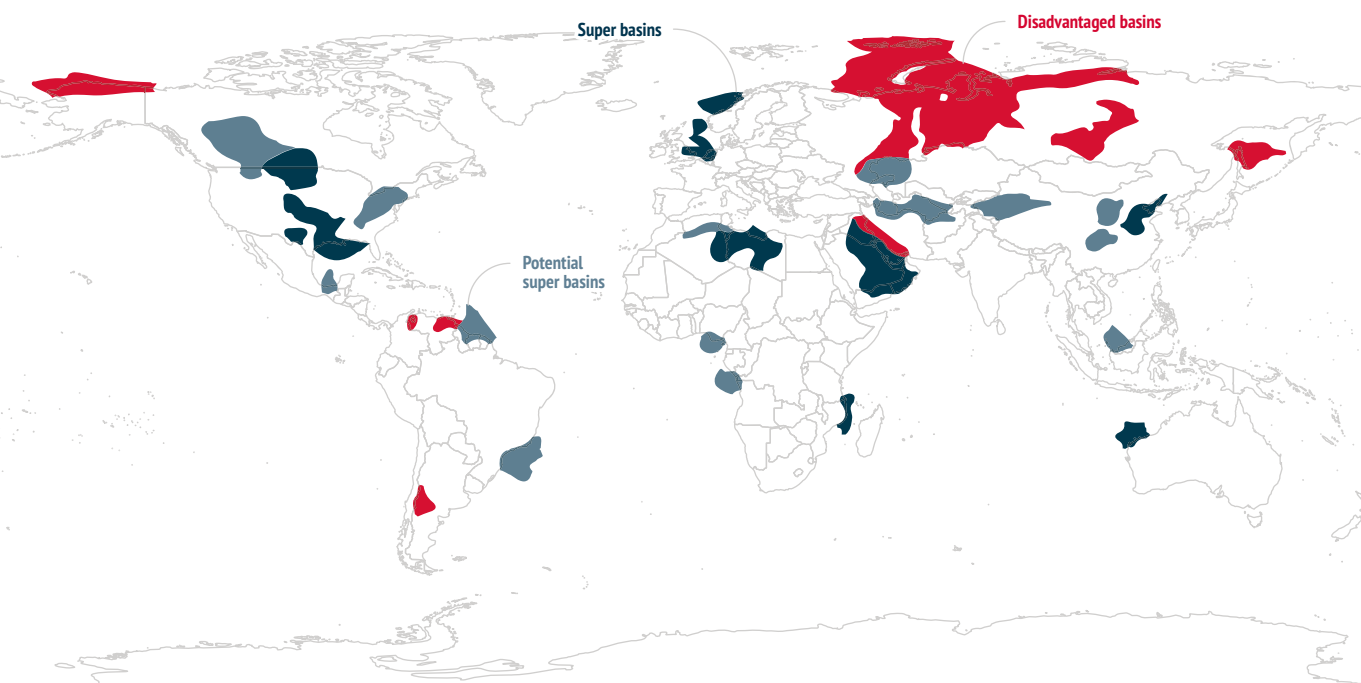
(29) Qamar, S., *Overcoming Constraints to SME Development in MENA Countries and Enhancing Access to Finance*, IFC (https://www.ifc.org/wps/wcm/connect/09012193-bbca-4d8b-8b3f-2322eda6d9de/IFC+Report_Final.pdf?MOD=AJPERES&CVID=jXA.xEV). The IMF projects that private sector and SME development can create more than 15 million jobs in the region by 2025.

(30) Azour, J., 'Poor access to finance is holding back businesses in MENA. This is how we can help them', World Economic Forum, 27 March 2019 (<https://www.weforum.org/agenda/2019/03/scaling-up-sme-access-finance-mena-region/>); World Bank Data, Ease of Doing Business Ranking (<https://data.worldbank.org/indicator/IC.BUS.EASE.XQ?view=map>).

Survival of the fittest – traditional super basins' adaptation to net-zero

In a carbon-constrained operating environment, some energy basins will thrive, while others erode

The majority of Russian super basins, as well as those in Venezuela, Central and Southeast Asia are particularly concerned due to the paucity of REN, and limited potential for CCUS. The exit from such basins will be precipitous as the world progresses along the net-zero journey and only the lowest-carbon intensive production is marketable. The Gulf states are set to benefit significantly from this transformation due to lowest emission intensity of production, as well as unlocking the potential of CCUS and REN.



Data: Wood MacKenzie, *Energy Super Basins: Where the renewable, CCS and upstream stars align*, 2022

the KSA and the UAE have used their Sovereign Wealth Funds (SWFs) and newly-established financial vehicles to spur the process – this can be emulated by other countries in the region. The International Monetary Fund (IMF) provides strong direction as to how Gulf Cooperation Council (GCC) economies can design and/or enhance sovereign asset-liability management frameworks to ensure the sustainability of SWFs ⁽³¹⁾. The windfall profits that many of the petro states accumulated in 2022, as well as the economic expansion that

they have pursued in recent years, could and should be utilised to drive these transformations forward (the World Bank estimates economic growth of 6 % across the GCC states in 2022 ⁽³²⁾). The strong fiscal surplus that surging commodity prices helped accumulate across the GCC region throughout 2022 should be used to also reduce public debt and mobilise non-hydrocarbon related revenue. This should be implemented together with fiscal reform to provide economic buffers against procyclical economic patterns related to oil-price

(31) International Monetary Fund, 'Gulf Cooperation Council: Economic prospects and policy challenges for the GCC countries', 29 November 2022 (<https://www.imf.org/en/Publications/Policy-Papers/Issues/2022/11/29/Gulf-Cooperation-Council-Economic-Prospects-and-Policy-Challenges-for-the-GCC-Countries-525945>).

(32) World Bank, 'GCC economies to expand by 5.9% in 2022', Press Release, 23 May 2022 (<https://www.worldbank.org/en/news/press-release/2022/05/23/-gcc-economies-to-expand-by-5-9-in-2022>).

gyrations⁽³³⁾. Efforts have also recently been made in the GCC states to introduce new labour market policies to attract global capital and talent – similar reforms should be undertaken in other rentier states to ensure they recruit and retain a skilled and high-performing workforce⁽³⁴⁾.

Another avenue forward is the transformation of traditional super basins into energy super basins⁽³⁵⁾. The latter are characterised by access to low-cost clean energy sources and carbon capture and storage (CCS) opportunities via sequestration or offsets. Basins in the Gulf Coast and the Permian Basin in the United States, the Rub' al Khali in the Middle East, the North Sea, North Africa, and Australia's North Carnarvon are best positioned for such a leap. But local governments would need to be at the vanguard of creating these opportunities. CCUS technology and capacity is still in its infancy with considerable interest having been expressed in such innovation in the past couple of years but still insufficient investment. Producing states that have both existing carbon point sources and storage capacity need to utilise their historic windfall profits from the current energy crunch to expand such capacities, which could cut up to 18 % of global emissions by 2050 combined with direct air capture⁽³⁶⁾. In the long term this could also provide a new financial stream for these economies if they provide carbon sequestration services commercially for offsets to companies or nations elsewhere. This can become a powerful business venture in a net-zero world and rentier states, especially those currently in a vulnerable position, need to be made aware and potentially helped in developing this new source of revenue.

It is critical for oil-reliant economies to transform, create new labour structures and practices and unlock new revenue streams around clean energy; where this transformation is not organic or led from within, external support or facilitation is warranted, even via conditionality if necessary. The alternative could be fiscal default of wartime proportions, instability and conflict and ultimately compromised recovery and decarbonisation dynamics, which will have repercussions far and wide beyond these economies. The EU so far has been a passive actor in this regard: opting to condemn fossil fuel exploration rather than propose viable alternatives to rentier states that would enable them to adapt to low-carbon economic models. The options indicated above are only a few of the potential avenues of action that the EU could undertake to promote and facilitate through engagement with these rentier states to ensure a timely transformation, and thereby (i) avoid the economic and social tsunami that the collapse or defaults of these economies would inevitably cause; (ii) help the advancement of the climate cause; and (iii) position itself as the interlocutor of choice for smart, equitable and green growth. The latter could prove to be an advantage of significant value in the evolving global geopolitical landscape.

INTERNATIONAL OIL COMPANIES: TREADING A FINE BALANCE

The climate agenda has profoundly disrupted the 'Big Oil' business model. Policy ambition,

(33) 'Gulf Cooperation Council: Economic prospects and policy challenges for the GCC countries', op.cit.

(34) Mogielnicki, R., 'GCC states step up efforts to attract global wealth and talent', Henley & Partners, 11 August 2022 (<https://medium.com/henley-partners/gcc-states-step-up-efforts-to-attract-global-wealth-and-talent-104a186ed3bc>).

(35) Traditional super basins are defined as those holding more than 10 billion boe originally with at least 5 billion boe remaining. Today, these supply most of the world's oil and gas; 75 % of oil and gas resources are in 10 basins that hold more than 100 billion boe. For an excellent overview of super basins and their evolving potential, see: Latham, A., Wilson, J. and Gaylord, B., *Energy Super Basins: Where the renewable, CCS and upstream stars align*, Wood Mackenzie, July 2022 (https://www.woodmac.com/horizons/energy-super-basins-where-the-renewable-ccs-and-upstream-stars-align/?utm_source=inside-track&utm_medium=email&utm_content=energy-super-basins-26july22-iss178&utm_campaign=inside-track-july-2022).

(36) Ibid.

climate activism and economic logic have dictated a recalibration of strategies around three prerogatives: efficiency improvements, operational decarbonisation and asset diversification. To position their businesses for survival in a carbon-constrained world, international oil companies (IOCs) have set corporate carbon targets, engaged in a series of acquisitions of clean energy ventures and invested in streamlining notoriously wasteful production practices. At the time of writing, all listed energy corporations (Total, BP, Equinor, Shell, Exxon Mobil, Eni, Chevron) have embedded emissions commitments in their corporate memoranda, and started to wind down legacy assets and include more low-carbon assets in their portfolios⁽³⁷⁾. Carbon offset agreements and partnerships on CCUS seem to have multiplied across the industry as well. In addition, as the impact of climate change has become better understood and calculated, the exposure of the industry to carbon risk, particularly upstream, has led to reserves and investments being written off as stranded assets, thus compromising the financial profile of the sector, amidst fluctuating commodity prices and rising carbon prices. Henceforth, exposure to mega-projects has been scaled down with a

redirection of capital expenditure (capex) to agile, carbon-light, higher-margin and less risky assets with a higher index of profitability under various carbon pricing regimes.

In the current context, the idea that conventional energy sources should be rapidly eliminated is fatally flawed.

The capital discipline adopted by Wall Street after the disruption wrought by the Covid pandemic has bolstered attempts to reduce asset exposure to conventional break-even and carbon-price economics⁽³⁸⁾. Consolidation in the industry is also a conspicuous trend with the absorption of smaller companies within larger portfolio holders with more exper-

tise, operational agility, capabilities and brand recognition. Complex agreements on carbon offsets and activism in demanding a carbon pricing regime have also proliferated within the sector. Major oil corporations, as well, have focused on the supply chain and tackling Scope 1 and 2, but also Scope 3 emissions⁽³⁹⁾. Some have opted to metamorphose into 'integrated energy companies'⁽⁴⁰⁾ capitalising on their dominant incumbent positions in the market to enter new business domains – downstream and services, facing the customer directly or creating new energy groups – with Orsted (the former Danish Oil and Gas Company) electing to become the first offshore wind

(37) Recent analysis demonstrates that many of the public campaigns amount to 'climate disinformation' with InfluenceMap data from 8 September 2022 clearly showing that energy majors are grossly inflating their green credentials while continuing to allocate the majority of new investment to hydrocarbons. Among the major oil companies analysed (TotalEnergies, BP, Shell, Chevron and ExxonMobil), Shell demonstrates the largest disparity between rhetoric and action with 70 % of the company's public campaigns including 'green claims', compared to an actual level of 10 % of decarbonisation investment. It is followed by TotalEnergies with a 65 % to 25 % share. InfluenceMap, 'Big Oil's real agenda on climate change 2022', September 2022 (<https://influencemap.org/EN/report/Big-Oil-s-Agenda-on-Climate-Change-2022-19585>).

(38) The Stanford School of Sustainability has developed an indicator of profitability for oil investments under different commodity and carbon pricing regimes: at a price of \$100 CO₂t the break-even price oscillates at around \$60/b for 80 % of projects; variation as per shallow or (ultra)deep-water projects should be taken into account with 25 % of the former and less than 5 % of the latter being viable under such a price. See: The Stanford Oil Emissions Estimator (<https://eao.stanford.edu/opgee-oil-production-greenhouse-gas-emissions-estimator>).

(39) Scope 1 refers to direct emissions from own sources while Scope 2 covers indirect emissions from the company's consumption. Scope 3 is linked to the use of products and across the company's value chain. CarbonTrust, 'Briefing: What are Scope 3 emissions?' (<https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/briefing-what-are-scope-3-emissions#:~:text=Scope%201%20covers%20direct%20emissions,in%20a%20company's%20value%20chain.>); Scope 3 accounts for three quarters of the sector's emissions and represents about half of global energy-related emissions. See: *Energy Super Basins: Where the renewable, CCS and upstream stars align*, op.cit.

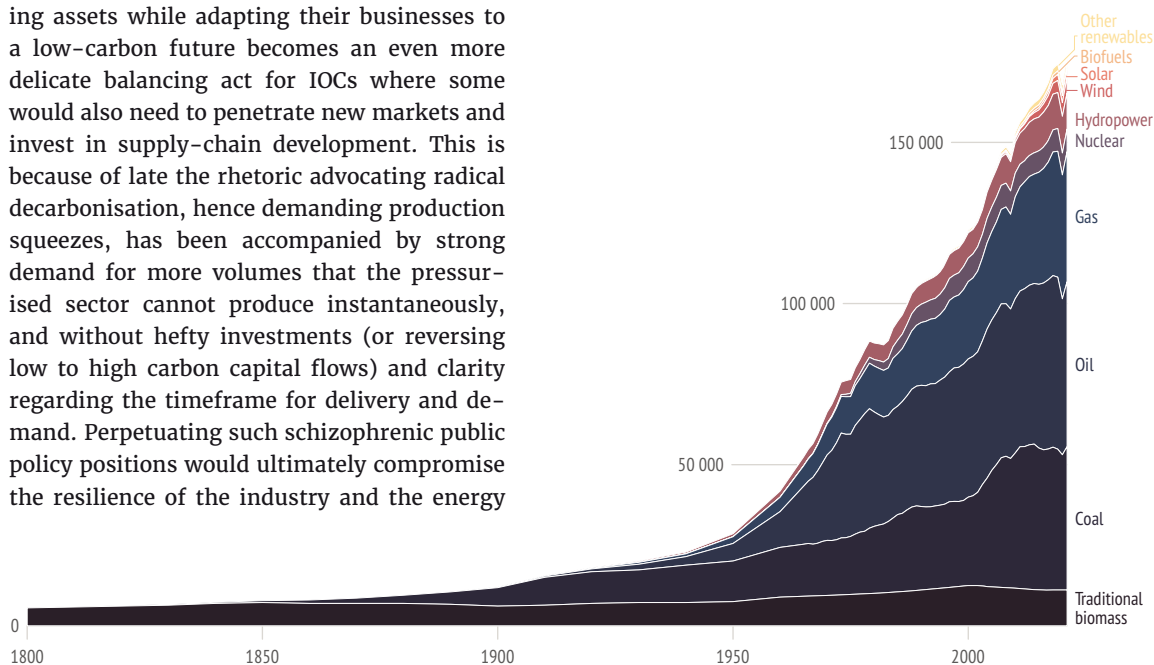
(40) BP, 'From international oil company to integrated energy company: BP sets out strategy for decade of delivery towards net zero ambition', 4 August 2020 (<https://www.bp.com/en/global/corporate/news-and-insights/press-releases/from-international-oil-company-to-integrated-energy-company-bp-sets-out-strategy-for-decade-of-delivery-towards-net-zero-ambition.html>).

giant in the world earlier in the decade⁽⁴¹⁾. The transformation, executives surmise, brings reputational benefits and augments corporate resilience to changing global energy markets.

The above resilience strategies are effective in mitigating exposure to carbon economics; yet they have also led to chronic underinvestment in both legacy assets and in new reserve exploration that in the absence of demand-side reductions creates significant supply-demand imbalances. This is a product of a public policy failure, and a reflection of a misguided logic regarding decarbonisation pathways, also leading to heightened uncertainty as to the pace of the energy transition and the level of demand for hydrocarbons. In the perfect storm unfolding in Europe and engulfing the world where multiple factors converge to undermine the stability of the energy market and unleash wider economic pressures, severely compounded by Russia's invasion of Ukraine, the idea that conventional energy sources should be eliminated rapidly and completely emerges as fatally flawed⁽⁴²⁾. In this context, attempts to maximise returns from existing assets while adapting their businesses to a low-carbon future becomes an even more delicate balancing act for IOCs where some would also need to penetrate new markets and invest in supply-chain development. This is because of late the rhetoric advocating radical decarbonisation, hence demanding production squeezes, has been accompanied by strong demand for more volumes that the pressurised sector cannot produce instantaneously, and without hefty investments (or reversing low to high carbon capital flows) and clarity regarding the timeframe for delivery and demand. Perpetuating such schizophrenic public policy positions would ultimately compromise the resilience of the industry and the energy

transition trajectory. In addition, shareholders' interest in returns in the current context of ballooning market demand might stall transformational strategies, raise the stakes for stranded assets in the near future and present considerable risk to the transition trajectory (the IEA has estimated that global oil and gas sector income amounted to USD 4 trillion in 2022 or twice its five-year average); the predominant trend being redirection of profits to bolster shareholders' returns rather than redirection to bolster business resilience to transition risk.

Addition or replacement?
Global energy consumption, 1800–2021,
TWh, substituted energy



Data: Ritchie, H., 'How have the world's energy sources changed over the last two centuries?', Ourworldindata, 1 December 2021

(41) Bloomberg, 'The real story of how a fossil-fuel company became a wind giant', Bloomberg Zero Podcast, Episode 24 (<https://www.bloomberg.com/green-zero-emissions-podcast>).

(42) 'The EU's energy crisis conundrum', op.cit.

Prices and profits

Some fissures have begun to emerge as well, going beyond the current tight market context and in anticipation of reserve needs. Outside of the limelight of public announcements, oil executives, especially of non-listed companies, nonchalantly cite the Jevons paradox which posits that increases in efficiency and cost reductions unlock new demand, leading to a quantitative increase in the demand for energy *per se* – in all its forms – hence eliminating speculation about the swift displacement of fossil fuel reserves⁽⁴³⁾. The spectacular car efficiency improvements achieved over the past century did not eliminate demand for petrol after all⁽⁴⁴⁾. The Hirschman–Hirshman Index charts levels of concentration in the fuel market over the past 100 years, illustrating this point⁽⁴⁵⁾.

New technologies are also conspicuously energy-intensive – blockchain, bitcoin mining, carbon sequestration technologies, hydrogen production, and desalination already garner some, albeit insufficient, attention as regards how their production processes will be managed sustainably as they evolve. In addition, much uncertainty remains regarding renewable energy generation under extreme weather conditions and increasing temperatures that often lead to a complete halt of wind or solar power generation. The expansion and upgrade of power grids to allow seamless integration of large amounts of renewable energy sources (RES) is also a multi-year process requiring complex engineering and robust financing – something that, although absolutely essential, seems not to complement the

clean energy upscaling strategies, thereby potentially leading to bottlenecks.

The logic is valid and worthy of consideration. However, it also has important limitations. The current energy transition is unique in terms of its *raison d'être* – no introduction of a new fuel hitherto observed was driven by policy or by the vital need to avoid an ecosystem collapse; the current emissions reduction imperative imposes a preference for clean technologies on markets and consumers, leading to unprecedented adoption, diffusion and cost deflation of clean energy sources. The process is also incentivised via consecutive rounds of global consultative meetings among all countries in the world – clearly unprecedented in the history of energy. This is an important element to consider when allowing for Jevons paradox-inspired investment decisions. The IOCs have so far managed to navigate the process, albeit incurring considerable losses before benefiting from recent windfalls. While cyclicity is not an unfamiliar feature of the energy industry, the current period as examined is fraught with conflicting signals and high degrees of uncertainty that can and indeed do result in paralysing volatility and weaken the sector.

RECOMMENDATIONS

In such a context, going forward, major oil corporations need to (i) further enhance their operational agility; (ii) progressively retire energy and carbon-intensive assets; and (iii) focus on high throughput reserves. In addition to these three fundamental priorities, to bolster resilience to multiple mutually reinforcing pressures, the sector needs to

(43) The Jevons Paradox states that, in the long term, an increase in efficiency in resource use will generate an increase in resource consumption rather than a decrease. See Giampietro, M. and Mayumi, K., 'Unraveling the complexity of the Jevons Paradox: The link between innovation, efficiency, and sustainability', *Frontiers Energy Research*, Vol. 6, 4 April 2018 (<https://www.frontiersin.org/articles/10.3389/fenrg.2018.00026/full#:~:text=The%20Jevons%20Paradox%20states%20that,consumption%20rather%20than%20a%20decrease>).

(44) It took on average 7 decades for key commodities to achieve a substantial market share in the economy: coal – 1830s (5 %) to 1910s (60 %); oil – 1910s (1 %) to 1970s (45 %); gas – 1940s (4 %) to today (25 %); and nuclear – to just 2 % in over 5 decades. For an excellent history on the supply vs. demand-side energy revolutions see Fouquet, R., 'Historical energy transitions: Speed, prices and system transformation', August 2016 (<https://www.sciencedirect.com/science/article/abs/pii/S2214629616301979>); Smil, V., *Energy and Civilization: A History*, The MIT Press, 2017.

(45) For an insightful overview of the Jevons paradox and the Hirschman–Hirshman Index of global energy supplies, see 'The rise of renewables and energy transition', op.cit.

pre-emptively adopt strict ESG criteria and observance guidelines. An initiative to form an independent commission to standardise processes and evaluate and contrast progress seems highly pertinent to both provide clarity to the sector participants but also streamline and standardise the various requirements under the broad ESG narrative. Such an independent commission would also be a critical actor in the progress towards sustainability and ecosystems protection. To complement this work and build resilience to market and regulatory pressures, the sector also needs to holistically improve carbon management cycles and use the current unprecedented wind-fall profits to invest in the technologies that require 'dramatic growth' in addition to clean energy generation—namely CCUS, negative emissions technologies and hydrogen⁽⁴⁶⁾. Pivoting to investing in these is essential for the industry's expertise and capabilities profile, characterised by complex engineering, massive capital flows and difficult infrastructure challenges, thereby creating important new revenue streams under net-zero scenarios. Ultimately, it is vital for oil and gas companies to decarbonise their operations via clean electrification and the installation of solar panels on drilling vessels, especially effective in avoiding transmission costs and wastage.

From the point of view of public policy, the above processes and requirements need to be well understood and when possible, facilitated. In addition, the consolidation of the industry is ongoing and the impacts of that need to be carefully evaluated by public authorities in terms of resource concentration and the associated risks of contagion, but also bankruptcy of smaller and weaker players that might be expected to hit economies in the upcoming decade and destabilise markets⁽⁴⁷⁾. Failure to recognise, anticipate and prepare policy responses to these adverse consequences might unleash an avalanche of insolvency of hitherto unprecedented proportions that could

immobilise the global economy, stall the decarbonisation drive and result in a severe climate, political and social crisis. This facet of the low-carbon transition is often ignored, yet it could place immense pressures on already weakened economies and should therefore be tackled as a matter of urgency in tandem with, rather than consecutively to, efforts to manage the current energy crunch and mitigate the climate crisis.

(46) 'The net-zero transition: What it would cost, what it could bring', op.cit.

(47) Rystad Energy, 'North American oil and gas bankruptcy debt reached an all-time high in 2020 and is set to grow', Press release, 22 October 2020 (<https://ajot.com/news/north-american-oil-and-gas-bankruptcy-debt-reached-an-all-time-high-in-2020-and-is-set-to-grow>).

CHAPTER 3

GEOPOLITICAL FALLOUTS

The power dynamics of global energy politics

The multiple and mutually reinforcing crises that have created a maelstrom of risk for global economies in the past two years have been of particularly stark proportions for the oil and gas industry. The Covid-19 pandemic hit the world at a time of historic abundance of oil in global markets, mainly induced by the United States' newly-found energy dominance and the dramatic ascent of shale gas production. The supply-side effect was compounded by a demand shock – lockdown measures to prevent the spread of the virus led to unprecedented market contraction of close to 7 %, or the equivalent of taking India's entire consumption off the global market in 2020. In addition, the battle for market share between US shale producers and OPEC producers and Russia led to acute market distortions. Market disequilibrium resulted in a temporary price slump of hitherto unseen proportions – with oil pricing entering negative territory in April 2020 – testing the resilience of petro states and prompting some analysts to speculate about the ultimate terminal decline of the oil industry and the end of OPEC's power over global oil markets. The positive performance of renewable energy made prospects look even more grim for the oil sector.

THE OPEC+ FACTOR

However, the multiple shocks led to the forging of new alliances and discipline among hitherto competing producers. Saudi Arabia and Russia moved closer together, forming the powerful OPEC+, alliance to exert collective control of the market⁽¹⁾. Helmed by Crown Prince Mohammed bin Salman and President Vladimir Putin, two leaders who have attracted the opprobrium of the global community, OPEC+ has proven its virtues to its contracting parties and remains robust despite systemic pressure exerted by the West for Russia to be ostracised, thus serving as a sober reminder of not only the lingering power of fossil fuels but also the growing polarisation of global politics. In a matter of 18 months, OPEC+ managed to stabilise the markets and achieve an unprecedented oil price rally. In the current high pricing environment, the alliance has been impervious to calls for an increase in production, sticking to its policy of modest monthly output increases⁽²⁾. This somehow presents the world with a stark choice – when one dictator invades a friendly nation state, the only option the free world has is to run to other, no less iniquitous dictators, to ask for help. Multiple futile calls on Saudi Arabia to release some of its spare capacity volumes to calm the markets after Russia's invasion of Ukraine demonstrated the leverage of the

(1) 'Russia and others join OPEC in rare, coordinated push to cut oil output', *New York Times*, 10 December 2016 (<https://www.nytimes.com/2016/12/10/business/russia-opec-saudi-arabia-cut-oil-output.html>).

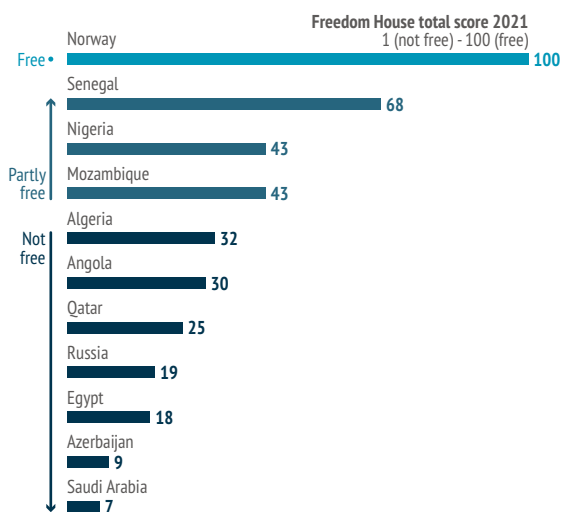
(2) The International Energy Agency suggested doubling the net income of global oil and gas producers to \$4 trillion in 2022 compared to 2021. IEA, *World Energy Outlook 2022* (<https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf>).

KSA and the special relationships forged within OPEC+. It has also led to the abdication of moral leadership when global democracies confronted the kingdom over the Khashoggi killing only to subsequently gloss over the gruesome affair in the interests of *realpolitik*⁽³⁾; or choose to overlook Qatar's appalling human rights record and ignore abuses and sporadic killings in Yemen – all no less ghastly than those observed in Ukraine.

Diversification towards autocracies?

Freedom or the lack thereof in countries with which the EU struck deals in 2022

Apart from Norway, all of the countries with which the EU struck energy deals in 2022 are characterised as 'partly' or 'not' free, with some being overtly repressive regimes.



Data: Freedom House Index, *Freedom in the World* 2021. (Scores for Algeria, Saudi Arabia, Azerbaijan, Egypt, Qatar, Senegal, Mozambique, Angola, Nigeria and Russia are shown for comparison)

Almost in the immediate aftermath of President Joe Biden's controversial visit to Saudi Arabia, there was an exchange between Putin

and MbS. A week later, the Russian energy minister, Alexander Novak, travelled to Riyadh for talks with his counterpart, the influential Prince Abdulaziz bin Salman. Officially, their discussions covered global energy markets as well as extending the KSA–Russian partnership on strategic areas such as clean energy, petrochemicals, new technology, healthcare and education – but also, it has been speculated, behind the official agenda, the OPEC+ positioning in response to President Biden's trip. The relationship was cemented by announcing already in July the institutionalisation of these meetings. Saudi Arabia's decision a few days after this meeting, to add a symbolic 100,000 barrels per day in September (which in practice would have been about 50,000 b/d due to unfulfilled quotas) while allowing Russia to continue discounting its crude, vividly conveyed to its Western suitors where its allegiance lies⁽⁴⁾. The posture of support to Russia was even more pronounced when OPEC+ again trimmed the 100,000 b/d in September as a retaliation against the G7 agreeing on an oil price cap. Depending on how the price cap impacts markets in 2023, and how Russia navigates the new environment, OPEC+ might retaliate by withdrawing further volumes from the market. The October OPEC+ meeting confirmed this speculation with the cartel cutting 2 mb/d from its output, to the dismay of the West. The loyalty to Russia seems to be widely shared across the GCC states, as well as throughout the OPEC grouping and its Secretariat. This was unapologetically demonstrated by the newly elected OPEC Secretary General Haitham al-Ghais, who, in his first interview on his role with the Kuwaiti *Alrai* newspaper, referred to Russia as 'a big, main and highly influential player' in the global energy landscape, whose importance is key for the success of OPEC+ and with whom OPEC is not in competition⁽⁵⁾.

(3) Popkostova, Y., 'US–Saudi Arabia alliance: Cracks or overhaul of the global rule of law regime?', Euractiv, 25 October 2018 (<https://www.euractiv.com/section/global-europe/opinion/us-saudi-arabia-alliance-cracks-or-overhaul-of-the-global-rule-of-law-regime/>).

(4) Energy Intelligence Group, 'Russia, Saudi Arabia strengthen ties', 3 August 2022 (<https://www.energyintel.com/00000182-637c-d9e9-af9e-fbdfc52a0000>).

(5) Reuters, 'OPEC secretary general says Russia's membership in OPEC+ is vital for success of agreement', 31 July 2022 (<https://www.reuters.com/business/energy/opec-secretary-general-says-russias-membership-opec-is-vital-success-agreement-2022-07-31/>).

POWER RELATIONS AND ENERGY MARKETS

The polarisation of global energy politics may be exacerbated by the decarbonisation agenda and the vicissitudes of energy markets. Current developments herald a future where, under a carbon-constrained scenario, the position of certain hydrocarbon producers will be consolidated. Low-cost producers such as Saudi Arabia, the UAE, Iraq, Iran, Qatar but also Russia (if somehow it manages to cushion its production against the destructive impact of sanctions, and the latter are indeed implemented and adhered to rather than swiftly abandoned or successfully circumvented) will account for a larger share of hydrocarbons – some analysts surmise that from the current 40 % share of exports they will account for about 60 % by mid-century, thereby in practice increasing the leverage of OPEC+ on the global oil market. NOCs such as Saudi Aramco, Adnoc and potentially Rosneft (with the abovementioned caveat) will be the dominant hydrocarbon producers while being less vulnerable than IOCs to pressure from investors or public opinion to clean operations, divest hydrocarbon assets or change production volumes – thereby potentially perpetuating a high-price environment.

Higher-cost producers – the likes of Angola, Nigeria, South Sudan, but also Azerbaijan, Algeria and Egypt – might face a more difficult and challenging outlook as the transition progresses and their ability to withstand declining revenue will largely depend on leadership stability and vision, capacity to provide a financial cushion as the process takes a toll on profits and state coffers, and how their populations respond to squeezed public spending. A lot of these countries will also face increasing pressures caused by the impacts of climate change that will further affect their social cohesion, fiscal balance, and political stability. For the alliance of democracies, this spells bleak times ahead where dependency on a number of authoritarian regimes will likely increase while the remaining hydrocarbon producers will suffer major losses and potentially implode, triggering a series of

Oil and net-zero

The breakeven factor

As the transition to carbon neutrality gathers pace, only the lowest-cost and lowest-emitting hydrocarbon producers will be able to remain competitive, while remaining producers will incur severe economic losses and social costs if they fail to diversify their economies. This will not only impact the net-zero transformation, but will also have adverse consequences for regional stability and peace.

ICE Brent crude oil front month

Jan 2020 - Feb 2023, \$



Data: IMF, Breakeven Oil Prices, 2023; FT, Markets Data, Commodities, 'ICE Brent Crude Oil Front Month', 2023; S&P Global Commodity Insights, 2023

economic, social and political shocks. The situation might not be alleviated by the projected expanded share of renewable energy within global energy systems where China's share in green commodities is about 9 times higher than Saudi Arabia's stake in oil production today, as China has overarching control over

the bulk of the world's refining and processing capacity (90 % of rare earths and two thirds of lithium⁽⁶⁾). In terms of final products, China dominates global solar panel manufacturing, accounting for about 90 %, half of global electric vehicle (EV) production, as well as half of the global battery market, hosting 3 of the top 5 battery manufacturing giants. It is also making increasing inroads into the wind turbine industry⁽⁷⁾. The country is moreover the main refiner of 84 % of the world's nickel and 85 % of its cobalt – commodities that are key to fuelling the EV revolution⁽⁸⁾. So even if Europe and the alliance of democracies manage to access and stockpile the critical raw materials needed to power clean energy systems (a tall order in itself), ignoring the refining intermediary is dangerous because acquiring a resource that you are unable to process renders the exercise futile⁽⁹⁾. Russia is also reportedly investing massively in the development of copper and the palladium-group metals which will be particularly vital in the clean energy and mineral-intensive economy. Recent deals between China, Russia and a host of African nations present a further worrying signal of the emergence of a powerful grouping controlling strategic supply chains – a development that receives a lot of rhetorical attention among the EU's top leadership, yet that is still to be addressed by tangible and robust measures, notwithstanding initiatives such as the European Critical Raw Materials Act and the European Battery Alliance.

The spectre of a perfect storm

In addition, the energy crisis conundrum of today provides a peek into a future where increasingly a variety of pressures conspires to destabilise the energy system: extreme weather events, and cyber and conflict risks that constrain both hydrocarbon and REN generation and supply chains. The most recent episode of scorching heatwaves across Europe in July 2022 led to a curtailment of nuclear power as water-cooled nuclear plants had to be shut down or have their operations reduced; it also halted wind generation and caused severe hydropower shortages; the low levels of the Rhine river led to disruptions in the supply of coal along the waterway at a time when the commodity was potentially a resource of last resort to buttress the system⁽¹⁰⁾. None of these episodes was the result of conflict or of politicisation of the energy supply, but they demonstrated both individual Member States' and the EU's collective unpreparedness to handle a dramatic disruption of energy supplies, and exposed the fragility of assumptions that had previously prevailed regarding the reliability of our foresight on or the resilience of our economies to disruption. And in the absence of hydrocarbons, no resource is available to back up the system, leading to the prospect of rationing of gas and electricity and the risk that resulting socioeconomic grievances will drive a rise in demagoguery and populism. If one imagines a potential incident on the power grid provoked by either a malicious cyber operation or weather conditions (identical to the cyberattack on the Colonial Pipeline or the blackouts caused by freezing

(6) von der Leyen, U., State of the Union Address 2022, 14 September 2022 (https://ec.europa.eu/commission/presscorner/detail/ov/speech_22_5493).

(7) Hodgson, C., 'Europe's wind industry flags further weakness in 2023 despite energy demand', *The Financial Times*, 29 January 2023 (<https://www.ft.com/content/74ff8ff7-8009-413a-8f2e-2a3c34695d78>).

(8) *The Economist*, 'Will the electric vehicle boom go bust?', Money Talks, Podcast, 31 August 2022 (<https://www.economist.com/podcasts/2022/08/31/will-the-electric-vehicle-boom-go-bust>).

(9) For an overview of the importance of critical raw materials for the EU's net-zero agenda see: Popkostova, Y., 'Europe's place in the resource race: sovereignty in critical minerals as the key vector in achieving EU's low-carbon transition efforts', in Rządowski, A.E. (ed.), *Europe - Energy - Climate: The quest for the green energy transition in the EU*, European Solar Network Press, 2021. Analysis of the pipeline of committed metals projects (for cobalt, lithium, graphite, neodymium, aluminium, iron ore, nickel, copper and zinc) shows that these are acutely insufficient to meet even base case projected demand. See 'Supply and demand on the road to net-zero', op.cit.

(10) Paullson, L., 'France to curb nuclear output as Europe's energy crisis worsens', Bloomberg, August 2022 (<https://www.bloomberg.com/news/articles/2022-08-03/edf-to-curb-nuclear-output-as-french-energy-crisis-worsens>).

weather in Texas, both in 2021), or attacks on energy infrastructure (such as the 2019 Iran attack on Saudi Arabia's largest oil-processing facility at Adqaiq), or disruption along the Algeria pipeline (like the one in July, 2022 on the MedGas subsea route) or of LNG tanker deliveries or regasification terminals (like the June 2022 fire in the Freeport terminal in the United States which is responsible for 20 % of the country's LNG exports) happening in sequence or altogether in a perfect storm, the risk to European economies will be calamitous even if they have built up comfortable storage inventories. Yet, it seems that currently no scenario building or strategic resilience testing of such potentiality is being discussed within Member States or in the corridors of the Commission, exposing the EU to repetitive cycles of reactive crisis response, rather than predictive crisis-management. Unfortunately, in the evolving global energy landscape, the geopolitics of energy will likely become even more of a delicate balancing act between value-driven foreign policy and national interests, where energy security will become interchangeable with national security and where idealism has to give way to pragmatism.

RECOMMENDATIONS

To prepare for such a scenario, the EU urgently needs to strengthen its foresight capacity; bolster its predictive resilience and emerging risk management strategies; and more energetically and articulately communicate to the EU's citizens the reasoning behind measures and approaches pursued, and via enhanced transparency and public consultations avoid destabilising market turbulence and social unrest in response to price spikes or scarcity. This new brand of pragmatic and transparent EU energy and climate policy should be built

around the recognition that going forward action on the supply side via the imposition of emissions mandates or levies on polluting imports can only work when there is a complementary activity aimed at demand destruction of fossil fuels. The former without the latter, as is becoming painfully clear, leads to chronic market tightness with severe and potentially catastrophic geopolitical consequences, that will impede and delay rather than accelerate the journey to net-zero. In the absence of consistent policies, behavioural changes and dramatic innovation incentives, the bold rhetoric on combating the climate crisis, ensuring energy security and consigning hydrocarbons to the annals of history will remain just that – rhetoric.

Finally the current energy crisis, the dynamics of which are unfolding predominantly in Europe but which are increasingly engulfing the world due to the interconnectedness of markets, will likely fuel lingering instability and volatility particularly in emerging markets. The energy crisis is compounded by the effects of the Covid-19 pandemic and the supply chain disruptions it induced, but also the negative impact of the war in Ukraine on commodities, from energy to food, fertilisers and metals. Chronic inequalities become even more accentuated at times of crisis and current developments might wipe out advances made in poverty alleviation over the past decade with the spectre of widespread famine and political chaos becoming a real possibility⁽¹¹⁾. The 2022 political upheaval in Sri Lanka was largely caused by social hardship instigated by soaring prices of basic commodities and energy. The government opted to use its foreign exchange reserves to support prices, rather than pay off its debt, leading to a looming debt default⁽¹²⁾. This is unlikely to be an isolated case, and may be a harbinger of a systemic emergency in the making. The IMF estimates that 60 % of low-income countries are at risk

(11) Rubin, M., 'Pakistan's coming collapse should worry the world', *National Interest*, 14 July 2022 (<https://nationalinterest.org/feature/pakistan%E2%80%99s-coming-collapse-should-worry-world-203545>).

(12) 'Sri Lanka defaults on its \$51 billion external debt, calls it "last resort" as country runs out of foreign exchange', *France24*, 12 April 2022 (<https://www.france24.com/en/live-news/20220412-crisis-hit-sri-lanka-defaults-on-all-foreign-debt>).

of debt distress; cascading defaults would result in the institution not having sufficient resources to keep these economies afloat, a situation that would have grave consequences for the local, regional and global economy⁽¹³⁾. The hike in interest rates adopted by Central Banks in Europe and the United States to curb inflation may compound the situation for developing countries, leading to higher borrowing costs⁽¹⁴⁾. Fractures in Egypt, Nigeria, Tunisia and Laos caused by scarcity and the escalating prices of basic staple goods and energy are also starting to emerge. In Iraq, power outages amidst record scorching heatwaves have resulted in social unrest. Pakistan is subjected to systemic blackouts and the prospect of a complete collapse of the country partly also due to being priced out of global gas markets, with volumes being redirected to Europe⁽¹⁵⁾. Energy scarcity, spiralling inflation, and the chronic and escalating debt conundrum have all been exacerbated by the recent devastating floods that submerged 30 % of the country under water – creating widespread disruption and a breeding ground for unrest⁽¹⁶⁾. Paradoxically, Pakistan had long-term LNG contracts signed at a very low price level. When prices in EU markets skyrocketed, LNG exporters opted to breach the sanctity of these long-term contracts, pay the penalties associated with undelivered cargoes and redirect as many volumes as possible to Europe at a substantial premium. Within the EU, this hidden facet of our success in securing LNG volumes has not been widely discussed. Yet, it is important to examine how this was allowed to happen and engage in discussions on global mechanisms to avoid such occurrences in the future, which penalise poorer and weaker states and fuel narratives on neo-colonialism, hypocrisy and double standards that will only

weaken Europe's geopolitical standing. This will inevitably have adverse regional and international security implications, destabilising established alliances, amplifying negative perceptions about the West's adherence to rule of law principles and thereby opening the gates to Chinese and Russian exploitation and propaganda that would ultimately degrade the regional security environment.

(13) IMF, *Annual Report 2022 – Debt Dynamics* (<https://www.imf.org/external/pubs/ft/ar/2022/in-focus/debt-dynamics/#:~:text=About%2060%20percent%20of%20low,be%20critical%20for%20these%20countries>).

(14) 'Global Central Banks ramp up inflation fight', *The New York Times*, 17 July 2022 (<https://www.nytimes.com/2022/07/17/business/economy/global-central-banks-inflation.html>).

(15) Shaah, S. and Hirtenstein, A., 'Europe scoops up LNG, choking off power supplies in poorer nations', *The Wall Street Journal*, 7 July 2022 (<https://www.wsj.com/articles/europe-scoops-up-lng-choking-off-power-supplies-in-poorer-nations-11657212688>); 'Poorer nations like Pakistan pay the price for EU's scramble for gas', *The Express Tribune*, 10 July 2022 (<https://tribune.com.pk/story/2365578/poorer-nations-like-pakistan-pay-the-price-for-eus-scramble-for-gas>).

(16) Ahmed, M., 'Pakistan's ex-Premier Khan warns of economic "collapse"', 20 July 2022 (<https://www.usnews.com/news/world/articles/2022-07-20/pakistans-ex-premier-khan-warns-of-economic-collapse>).

CHAPTER 4

THE EU ENERGY CRISIS

A debacle waiting to happen?

A confluence of factors has created a perfect storm in EU energy markets that was apparent already in September 2021: among them severe post-Covid-19 demand-supply imbalances, chronic underinvestment in hydrocarbon supply, suboptimal clean energy generation due to weather conditions, corrosion of nuclear reactors and maintenance delays, and historic drought conditions impacting hydropower output as well as coal thermal plants due to shipping bottlenecks⁽¹⁾. In addition, the scarcity was compounded by Russia reducing gas flows into Europe in summer 2021 and letting gas inventories at Gazprom storage facilities in the EU fall to low levels. Thus, scarcity and volatility were defining features of the EU energy market at the dawn of 2022 with energy price gyrations and liquidity problems engulfing the continent. In the context of a precarious energy situation, where scarcity and price hikes were already paralysing economic activity and squeezing disposable incomes, pushing many households into energy poverty, the Russian invasion of Ukraine in February heightened a sense of foreboding across the continent and focused minds on the prospect of Russian gas supplies to Europe being severed. High-level political pronouncements and expert communiqués issued by the EU aimed to induce import curtailment via the imposition of sanctions and a gradual embargo on Russian energy imports until alternatives

were secured, somehow disregarding the possibility of Russia taking the unilateral decision to discontinue supply. While collective guidelines on tackling the looming crisis have been widely publicised, notably the EU regulation on demand reduction⁽²⁾, in practice a cacophony of uncoordinated national measures, characterised primarily by the disbursement of subsidies to consumers, has defined the EU policy response, potentially compromising the effectiveness of the outcomes sought in the short term but also undermining long-term energy market stability, the investment environment and climate neutrality targets.

THE IMPACT OF THE WAR IN UKRAINE ON EUROPE'S ENERGY MARKETS

On 8 March, just 12 days after the invasion, the European Commission released the flagship REPowerEU plan to reduce Russian natural gas imports by two-thirds by the end of 2022 (100 mb/d), and phase out all Russian hydrocarbon imports by the end of the

(1) 'Europe's energy crisis conundrum', op.cit.

(2) European Council, Regulation on coordinated demand-reduction measures for gas, 2022/1369, 5 August 2022 (<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R1369>).

decade⁽³⁾. Nine consecutive sanctions packages flagged the EU's intention to also ban Russian coal imports from August, and sea-borne oil and refined products by December and February respectively⁽⁴⁾. The assumption underlying the sanctions regime, combined with the announced aim to break away completely from Russian energy sources, was the somehow naïve notion that the Russian Federation and its leader will happily oblige until their services are no longer required. But while the EU fretted over the best course of action to adopt, Russia retaliated by altering the terms of existing gas contracts and cutting supplies to the EU.

Firstly, on 31 March, the Russian Federation released a presidential decree that stipulated a new payment regime for pipeline gas supplies for the group of nations – called ‘unfriendly countries’ – that had enacted sanctions against Russia⁽⁵⁾. The decree established a clear timeline for the entry into force of the new framework – 27 April; it also specified in Article 9 that individual bilateral and tailored arrangements between the state gas behemoth Gazprom and individual buyers will be permitted, sowing the seeds of fragmentation among EU gas importers.

The EU executive's immediate reaction was ambivalent and contradictory, revealing its lack of foresight and preparedness regarding potential avenues of retaliation and the paucity of response options *vis-à-vis* the sanctioned entity. On 21 April the European Commission released a statement condemning the new payment framework, but clearly stating that countries and European companies opting to pursue the new payment system that involved dealing with the Russian Central Bank, an entity designated under the sanctions regime, would not breach the sanctions regime⁽⁶⁾. A week later, the President of the European Commission, Ursula von der Leyen, vehemently criticised the new regime, seconded by the EU Energy Chief, Kadri Simson, describing it as a unilateral breach of contract and clearly stating that it would constitute a breach of sanctions for the stakeholders willing to accept it⁽⁷⁾. In the meantime Russia had quickly adjusted the payment regime so that transactions and settlements would be processed via the National Clearing Centre, thus circumventing the sanctioned Central Bank.⁽⁸⁾

The lack of clarity and the urgency of the situation resulted in divergent positions among Member States, their responses also largely dictated by their different degrees of reliance

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- (3) European Commission, Communication – ‘REPowerEU: Joint European action for more affordable, secure and sustainable energy’, COM(2022) 108 final, 8 March 2022 (https://eur-lex.europa.eu/resource.html?uri=cellar:71767319-9f0a-11ec-83e1-01aa75ed71a1.0001.02/DOC_1&format=PDF).
 - (4) European Commission, ‘Russia's war on Ukraine: EU adopts sixth package of sanctions against Russia’, Press Release, 3 June 2022 (https://ec.europa.eu/commission/presscorner/detail/en/IP_22_2802). For information about the entirety of the sanctions packages consult the European Council dedicated page ‘EU response to Ukraine invasion’ (<https://www.consilium.europa.eu/en/policies/eu-response-ukraine-invasion/>). For in-depth information about the specifics of each sanctions package consult the dedicated page (https://finance.ec.europa.eu/eu-and-world/sanctions-restrictive-measures/sanctions-adopted-following-russias-military-aggression-against-ukraine_en). For a visual representation of the sanctions package consult the infographics section (<https://www.consilium.europa.eu/en/infographics/eu-sanctions-russia-ukraine-invasion/>).
 - (5) Basically according to the decree European gas importers would have to open two Gazprom bank accounts – in euro or dollars (depending on the contract currency) and in roubles. Once a payment is made in the original account, Gazprom's bank will exchange it on the domestic exchange market and credit the rouble account of the buyer, to allow it to subsequently pay for the gas volumes in roubles. The system is extremely clever in the sense that it provides Gazprombank with full control over the payment process and timeline, while also circumventing sanctions and a potential freezing of assets, given that Gazprombank is not covered by sanctions. For the full text of the presidential decree see: Reuters, ‘TEXT-Putin's decree on Russian gas purchases in rubles’, 31 March 2022 (<https://www.reuters.com/article/ukraine-crisis-russia-gas-putin-decree-idUSL5N2VY5U7>).
 - (6) European Commission, ‘Gas imports: Frequently Asked Questions —As of 21 April 2022,’ 21 April 2022 (https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/faqs-sanctions-russia-gas-imports_en.pdf).
 - (7) Murray, S, ‘EU countries paying for Russian gas in roubles may face legal action, warns Dombrovski’, Euronews, 28 April 2022 (<https://www.euronews.com/my-europe/2022/04/28/eu-countries-paying-for-russian-gas-in-roublesmay-face-legal-action-warns-dombrovskis>).
 - (8) Bloomberg, ‘Gazprom tries to reassure Europe clients they can still buy gas’ 7 May 2022 (<https://www.bnnbloomberg.ca/gazprom-tries-to-reassure-europe-clients-they-can-still-buy-gas-1.1762430>).

on Russian gas: Hungary was the first to accept the new payment framework without consulting with its fellow Member States or the EU executive; the now former Italian prime minister Mario Draghi stated that the new payment mechanism did not necessarily constitute a violation of the sanctions regime; a number of German companies opted to follow suit immediately as well and the majority of EU buyers quickly and quietly accepted the new terms. This series of developments effectively discredited the European Commission's high-level guidance, leaving it to the latter to simply acquiesce to a *fait accompli*⁽⁹⁾. Bulgaria, Denmark, Finland, the Netherlands, Poland and Shell Energy in Germany were the only entities that refused to oblige. The response was prompt: while EU pundits were still panickily arguing about the legality of the presidential decree, Russia discontinued supplies to the countries who refused to comply⁽¹⁰⁾. The process started with supplies to Bulgaria's Bulgargas and Poland's PGNiG being cut off (both on 27 April) followed by cuts to Gasum

(21 May), GasTerra (May 31), Orsted, and Shell Energy (both on 19 June), altogether eliminating 22 bcm from the market and leading to a 16 % jump of the Dutch Title Transfer Facility (TTF) on 27 April⁽¹¹⁾.

Russia persevered in this vein, and to EU accusations that it was unilaterally breaching contracts, retorted, in a calculated manner and targeting receptive audiences within the EU, and across the Middle East, Africa and Asia, that the REPowerEU prescription to reduce already contracted import volumes by two thirds within long-term contracts constituted a breach of contract to which it was compelled to respond⁽¹²⁾. Debates across the Gulf and Middle Eastern countries largely echoed this sentiment, with talk about the West being accustomed to acting with impunity.

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- (9) Dempsey, H. and Hume, N., 'Divide and rule: Russia's rationale for halting gas flows to Poland and Bulgaria', *The Financial Times*, 27 April 2022 (<https://www.ft.com/content/a2b5a61f-9c07-4284-be81-ce3f7a8a2cf1>); Mayadeen, A., 'Hungary: 9 other EU countries have opened accounts in Russian banks', 1 May 2022 (<https://english.almayadeen.net/news/economics/hungary:-9-other-eu-countries-have-opened-accounts-in-russia>); Bloomberg, 'Ten more European gas buyers open rouble accounts for payments', 12 May 2022 (https://www.bloomberg.com/news/articles/2022-05-12/ten-more-european-gas-buyers-open-rouble-accounts-for-payments?utm_content=business&utm_source=twitter&utm_campaign=socialflow-organic&utm_medium=social&utm_id=twitter-business&sref=uFajcogC); Euractiv, 'EU clarifies how companies can legally pay for Russian gas, ENI and RWE open bank accounts', 17 May 2022 (<https://www.euractiv.com/section/energy/news/eu-clarifies-how-companies-can-legally-pay-for-russian-gas-eni-and-rwe-open-bankaccounts/>).
- (10) PGNiG, 'Press Release: Halt of natural gas supplies under the Yamal contract' 27 April 2022 (<https://en.pgnig.pl/news/-/news-list/id/halt-of-natural-gas-supplies-under-the-yamal-contract/newsGroupId/1910852>); Bulgargas, 'Press Release', 28 April 2022 (<https://www.bulgargaz.bg/bg/novini/393>); Gasum, 'Press Release: Natural gas imports from Russia under Gasum's supply contract will be halted on Saturday 21 May at 07.00', 20 May 2022 (<https://www.gasum.com/en/About-gasum/for-the-media/News/2022/natural-gas-imports-from-russia-under-gasums-supply-contract-will-be-halted-on-saturday-21-may-at-07.00/>); GasTerra, 'Press Release: GasTerra will not go along with Gazprom's payment demands', 30 May 2022 (<https://www.gasterra.nl/en/news/gasterra-will-not-go-along-with-gazproms-payment-demands>); Reuters, 'Gazprom cuts gas supply to Orsted and Shell Energy', 1 June 2022 ([https://www.reuters.com/business/energy/gazprom-cuts-gas-supply-orsted-shell-energy-2022-06-01/#:~:text=June%201%20\(Reuters\)%20%2D%20Russian,to%20make%20payments%20in%20roubles](https://www.reuters.com/business/energy/gazprom-cuts-gas-supply-orsted-shell-energy-2022-06-01/#:~:text=June%201%20(Reuters)%20%2D%20Russian,to%20make%20payments%20in%20roubles)).
- (11) Arguably the decision to start the cuts with these countries can be explained by the earlier expiration dates of these contracts (at the end of 2022 for Poland and Bulgaria) meaning that a potential legal action for premature termination of contracts would lead to Gazprom having to pay less in compensation than for contracts that end later while incurring a significant adverse impact on these economies. See: Corbeau, A., 'A divide-and-rule game: will Russian supplies to Europe be cut?', Center on Global Energy Policy, Columbia University, August 2022 (<https://www.energypolicy.columbia.edu/research/commentary/divide-and-rule-game-will-russian-gas-supplies-europe-be-cut>).
- (12) According to Corbeau, 'The only way for European buyers to exit from their contracts legally would be if the EU imposed blanket sanctions, assuming that the contracts are all governed by EU or Swiss law, which specialists believe to be the case. A reduction of only two-thirds, therefore, would either breach long-term contracts or the sanctions (unless they are phased and/or exempt some countries, as is envisaged for oil)'. Ibid.

When foresight matters

Poland was in a solid position to withstand the impact of the cuts to its supplies. For the past decade, the country has invested substantial diplomatic and financial capital in reducing its reliance on Russia gas. It launched an LNG terminal able to process 5 bcm/d in 2015, with capacity extension work in 2022 increasing this volume to 8 bcm/d. The country also inaugurated an interconnector with Lithuania in May 2022 and finalised the Baltic pipeline in October 2022 allowing 10 bcm/d of imports from Norway. Capacity extensions at the Mallnow metering point on the border with Germany and reverse flows via the Yamal pipeline will also potentially provide for access to some additional gas volumes. The Yamal pipeline has not been operational since 11 May 2022. The country also produces about 4 bcm/d domestically. Poland had also replenished its gas storage facilities to the maximum level by the end of 2022 ⁽¹³⁾.

The situation in Bulgaria was diametrically opposed to that in Poland. The reasons were, first, significantly higher exposure – Bulgaria is dependent on Russia for about 75 % of its gas supplies, which represents 15 % of the country's primary energy mix, mainly used in industry and for heating – and, second, failure to build resilience to such a situation arising, despite a painful episode in recent history ⁽¹⁴⁾. Since 2020, gas flows into the country via TurkStream, replacing the TransBalkan route

traversing Ukraine. The severance of Russian supplies virtually paralysed the Bulgarian energy system: the country lacked interconnectors and had no functioning LNG terminal. Pre-contracted volumes (about 1bcm) from Azerbaijan were conditional on the completion of the Bulgaria–Greece Interconnector (IGB) which, despite a lavish opening ceremony in July, was allowed to start operating only in October, due to delays in obtaining the necessary Act 16 ⁽¹⁵⁾. An alleged offer for 7 LNG tankers contracted from the United States has been cancelled due to the state authorities being unable to pay for them as a result of Bulgargas' insolvency problems and the lack of available slot capacity for import and regasification in terminals. The technocratic government opened a tender for gas supply in mid-September but irrespective of the potential offers received, the lack of available slots in Greek and Turkish LNG terminals has not been resolved. In October, with the aid of the Turkish government, Bulgargas acquired one tanker from the American *Cheniere* Energy for 0.6 bcm. Negotiations to use the Vlorë LNG terminal in Albania for additional deliveries from the American *Excellerate* company have also been reported ⁽¹⁶⁾. Coal power plants, some of which are among the most polluting across Europe, operate at high capacity with the public and industry in favour of coal, oblivious to the toxic impact on health and the environment. As of November 2022, the country has managed to replenish its storage levels to 93 %, up from less than 50 %

(13) 'Divide and Rule: Russia's rationale for halting gas flows to Poland and Bulgaria', op.cit.; Interfax, 'Russia imposes blocking sanctions on Yamal–Europe gas pipeline' 11 May 2022 (<https://interfax.com/newsroom/top-stories/79041/>).

(14) Kovacevic, A., 'The impact of the Russia–Ukraine gas crisis in South Eastern Europe', Oxford Institute for Energy Studies, March 2009 (<https://www.oxfordenergy.org/wpcms/wp-content/uploads/2009/03/NG29-TheImpactoftheRussiaUkrainianCrisisinSouthEasternEurope-AleksandarKovacevic-20091.pdf>); Reuters, *Timeline: Gas Crisis*, 11 January 2009 (<https://www.reuters.com/article/us-russia-ukraine-gas-timeline-sb/timeline-gas-crises-between-russia-and-ukraine-idUSTRE50A1A720090111>).

(15) Reuters, 'Greece, Bulgaria complete "Energy Bridge" to cut Russia gas reliance', 8 July 2022 (<https://www.reuters.com/business/energy/greece-bulgaria-complete-energybridge-cut-russia-gas-reliance-2022-07-08/>).

(16) European Council for Foreign Relations, 'EU Energy Deals Tracker' (<https://ecfr.eu/special/energy-deals-tracker/>).

in August⁽¹⁷⁾. After being the first country to refuse to comply with the Kremlin's rouble payment system, Bulgaria invited Gazprom to discuss 'inevitable gas imports' in August, while the Bulgarian president lobbied Lukoil to lower fuel prices in September⁽¹⁸⁾. Bulgaria also secured derogation from the EU ban on Russian seaborne crude imports that started on 5 December 2022, which also has a direct impact on the Lukoil refinery in the Bulgarian city of Bourgas. The refinery supplies half of domestic fuel consumption and accounts for 10 % of the national GDP. Exports from this refinery will be permitted only to Ukraine after the ban on refined products enters into force on 5 February but difficulties in monitoring can lead to smuggling and clandestine delivery to other countries⁽¹⁹⁾.

As for **Finland**, the **Netherlands** and **Denmark**, the cuts will not impact their markets significantly. Finland, which was previously entirely reliant on Russia for its gas supplies (2 bcm) via both pipelines and LNG, has set up a contingency plan for gas deliveries via the Baltic interconnector with Estonia. The country also announced the opening of two Floating Storage Regasification Units (FSRUs) in 2022 able to process about 5 bcm⁽²⁰⁾. The **Netherlands** has

established links with Norway and the UK, as well as a functioning LNG terminal providing 14 bcm/y, with plans to almost double that by the end of the decade. At the end of November 2022, it had filled 89 % of its gas storage capacity⁽²¹⁾. The expected closure of the Groningen field will expose the country to some minor scarcity not exceeding 2 bcm/y. For **Denmark**, the cut will not impact the market given domestic production, as well as the opening of the Baltic pipeline⁽²²⁾.

Accepting the new payment regime gave EU buyers, apart from the above, an illusory sense of security. This however was shattered violently when the Russian Federation followed up its new gas payment mechanism with a series of technical offensives beginning in mid-May. First, on 11 May Moscow imposed sanctions on EuRoPol GAZ, which owns the Polish section of the Yamal-Europe gas pipeline, that virtually brought the operation of the pipeline to a halt (amounting to a capacity loss of 30 bcm/y)⁽²³⁾. In addition, a declared emergency at the Sokhranivka gas metering station in Ukraine reduced flows via Ukraine by two thirds to about 13 bcm/y in May⁽²⁴⁾. In June, flows via the Nord Stream 1 pipeline (NS1) were reduced by 60 %, and ultimately completely halted in July, with Gazprom citing technical reasons as well the fact that

(17) Gas Infrastructure Europe, Aggregated Gas Storage Inventory Database (AGSI) (<https://agsi.gie.eu/>).

(18) Nikolov, K., 'Gazprom silent over Sofia's invitation for gas talks', Euractiv, 31 August 2022 (<https://www.euractiv.com/section/energy-environment/news/gazprom-silent-over-sofias-invitation-for-gas-talks/>); Nikolov, K., 'Bulgarian President lobbies Lukoil to lower fuel prices', Euractiv, 9 September 2022 (<https://www.euractiv.com/section/energy-environment/news/bulgarian-president-lobbies-lukoil-to-lower-fuel-prices/>).

(19) Jack, V., 'Russia's Lukoil keeps on pumping in Europe — for now', *Politico*, 17 January 2023 (<https://www.politico.eu/article/russias-lukoil-keeps-on-pumping-in-europe-for-now-putin-sanctions-ukraine-war-oil/>).

(20) Myers, P., 'Russia cuts electricity supply to Finland as country edges near NATO membership', RFI, 14 May 2022 (<https://www.rfi.fr/en/international/20220514-russia-cuts-electricity-supply-to-finland-as-country-edges-near-nato-membership-war-ukraine>); LNG Prime, 'Finland, Estonia agree to place Excelerate's FSRU in Inkoo', 11 October 2022 (<https://lngprime.com/lng-terminals/finland-estonia-agree-to-place-excelerate-fsru-in-inkoo/63435/>).

(21) AGSI, op.cit.

(22) Danish Energy Agency, 'Closing gas to Ørsted does not change Denmark's gas situation', 31 May 2022 (<https://ens.dk/presse/luk-gas-til-orsted-aendrer-ikke-paa-danmarks-gas-situation>).

(23) PGNiG, 'Halt of natural gas supplies under the Yamal contract', 27 April 2022 (<https://en.pgnig.pl/news/-/news-list/id/halt-of-natural-gas-supplies-under-the-yamal-contract/newsGroupId/1910852>).

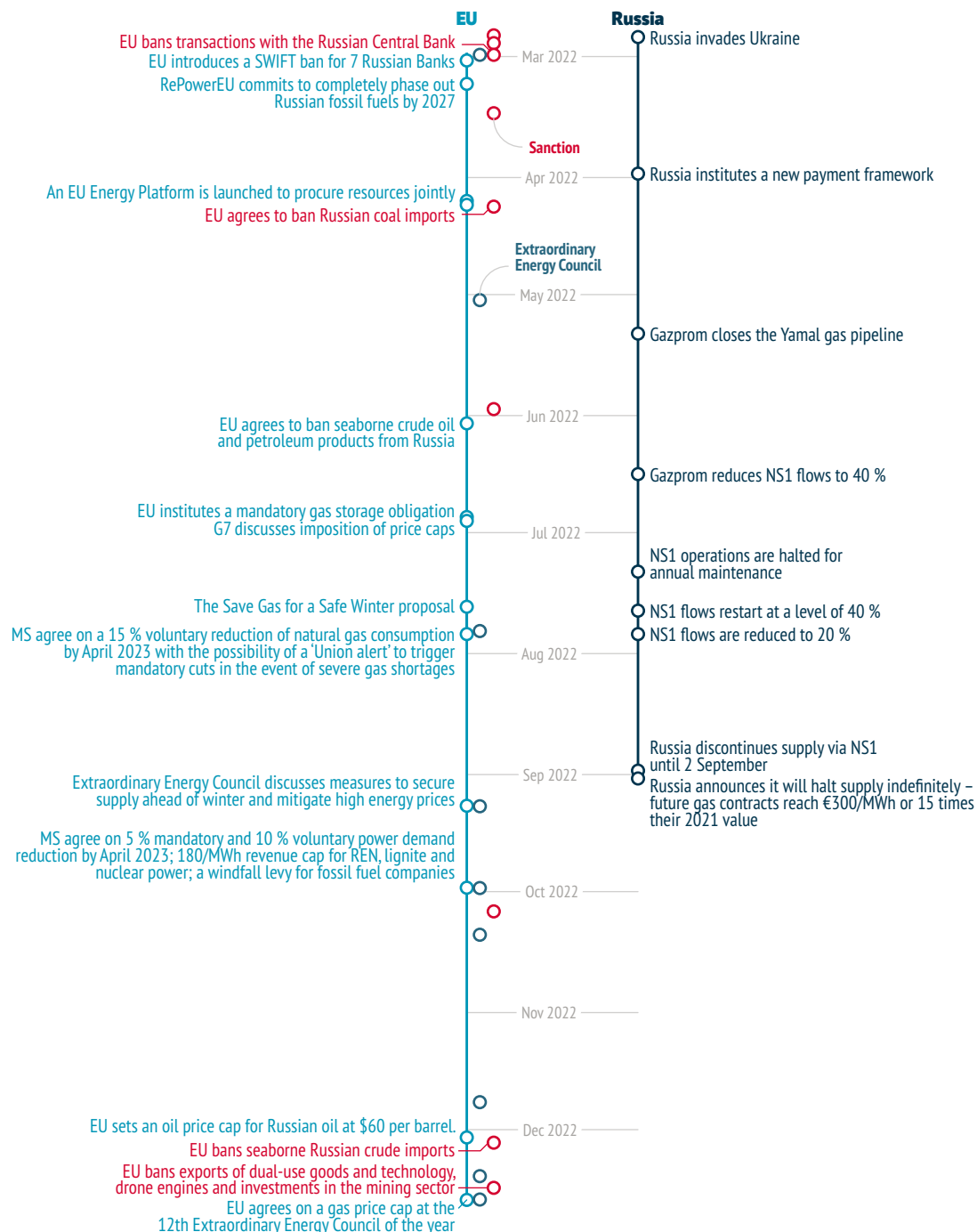
(24) Sabadus, 'Ukraine gas TSO calls for majeure amid concerns over Russian gas transit interference', ICIS, 10 May 2022 (<https://www.icis.com/explore/resources/news/2022/05/10/10762624/ukraine-gas-tso-calls-force-majeure-amid-concerns-over-russian-gas-transit-interference/>).

Tit-for-tat: The chronology of the energy war

Selected developments

In 2021, the EU imported 155 bcm of natural gas from Russia, representing 43 % of the bloc's annual demand. Before the invasion, the EU also collectively imported 51 million tonnes of coal from Russia, about half of total imports, 110 million tonnes of oil, as well as 90 million tonnes of petroleum products. 18 nuclear reactors also depend on Russian fuel.

The EU held 12 Extraordinary Energy Councils and launched 9 Sanctions packages against the Russian Federation in the course of 2022. A complete ban on coal imports from Russia was implemented on 10 August, followed by an embargo on seaborne crude oil and on refined products on 5 December and 5 February respectively.



sanctions had prevented the return of a Siemens gas compressor unit turbine under repair in Canada. These sanctions were exceptionally lifted with a 'time-limited and irrevocable permit' to allow the delivery of the turbine ⁽²⁵⁾. Resumption of limited flows (40 %) followed on 21 July, only to be promptly terminated due to alleged technical issues.

This pushed prices to new peaks averaging €170/MWh in July and exceeding €200/MWh in August (ten times higher than pre-war averages), translating into day-ahead power market peaks of €1 100/MWh in some Member States at the beginning of September, and a slowdown in the pace of inventory replenishment, albeit not dramatic (Europe achieved its target two months ahead of schedule). It is noteworthy that so far, Russia has not put pressure on LNG volumes, which have been constantly increasing since the start of the invasion; these volumes have not been targeted by sanctions because they are simply indispensable. However, should Moscow decide to reduce those, the result will exacerbate the scarcity in EU gas markets and put further pressures on prices, causing them to rise to stratospheric levels. At the end of November LNG imports from Russia to the EU had increased by 40 % compared to the values of the same period in 2021 ⁽²⁶⁾. Between

In 2022, Russia was the second-largest exporter of LNG to the EU.

January and September 2022, Russia was the second-largest exporter of LNG to the EU after the United States and ahead of Qatar, accounting for 17 % of exports ⁽²⁷⁾.

Russia further announced at the beginning of August that NS1 would be completely halted for three consecutive days at the end of the month for further maintenance.

Fears that supplies might be cut off altogether gave renewed impetus to efforts to temper demand and find alternative energy sources. Capping prices, providing subsidies to citizens under a certain wage threshold

or freezing prices at the pump have featured among a panoply of measures rolled out across the bloc, estimated to have cost the public at least €500 billion since September 2021 and thus further increasing the level of sovereign debt ⁽²⁸⁾. There are proposals for the expansion of nuclear and coal capacity, despite the fact that the public health and environmental dangers posed by nuclear and coal power facilities have been amply demonstrated: moth-balled coal power plants have been reopened across the continent, including in Norway's Svalbard archipelago in the Arctic – one of the fastest warming places on the planet ⁽²⁹⁾ – while nuclear decommissioning processes have been reversed ⁽³⁰⁾. Alas, irrespective of the various efforts to reduce demand, such as

- (25) Fulwood, M., Sharples, J., Stern, J. and Yafimava, K., 'The curious incident of the Nord Stream gas turbine', Oxford Institute for Energy Studies, July 2022 (<https://a9w7k6q9.stackpathcdn.com/wpcms/wp-content/uploads/2022/07/The-Curious-Incident-of-the-Nord-Stream-Gas-Turbine.pdf>).
- (26) Tani, S., 'Europe's imports of Russian seaborne gas jump to record high', *The Financial Times*, 28 November 2022 (<https://www.ft.com/content/81db1e45-6ef9-4034-879b-82597e2b87f9?emailId=16095daf-8da2-4767-a075-ce5ad833f5d4&segmentId=22011ee7-896a-8c4c-22a0-7603348b7f22>).
- (27) European Commission, 'Energy – Liquefied Natural Gas' ([https://energy.ec.europa.eu/topics/oil-gas-and-coal/liquefied-natural-gas_en#:~:text=From%20the%20beginning%20of%202022,time%20record%20year%20\(2019\)\)](https://energy.ec.europa.eu/topics/oil-gas-and-coal/liquefied-natural-gas_en#:~:text=From%20the%20beginning%20of%202022,time%20record%20year%20(2019)))).
- (28) Krukowska, E. and Gillespie, T., 'Europe's deepening energy crisis pushes bill to \$500 billion', Bloomberg, 21 September 2022 (<https://www.bloomberg.com/news/articles/2022-09-21/europe-s-deepening-energy-crisis-pushes-bill-to-500-billion>). A dataset by Bruegel from November estimates the fiscal response to have been at €700 billion: Bruegel, 'National fiscal policy responses to the energy crisis', Dataset, 29 November 2022 (<https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices>).
- (29) Milne, R., 'Norway prolongs life of Arctic coal mine as energy crisis bites', *The Financial Times*, 2 September 2022 (<https://www.ft.com/content/2f84b922-6d8a-4cc9-9440-f697c7c40103>).
- (30) Storbeck, O., 'Germany fires up coal plants to avert gas shortage as Russia cuts supply', *The Financial Times*, 19 June 2022 (<https://www.ft.com/content/f662a412-9ebc-473a-baca-22de5ff622e2>); Reuters, 'France to intensify monitoring of EDF nuclear fleet', 27 July 2022 (<https://www.reuters.com/business/energy/france-intensify-monitoring-edf-nuclear-fleet-source-2022-07-27/>); Euronews, 'Belgium extends life of its nuclear power industry by 10 years', 10 January 2022 (<https://www.euronews.com/2023/01/10/belgium-extends-life-of-its-nuclear-power-industry-by-10-years>); Kaufman, A., 'The Netherlands, facing energy and climate crises, bets on a nuclear revival', *The Huffington Post*, 26 June 2022 (https://www.huffpost.com/entry/netherlands-nuclear-energy_n_62aba4d2e4b04a61735a273a).

setting temperature limits in public buildings, dimming or placing restrictions on the exterior lighting of public buildings, storefronts and monuments, urging citizens to limit hot water usage, etc., rationing would have been all but inevitable in the event of a cold and protracted winter – this despite storage levels being filled to adequate levels in advance of the target date. Under EU rules, household customers are classified as ‘protected’, therefore supplies to domestic consumers have been prioritised, at the expense of industry, exposing European economies to severe economic contraction⁽³¹⁾. Even prior to such tight restrictions on energy consumption in industry, numerous energy-intensive industries had already opted to halt production due to difficulties in accessing energy as well as exorbitant costs that reduce profit margins and make their products uncompetitive⁽³²⁾.

The challenge of replacing 155 bcm/y of Russian gas is a tall order for the EU, a weakness that the Russian president has shrewdly exploited by striking first, also being aware that his time horizon for creating major and painful disruption is not indefinite. Today, despite some significant strides being made by the EU to cushion against the impact of curtailed Russian gas supplies, the reality is that behind the bold rhetoric options are quickly shrinking, especially in view of the 2023/2024 winter season. First, while Norwegian flows have been steadily increasing they have reached their maximum capacity, with additional volumes potentially becoming available only later in the decade. Second, LNG cargoes flowing exclusively to Europe (60 % more LNG imports year-on-year) have been crucial to the EU’s ability to fill up storage facilities and maintain economic activity in the face of reduced Russian exports – yet today producers’ capacity limits have been reached and Europe

has even attracted volumes destined for other nations, compromising their energy security. Ultimately Algerian flows have systematically underperformed and are currently partially halted and the extent of additional volume supply from that source is severely limited if indeed it ever materialises. Azeri gas is at maximum capacity as well, and while the extension of the TAP pipeline from 10 to 20 bcm will not be technically difficult it will nevertheless take several years; nor can significant supplies from Egypt, Israel or Mozambique be expected in the short term. These are important limitations that the EU needs to recognise, come to terms with, and incorporate into its strategic thinking on the evolution of energy policy and setting priorities for the several upcoming winters. Unfortunately, at the time of writing, these aspects seem to be widely neglected.

The EU’s piecemeal and fragmented approach to handling the crisis painfully highlights the lack of strategic foresight capacity within the Union on how to build dynamic anticipatory resilience instead of just putting together a hastily-prepared emergency response once a crisis strikes and trusting to luck. For example, a mechanism from the 2017 EU gas package provides for a solidarity agreement among Member States to ensure market integration and security. For the past five years only a handful of such agreements (6 out of an estimated 40 deemed necessary) were signed and the mechanism has slipped into oblivion⁽³³⁾. Regional energy cooperation arrangements in south-east Europe were widely discussed and backed with proposals for Projects of Common Interest (PCI) in the 2010s, yet little progress has been achieved on this front either⁽³⁴⁾. The MidCat interconnector from Spain via France was also blocked despite being considered to be of vital interest for EU energy security

(31) European Commission, ‘Save gas for a safe Winter: Commission proposes gas demand reduction plan to prepare EU for supply cuts’, Press Release, 20 July 2022 (https://ec.europa.eu/commission/presscorner/detail/en/IP_22_4608).

(32) Dempsey, H., ‘More smelters face closure as Europe enters power-starved winter’, *The Financial Times*, 19 August 2019 (<https://www.ft.com/content/0906df5d-1b92-4de1-95d6-3ae7b1055897>).

(33) Council Regulation (EC) No. 2017/1938 of 27 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010 (<https://eur-lex.europa.eu/eli/reg/2017/1938/oj>).

(34) European Commission, ‘Central and South Eastern Europe energy connectivity’ (https://energy.ec.europa.eu/topics/infrastructure/high-level-groups/central-and-south-eastern-europe-energy-connectivity_en).

and being formally included in the PCI, thus benefiting from a specific pool of funding and fast-tracked permitting procedure⁽³⁵⁾. In December 2022, it was decided that the project will be replaced with a hydrogen-only pipeline connecting Barcelona and Marseille to be built by the end of the decade despite uncertainties regarding demand and viability⁽³⁶⁾. Another project, connecting Spain to Italy, has also been mooted of late⁽³⁷⁾.

Demand destruction remains a viable if not the most critical option in this context⁽³⁸⁾. This has been acknowledged in the Save Gas for a Safe Winter strategy of 20 July. Overhaul of the scarcity pricing mechanism was another strategic measure advocated by experts already last autumn and now being earnestly discussed by the top EU leadership with a proposed directive on the electricity market reform to be unveiled in March 2023⁽³⁹⁾. Automated demand management and aggregation are also measures that must be seamlessly integrated in the energy system. The IEA speculates that in 2022, 65 bcm of Russian pipeline imports did not reach the EU market⁽⁴⁰⁾. Despite high storage inventories and the continuous LNG flows destined to compensate for two thirds of lost supply, economic contraction of between 2 and 4 % of GDP was projected for 2022 in Hungary, the Czech Republic and Italy, and as much as 12 % in Germany⁽⁴¹⁾. Energy consumption reduction might bring an additional GDP contraction (Gavekel research modelling

estimates an inverse 1:1 correlation)⁽⁴²⁾. This can potentially be slightly mitigated by formulating a joint response to the energy crisis, including implementing joint supply procurement and sharing. But cracks in this system have already emerged with individual Member States securing volumes bilaterally and publics becoming increasingly uneasy at the idea of exporting gas to neighbours when domestic industries are being shut down (see chapter 5).

The German energy odyssey

Germany is often referred to as the EU's economic engine. But today the German economy is the most exposed to the adverse impacts of gas supply curtailment. Due to its pivotal role in the eurozone and within key sectors – most notably the automotive and manufacturing sectors, as well as within Central European supply chains – a major downturn in the German economy will have repercussions that spill over across the continent. The country was among the first nations to start overtly strategising about the possibility of rationing for particularly energy-intensive industrial clients, such as cement and steel, chemicals and ceramics. This by default would inevitably lead to large-scale industrial contraction, a full-blown recession

(35) Basso, D. and Messad, P., 'La France troque le gazoduc MidCat contre un nouveau projet déjà controversé', Euractiv, 21 October 2022 (<https://www.euractiv.fr/section/energie/news/la-france-troque-le-gazoduc-midcat-contre-un-nouveau-projet-deja-controverse/>).

(36) Hancock, A., Foy, H. and Fleming, S., 'EU spars over proposal to cap Russian gas prices', *The Financial Times*, 9 September 2022 (<https://www.ft.com/content/c7e2644d-5726-4f3e-8f72-a141b5185ee6>); Jopson, B. and Abboud, L., 'Spain and France say planned undersea pipeline will cost €2.5bn', *The Financial Times*, 9 December 2022.

(37) 'Sanchez and Scholz to defend Midcat pipeline', Euractiv, 30 August 2022 (<https://www.euractiv.com/section/energy-environment/news/sanchez-and-scholz-to-defend-midcat-pipeline/>).

(38) As suggested in January 2022 by this author in 'Europe's energy crisis conundrum', op.cit.

(39) 'Europe's energy crisis conundrum', op.cit. The European Commission launched a public consultation on power market reform on 23 January (https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13668-Electricity-market-reform-of-the-EUs-electricity-market-design_en).

(40) IEA, *Gas Markets Report – Q3 2022*, 2022 (<https://www.iea.org/reports/gas-market-report-q3-2022>).

(41) International Monetary Fund (IMF), *Natural Gas in Europe: The potential impact of disruptions to supply*, 19 July 2022 (<https://www.imf.org/en/Publications/WP/Issues/2022/07/18/Natural-Gas-in-Europe-The-Potential-Impact-of-Disruptions-to-Supply-520934>); Arnold, M., 'Study puts cost of halting Russian gas supply at 12 % of German GDP', *The Financial Times*, 9 May 2022 (<https://www.ft.com/content/2f860359-7fa0-4b79-aa47-f5a55606ce33>).

(42) 'Europe's energy crisis is very far from over: We war game what will happen next', *The Economist*, 3 November 2022 (<https://www.economist.com/finance-and-economics/2022/10/30/europes-energy-crisis-is-very-far-from-over>).

and a significant loss of investor confidence in Germany and beyond spiralling into 2023/4⁽⁴³⁾. The German public has been warned of ‘conflict and strife’ and the prospect of ‘popular uprisings’⁽⁴⁴⁾. The energy regulator warned that consumption has to drop 20 % in order for the country to avoid rationing⁽⁴⁵⁾. The country has reactivated mothballed coal power plants and has invested in massive hydrocarbon infrastructure – new interconnectors, floating regasification units and LNG capacity. In another salvo of contradictory energy policy responses, and in the face of grid stress tests for winter projecting multi-hour black-outs (at the time of writing these projections seem to not have been realised), Germany maintained the phasing-out of nuclear reactors but announced plans to invest in floating oil power plants or so-called ‘power barges’ – used today to provide developing nations with power and balance supply, thus not only reverting to a polluting energy source but also potentially diverting such barges from countries where they are currently stationed and needed⁽⁴⁶⁾. The country has exceeded its inventory target, but without Russian volumes, in the event of a cold winter, Germany would not have had sufficient capacity to fill the supply gap, absent the overall extremely mild winter and China’s delay in reopening its economy that were auspicious for the German and European energy security. The exorbitant costs of acquiring gas will also affect fiscal balances with gas procurement issues potentially impacting fiscal balances well into 2023. The situation is compounded by the liquidity squeeze affecting energy

providers imposing a public buy-out of energy utilities, with the German state already bailing out the largest energy provider to cushion the market from disruption and facing a wave of bankruptcies among utility companies across the state (see chapter 5). The German case is important, yet not isolated. The same pattern has begun to emerge in other Member States – Wien Energie solicited a €6 billion bailout from the Austrian federal government in July. EDF in France also came under complete government control.

The current energy crisis reflects the failures of EU energy policy foresight, the craven complacency with the *status quo* and the optimism bias that encouraged recklessness and negligence and, unsurprisingly, is having punitive consequences for the EU’s citizens today. Amidst the escalating energy crisis the EU needs to discard the naivety that has hitherto characterised its evolving and largely reactive energy policy over the past few decades, and embark on a radical and comprehensive overhaul of its energy policy and system based on pragmatism and solidarity. The crisis is consequential for the EU’s strategic sovereignty and geopolitical posture. It can give strong impetus to the emergence of the EU as an influential actor in global energy politics and cement the next phase of the EU’s geopolitical pre-eminence. The fundamental preconditions for this transformation are outlined in the next chapter.

(43) Wax, E., ‘German gas squeeze will last two winters, regulator says’, *Politico*, 17 July 2022 (<https://www.politico.eu/article/germany-gas-shortage-two-winters-klaus-muller-federal-network-agency/>).

(44) Chase, S., ‘Germany warned Canada in turbine talks of domestic repercussions of halt to Russian gas’, *The Globe and Mail*, 21 July 2022 (<https://www.theglobeandmail.com/politics/article-germany-warns-canada-it-may-cut-off-aid-to-ukraine-without-pipeline/>).

(45) ‘Germany must cut gas use by 20 % to avoid Winter rationing, regulator says’, *The Financial Times*, 14 August 2022 (<https://www.ft.com/content/ca215782-a3ba-4a85-997d-197769275a50>).

(46) Kurmayer, N., ‘Berlin eyes oil-fired “powerships” to secure electricity for the winter’, *Euractiv*, 7 September 2022 (<https://www.euractiv.com/section/energy/news/berlin-eyes-oil-fired-powerships-to-secure-electricity-for-the-winter/>).

CHAPTER 5

THROUGH A GLASS DARKLY

Looking ahead

THE FUTURE OF OIL & GAS

The evolution of global oil markets in the short-to-medium term (2023–2025 horizon) will be dictated by contrasting bullish and bearish scenarios⁽¹⁾. The most likely trajectory in this time horizon is that tight oil markets will exacerbate existing economic and political turbulence. Hypotheses about a sharp shortfall in the supply of Russian crude oil combined with the impasse of the Iran nuclear talks and squeezed supplies from Libya, Iraq and Nigeria, as well as almost non-existent buffers in the oil system such as spare capacity and potential for quick new capacity additions, will likely result in a further oil price rally. Oil price inflation may worsen if global gas-to-oil switching and Chinese demand ramp up. Conversely, the prospect, albeit currently waning⁽²⁾, of a global recession, ongoing Chinese power restrictions and efficiency improvements leading to demand destruction, might curb price increases.

At present, Saudi Aramco is the only entity that has sufficient spare capacity. Additional buffers can be provided by the UAE, and potentially Iraq⁽³⁾. Unfortunately, as the author has previously argued⁽⁴⁾, (i) Saudi Arabia does not have unlimited ability to add extra oil to the market; and (ii) the release of volumes will not necessarily be beneficial because such a release would signal to oil traders that future scarcity is forthcoming, heralding an inflationary spiral based on the expectation of scarcity tomorrow. This is an aspect that is not sufficiently discussed today within decision-making circles yet a critical vector in the current context. Such discussion becomes even more critical given that OPEC+ members such as Libya, Nigeria and Iraq are already struggling to meet current output volumes. The cosmetic increase, followed by the swift withdrawal of 100 000 b/d of additional capacity announced in August (due to the quota gaps that currently exist, this increase in practice would have amounted to merely 50 000 b/d), apart from being obviously intended to discomfit the West, signals that the KSA is aware of these risks and together with Russia and the remaining OPEC+ members will persist in keeping oil prices high. The decision to

(1) Fattouh, B. and Economou, A. 'Presentation – Oil market volatility: Assessing the bullish and bearish narratives', Oxford Institute for Energy Studies, 4 August 2022 (<https://www.oxfordenergy.org/publications/oil-market-volatility-assessing-the-bullish-and-bearish-narratives/>).

(2) In its latest forecast from 31 January 2023, the IMF upgraded its previous projections and reckoned that most countries might just avoid a recession this year. At the beginning of January, the Fund forecasted that a third of the world will be in recession. See Smith, C. and Giles, C., 'IMF raises growth forecasts as China reopens and gas prices fall', *The Financial Times*, 31 January 2023 (<https://www.ft.com/content/043e6c32-0da4-45ba-8c5c-89f53198d7f1>).

(3) IEA, *Oil Market Report August – 2022*, op.cit.

(4) Popkostova, Y., 'The Geopolitics of net-zero and EU energy security: Inconceivable chimera or inevitable outcome?', Lecture, 17th CSDP High Level Course 'Walter HALLSTEIN' – Panel on Energy Security, European Security and Defence College (ESDC), War Studies University, Warsaw, Poland, 8 June 2022.

cut production by 2 mb/d in October 2022 confirms such speculation. The political sympathy towards Russia in Saudi Arabia and across the GCC might increase resistance to a radical volume increase.

In addition, there is enormous uncertainty as to the future economic outlook and hence demand for oil; recessionary pressures are receding but remain a concern, signalling to producer nations that investment in a supply increase now can be followed by a sharp demand contraction – such a scenario already unfolded in the late 1990s, when the ‘ghost of Jakarta’ episode left producer nations bruised for years and is still vivid in their collective memory⁽⁵⁾. This makes reticence towards increasing supply volumes even stronger.

The EU’s partial ban on Russian oil, in combination with the imposition of a price cap of USD 60 per barrel for oil exports to third countries which entered into force on 5 December, holds the potential to exacerbate oil market tightness. Empirical analysis demonstrates that the EU-27 imported 0.8 mb/d via pipeline and 1.9 mb/d via seaborne shipments, in addition to 1.4 mb/d of refined products, or altogether about 4.1 mb/d of oil products in March⁽⁶⁾. Under the ban on seaborne crude imports and the ban on refined products that entered into force on 5 February, about 3.5 mb/d will need to be replaced by supplies from other sources. This would necessitate a release of the Strategic Petroleum Reserve (SPR) which would provide a short-lived respite. The full implementation of the ban (assuming Russian unwillingness to respect the price cap) will result in a long-term supply gap of 1 mb/d of lost Russian capacity that OPEC+ will struggle to cover, resulting in

prices stabilising at around USD 120/b. However prices could soar to much higher levels in case of a further loss of supply due to insurgency, political instability, physical or cyber-attacks on production facilities, or technical malfunctions in such facilities (all events that have impacted oil extraction and trade over the past few years). In addition, sanctions imposed after the annexation of Crimea have already crippled the Russian oil industry – these targeted exports of essential oil drilling technology. The expansion of the sanctions regime has led big oil services companies to pull out of the Russian market and may herald a steep and prolonged decline in production that will squeeze global markets further to proportions that could impact the global economic outlook. The collapse of the USSR saw Russian crude output being cut almost by half from 10 mb/d to less than 6 mb/d. The country was able to restore the lost output more than 20 years after⁽⁷⁾. Thus, if oil production is set to decline in Russia this will permanently harm the country’s production capacity and exacerbate global market scarcity.

Price cap mechanisms

To counter such an outcome, the idea of a price cap, rather than a cap on import volumes as promoted by the United States and agreed by the G7, could be pertinent given the magnitude of Russia’s share of global production, accounting for roughly 10 %. The argument has its merits: the self-imposed sanctioning and boycotting of Russian oil after the invasion of Ukraine triggered a global price spike in the context of which Russia was able to re-route barrels to India and China, albeit at

(5) Often referred to as the ‘The ghost of Jakarta’ the incident marks a period of oil price nadirs sparked by a misguided production decision by OPEC members at their meeting in Jakarta in November 1997. At the time, the price of oil was hovering around \$20 per barrel, yet Saudi Arabia persuaded its fellow members to bolster supply by a hefty 10 % based on the conviction that an acceleration of Chinese demand was imminent. However, a severe financial crisis engulfed Asia in 1998 leading to oil demand falling to a record low and prices plummeting to less than \$8 per barrel. For a historical overview and analysis, consult Koyama, K., ‘International oil markets shaken by “Ghost of Jakarta”’, The Institute of Energy Economics, 21 August 2018 (<https://eneken.ieej.or.jp/data/8075.pdf>).

(6) Fattouh, B. and Economou, A., ‘Implication of the proposed EU ban of Russian oil for global oil markets’, Oxford Institute for Energy Studies, 22 May 2022 (<https://www.oxfordenergy.org/publications/implication-of-the-proposed-eu-ban-of-russian-oil-for-global-oil-markets/>).

(7) Flemming, S., Politi, J. and Shepperd, D., ‘How would a G7 price cap on Russian oil work?’, *The Financial Times*, 2 September 2022 (<https://www.ft.com/content/1b570176-82ac-45fd-b9dc-96a05bacd8ae>).

discount prices (hovering at a discount of about USD 30/barrel, or a price of roughly USD 80/b in 2022 and hovering around USD 45/b at the start of 2023 compared to the price for Brent). The speed with which Russia adjusted to this new situation reveals that it has been preparing for this eventuality, but also that behind-the-scenes discussions within OPEC+ have allowed it to roll out such a strategy. The ultimate result has been greatly increased revenue for Russia (USD 168 billion)⁽⁸⁾, reaching the highest level since 2011, which goes against the grain of the West's intentions with the sanctions regime.

Notwithstanding the value of the Urals price cap idea which came into effect on 5 December, it can only be viable if the major global importers rally behind it – establishing such a buyers' cartel, including India and China, seems unlikely today, rendering the idea unfeasible. The price cap announced in December of USD 60 per barrel linked to insurance coverage in the above context might also have little practical impact, due to the fact that it is impossible to monitor ship-to-ship transfers of oil cargoes at sea, blending of fuel or payment for oil using other means, such as paying higher prices for non-sanctioned products to illicitly pay for the sanctioned commodity. Critically, this price cap would not supersede the EU's embargo on importing seaborne oil from Russia and is meant only for exports destined to third countries. Unfortunately, only G7 countries have accepted such a price cap at present, hence its ineffectiveness. In addition, to circumvent the ban on marine insurance by Western insurance companies, Russia has stepped up the provision of sovereign insurance for its cargoes. There are indications that

Russia had ample time to build up a 'ghost fleet' of oil tankers.

China, India and even Türkiye are willing to provide sovereign cover as well. Moreover, between the initial discussions of the price cap mechanism by G7 nations in April 2022 and the imposition of the mechanism in December 2022, Russia had ample time to acquire as many as 100 vessels (according to some reports) to build up its 'ghost fleet', thereby making it potentially able to largely avoid the use of Western vessels.

As for the price caps for petroleum products implemented on 5 February, they follow the same methodology as the price cap introduced

for crude oil. Imports to the EU are banned but exports to third countries are allowed at prices of under USD 100 per barrel for diesel and petrol, and under USD 45 per barrel for lower grades such as residual fuel oil. Since redirecting refined products will be more challenging

for Russia, in the months to come oil exports to the likes of India, Türkiye and China are set to increase. Data indicates that replenishment levels in Chinese and Indian storage tanks have remained static at two-thirds capacity, which means that the Russian oil is immediately processed and subsequently sold elsewhere, most likely Europe⁽⁹⁾. In early January, China decided to increase its export quotas for refined crude, potentially with a view to refining and reselling more Russian volumes on the global market. Some reports indicate that the UAE and Oman imported more Russian oil in 2022 than for the entirety of the previous three years; it is probable that some of this oil ended up in the EU and will continue to do so⁽¹⁰⁾. Exports whose end destination is unknown are projected to increase as well, making it difficult to track ship-to-ship transfers and blending of oil on the high seas (the strategies

(8) 'Russia earned 100 billion in energy exports in 100 days of war', *The Moscow Times*, 14 June 2022 (<https://www.themoscowtimes.com/2022/06/14/russia-earned-100b-in-energy-exports-in-100-days-of-war-research-a77990>); Stognei, A., 'Oil price cap and falling cost of crude worry Kremlin', *The Financial Times*, 19 January (<https://www.ft.com/content/8a5f4681-9592-469f-b223-a939dcbbf3f3>).

(9) 'How Russia dodges oil sanctions on an industrial scale', *The Economist*, 29 January 2023 (<https://www.economist.com/finance-and-economics/2023/01/29/how-russia-dodges-oil-sanctions-on-an-industrial-scale>).

(10) Ibid.

used by Venezuela and Iran of painting over the names of vessels and rebranding cargoes at sea should also not be ruled out, as Russia seeks to redirect its oil exports and evade sanctions).

The natural gas market: LNG futures

The situation for gas markets will not be fundamentally different. Contraction of gas volumes flowing out of Russia is certain, not only because of Russian actions and pending sanctions but critically due to the curtailed access to technology and capital, which will dent the industry and further unsettle global gas markets.

In Europe, LNG import increases, and new modest volume increases via Azerbaijan and Norway seem to have been completely offset by the sharp decline of Russian flows⁽¹¹⁾. The current boom in EU demand for LNG has catapulted prices to levels equivalent to USD 400 for a barrel of oil in August, attracting all non-contractual LNG cargoes (about 15 % of the LNG market)⁽¹²⁾. Following the incidents on both the Nord Stream 1 and 2 pipelines in September 2022, proven to have been caused by intentional sabotage, it seems that no flows can be expected along this route in the imminent future, despite a recent Gazprom announcement setting April 2023 as the date for restarting the NS1 supply. The overall mild weather so far this winter has alleviated immediate worries for the 2022/23 winter season, but inventory levels may be depleted by summer 2023 and without Russian flows the 2023/24 winter season remains a key challenge with 30 % of European industry potentially

liable to shut down during that period. At the beginning of September, 50 % of the key aluminium and zinc production capacity across the EU had been forced offline due to exorbitant costs. Meanwhile, the TTF, the European benchmark gas contract price, has tripled since February 2022 due to the halt of gas supplies via NS1 and lack of liquidity on global markets. Replacing NS1 capacity, based on these values, would cost an additional €50 billion, or ten-fold the historic averages. Meanwhile, the net profits for Gazprom for the first half of 2022 are recorded as €41.75 billion (2.5 trillion roubles) compared to USD 29 billion for the entire year of 2021. Non-exported volumes have been subject to flaring, estimated to amount to £8.5 million worth of gas per day⁽¹³⁾.

The situation will be exacerbated if there is a surge in Chinese demand after the end of the zero-Covid policy. After weeks of nationwide protests, at the beginning of December some restrictions started to be lifted in key urban economic centres, with full economic reopening starting from 8 January 2023. This will impact the availability of tankers for the European market: Chinese imports of LNG registered an unprecedented 21.3 % decline year-on-year for the first 8 months of 2022, totalling 40.64 million metric tonnes (mmt) compared to 79 mmt for 2021; pipeline imports rose by 11 % approximately reaching 30.40 mmt. The EU had imported 98 bcm of LNG or 39 bcm more year-on-year compared to 2021 by September 2022⁽¹⁴⁾. For 2022 overall, the market intelligence firm Kpler estimates that the EU imported 94.73 mt, corresponding to an increase of 37.46 mt compared to 2021. The key supplier was the United States, accounting for close to 39 mt of deliveries, followed by Russia (15.12 mt), Qatar (13.45 mt), Africa (Algeria, Angola, Egypt, Nigeria and Mozambique – 19.72 mt),

(11) Fulwood, M. and Sharples, J., 'Quarterly Gas Review: Short- and medium-term outlook for gas markets', OIES, August 2022 (<https://a9w7k6q9.stackpathcdn.com/wpcms/wp-content/uploads/2022/08/Gas-Quarterly-Review-Issue-18.pdf>).

(12) Mills, R., 'Good times for LNG will not last for ever', *The National News*, 1 August 2022 (<https://www.thenationalnews.com/business/comment/2022/08/01/good-times-for-lng-will-not-last-forever/>).

(13) Seddon, M. and Astrasheuskaya, N., 'High gas prices help Gazprom compensate for supply cuts', *The Financial Times*, 9 September 2022 (<https://www.ft.com/content/6e86c7ff-4a01-433b-84d9-a6115adca0c1>).

(14) Sharma, S., 'China LNG imports drop 28% in August', *Natural Gas World* (<https://www.naturalgasworld.com/chinas-lng-imports-drop-28-in-august-100909>); European Commission, Energy Data: LNG (https://energy.ec.europa.eu/topics/oil-gas-and-coal/liquefied-natural-gas_en).

Norway (2.29 mt), Latin America (2.78 mt) and China, Indonesia, Oman, South Korea and the UAE collectively (1 mt) ⁽¹⁵⁾. Yet, political pronouncements and capital flows within Europe hinge on the idea, misguided though it is, that LNG volumes are available for Europe upon request. The reality is somewhat different. Global LNG demand in 2023 is expected to exceed 440 million tonnes, with supply estimates amounting to 410 million tonnes ⁽¹⁶⁾. By 2030, demand may grow by an additional 150 mt/y. These projections need to be juxtaposed against LNG export capacity extensions, which will contract in the short term as an immediate result of the investment gaps that occurred in the mid-2010s. Current capacity expansion mainly in the United States, but also in Qatar, UAE and Tanzania, amounts to about 180 mt/y, but to be completed these projects would require a substantial investment of capital and would need from 3 to 10 years to become operational, meaning that they cannot provide an immediate respite to the EU. Global economic uncertainty that seems only to be intensifying indicates that LNG capital allocation decisions today may be guided by caution, implying that some of the approved projects could be cancelled, or new expansions delayed. In addition, recent hurricane meteorology models indicate that the hurricane season might be severe in the United States – this might lead to considerable LNG production and export disruption, and ahead of that, restrictions on exports to fill domestic inventories.

Logistics are also a key factor. Shipments to Europe rely on cryogenic tankers, produced mainly in China and South Korea, so even if project capacity is secured on the US or Qatari side, additional vessel shortages might make it harder to reach markets ⁽¹⁷⁾. Continuous supply chain imbalances might augur severe shortages of shipping and tanker capacity globally for various commodities. In addition, the granting of production and mining permits in the

United States is subject to the vagaries of the political cycle and can depend on which political party is incumbent in the White House, meaning that a change in the administration, or robust public pressure against fossil fuel expansion, could lead to many of these production permits being suspended or revoked. Escalating domestic gas prices on the US side might also make Americans less supportive of exporting volumes to Europe. In September 2022, Washington seemed to be preparing to announce export controls on diesel and refined products.

Conversely, reactivation or expansion of coal capacity in emerging and developed countries might augur reduced demand for LNG, hence leading to many of these investments becoming stranded assets. With the launch of the Russian Power of Siberia 2 gas pipeline which aims to divert volumes originally destined for the EU to the Chinese market, demand in China, hitherto the biggest LNG importer in the world (until overtaken in that position by the EU in 2022) will likely decline as well later in the decade. Clean energy project expansion globally, including green hydrogen development for energy-intensive industry, will also likely dent some of the demand for LNG or lead to acute price drops. Therefore a serious danger, that does not appear to be factored into official demands for capacity extensions, is that some of the projects risk becoming stranded assets before being able to yield returns on their investment. This is no less dire a prospect than the gas crunch with which Europe is currently grappling and will emerge as a critical geopolitical challenge in the next decade if not tackled.

(15) Elijah, D., 'EU LNG imports reach all-time highs in December and 2022', Kpler, 4 January 2023 (<https://www.kpler.com/blog/eu-lng-imports-reach-all-time-highs-in-december-and-2022>).

(16) 'Good times for LNG will not last for ever', op.cit.

(17) Ibid.

QUO VADIS, EUROPA? MOVING BEYOND REACTIVE CRISIS MANAGEMENT

The invasion of Ukraine exacerbated pre-existing oil and gas market volatility, paradoxically also exposing the enduring importance of hydrocarbons for the functioning of economies and societies. Blinkered by an embedded optimistic bias regarding the strength of the decarbonisation curve and statistics about the growth of renewable energy, policy leaders tend to forget that fossil fuels – gas, oil and coal – still produce two thirds of the world's electricity compared to a 7 % share for wind and 4 % for solar⁽¹⁸⁾. Within the EU, gas accounts for 25 % of power and heating needs with roughly 40 % of natural gas imports prior to February 2022 originating in Russia. The previous section examined the impact that discontinued supply (either as a result of EU-imposed embargoes or self-sanctioning, or due to cuts implemented by Russia) of Russian gas but also coal, oil and refined products would have and indeed already has had on European economies, as well as the sequencing and efficacy of divergent national measures taken to address the crisis environment.

Building on this analysis, the current section employs foresight logic to map the development of the energy situation within the EU and identify concrete approaches to bolster the bloc's resilience to scarcity and price inflation in the immediate term (i.e. this winter), but also outline measures to stress-test EU energy security beyond the immediate turmoil in the

medium (up to 2030) and long (2050) term. The analysis is guided by pragmatism and technological agnosticism. The key message is that it is imperative to prevent Europe from again succumbing to such paralysing panic in the face of acute geopolitical and market volatility and turmoil, which is likely to become a permanent feature of energy geopolitics in the decades to come.

Three important issues need to be emphasised before embarking on this exercise. First, the EU has to acknowledge and learn from its complacency. Policymakers at EU and Member State level were called upon already in autumn 2021 to cushion the energy market against large-scale disruption by balancing supply and demand-side measures, and by initiating an overhaul of the way in which the energy market operates⁽¹⁹⁾. Regrettably, certain expert communiqués at the time cautioned that the disruption in autumn 2021 was a temporary occurrence, not necessitating drastic measures. Policymakers' eagerness to accept this interpretation resulted in an episode of public and policy gaslighting where less politically palatable calls for caution and aggressive stress-testing of the system were deliberately ignored. This has compounded the malaise in energy markets, leading to belated and frantic attempts to avoid what would have been largely inevitable aggravation of the situation, with potential rationing and blackouts in the event

of habitual low winter temperatures and strong Chinese demand. The immediate lesson is that the EU should ensure that groupthink does not dominate the policymaking process, and that what may be perceived as controversial proposals are embedded in policy deliberations to avert negative political, social and economic consequences down the line.

One option worthy of consideration is enabling power market flexibility via monetisation of demand reduction.

(18) IEA, *Statistics Report – Key World Energy Statistics 2021*, 2021 (<https://iea.blob.core.windows.net/assets/52f66a88-0b63-4ad2-94a5-29d36e864b82/KeyWorldEnergyStatistics2021.pdf>).

(19) 'Europe's energy crisis conundrum', op.cit.

Second, the disparate palliative measures employed mainly at national level have proven inadequate to tackle the causes of the crisis or provide remedies to its consequences. Worse, various fiscal measures such as price caps and household subsidies may have contributed to the erosion of the most significant EU energy policy achievement for the past three decades – the liberalisation of the energy market and the creation of an internal energy market⁽²⁰⁾. Different degrees of exposure to Russian gas dependency have juxtaposed more resilient countries against more vulnerable ones, also giving rise to at times antagonistic debates on the historic responsibility of individual Member States, relating in particular to German energy policy choices since reunification⁽²¹⁾. This could exacerbate lingering tensions and schisms along the familiar West-East/North-South axis; it could also nourish populist rhetoric, and elevate to power elites that are more reluctant to ostracise Russia or more inclined to hoard resources. Thankfully so far the 2022/2023 winter season has been relatively mild, but it is imperative that the Union takes coordinated action to build resilience to scarcity and further energy shocks as the year progresses. Supplies for winter 2023/2024 might prove even more arduous to secure, meaning that a course of integrated and co-ordinated action has to be embedded in the system already today as an antidote to the current cacophony of measures. Perpetuating this disjointed and fragmented approach will only exacerbate market distress and potentially lead to the suspension of energy market operations, the disintegration of the common market, fiscal collapse of the utilities sector and a dangerous reversal of the drive towards

pan-European energy integration. In addition, this could fuel fierce competition for scarce resources, and create a risk of suboptimal investments and heightened social tensions within and among Member States that could spill over to other policy areas.

Third, the EU and its Member States need to recognise that the vagaries of the energy market have a direct impact on societal processes and could lead to tensions and disparities between Member States. Rising energy costs quickly translate into social unrest and could even lead to a populist backlash; they can also lead to social fragmentation within and among Member States. Data from the European Trade Union Confederation (ETUC) shows that in 16 Member States, the average annual energy bill exceeds the monthly salary of low-paid workers⁽²²⁾. The squeeze on disposable incomes may explain the ongoing decline in consumer confidence, with economic sentiment in the EU reaching record lows in September 2022, before a slight (+1 %) improvement in November⁽²³⁾. In such a context, wealthier Member States can dole out generous subsidies to mitigate the impact of the energy price hike on consumers, while financially weaker Member States are left exposed to more adverse impacts, a state of affairs that runs counter to the tenets of the Just Energy Transition doctrine. Anaemic growth can also pave the way for the rise of populist political elites, as attested by the outcome of elections in Italy, Sweden and Bulgaria throughout 2022 and the resurgence of the far-right in Austria⁽²⁴⁾. Certain voices across the Union have started to tentatively demand that EU sanctions be eased, amid protests over the cost of living that have taken

(20) Measures as varied and extreme as air conditioning limits in offices (France), dimming of storefront lights and monument illuminations (Germany), campaigns promoting shorter showers (Netherlands) and even potential replacement of the long summer holidays with a 2-month winter break for schools (Slovakia) or companies switching to night production (Finland) (<https://www.euractiv.com/section/energy-environment/news/slovak-schools-could-close-this-winter-over-rising-energy-prices/>; <https://www.euractiv.com/section/energy-environment/news/finnish-companies-switch-to-night-weekend-production-ahead-of-bleak-winter/>).

(21) Hernandez, A., Posaner, J. and Stamouli, N., 'Southern rebellion threatens to sink EU gas rationing plan', *Politico*, July 21, 2022 (<https://www.politico.eu/article/poland-portugal-spain-syprus-greece-rebellion-eu-gas-rationing-rules/>).

(22) European Trade Union Confederation (ETUC), 'Energy now costs month's wages for low paid', 6 September 2022 (<https://www.etuc.org/en/pressrelease/energy-now-costs-months-wages-low-paid>).

(23) European Commission, Economic Sentiment Indicator, November 2022 (https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/business-and-consumer-surveys/latest-business-and-consumer-surveys_en).

(24) Jones, S., 'Energy crisis and inflation help push Austrians towards far right', *The Financial Times*, 10 January 2023 (<https://www.ft.com/content/b2f3894e-1bf2-465f-ac4b-d3e71d6ab685>).

place across Europe, from Germany to Moldova, the Czech Republic and Italy, with some even calling for the EU to reconsider sanctions ⁽²⁵⁾. This could have a contagion effect leading to a decline in support for Ukraine but also, more dangerously, damaging EU cohesion ⁽²⁶⁾. While such a possibility seems negligible today it should not be ruled out. A survey commissioned by the European Parliament showed that 59 % of EU citizens subscribe to European values such as freedom and democracy; however 60 % also express concern about coping with spikes in the cost of food and energy ⁽²⁷⁾.

Initiatives to bolster the EU's dynamic resilience and emerging risk management going forward should be anchored on the above considerations.

The immediate challenge is ensuring market stability for the remaining months of this winter, as well as starting to anticipate and prepare for difficulties likely to arise next winter. Weather is a key variable – in November projections by the European Centre for Medium-Range Weather Forecasts (ECMWF) warned of cold weather for the 2022/23 winter season with significantly less wind and rain than usual ⁽²⁸⁾. Despite the season having got off to a mild start, cold spells can still occur at the tail end of winter and beginning of spring. This would translate into less wind power generation, suboptimal hydropower capacity and higher demand for

Mild weather and China's delayed reopening proved fortuitous for Europe.

heating and electricity. The expected bounce-back of the Chinese economy after the 20th National Congress of the Chinese Communist Party and the recently announced progressive lifting of zero-Covid policy-related restrictions across the country, starting with key economic centres on 1 December and followed by nationwide reopening on 8 January, will increase competition for LNG cargoes. In addition, speculation about global supply contraction and US export controls might heighten scarcity. Nor can the occurrence of unexpected natural or man-made disasters, leading to curtailment of pipeline or LNG flows and production capacities, be ruled out. The sabotage of the NS 1 and 2 pipelines, the incident on the MedGas pipeline and the fire at the Freeport key LNG export facility in the United States, all in summer 2022, preceded by drone attacks on oil infrastructure facilities in Saudi

Arabia in 2019, cyberattacks on the Colonial Pipeline in 2021, freezing weather paralysing the grid in Texas in 2021, and gas supplies via the Maghreb Europe pipeline being intermittently cut off, are just a few of the most striking incidents in the recent past. These are all elements that will compound an already dire situation. In a perfect storm where these combined factors were to unfold all at once, even if inventories are at maximum capacity (storage levels were estimated to be approximately 95 % as of December 2022), economic operations would be disrupted with strong

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- (25) Seddon, M., Sheppard, D. and Foy, H., 'Russia switches off Europe's main gas pipeline until sanctions are lifted', *The Financial Times*, 5 September 2022 (<https://www.ft.com/content/2624cc0f-57b9-4142-8bc1-4141833a73dd>); Today Moldova, 'Thousands take part in anti-government protest in Moldova', 19 September 2022 (<https://www.todayonline.com/world/thousands-take-part-anti-government-protest-moldova-1996281>); Jones, S. and Minder, R., 'Ordinary Germans are paying': anti-war protests stretch across central Europe', *The Financial Times*, 21 November 2022 (<https://www.ft.com/content/fedc259f-bf96-4a22-b032-bc181d4dd51d>).
 - (26) A pan-European survey from January 2023 shows that 48 % of Europeans favour a quick end to the war even at the expense of Ukraine losing territory with highest support for such an outcome in Austria (64 %), Germany (60 %), Greece (55 %) and Italy and Spain (both at 50 %). See Heller, F., 'Half of Spaniards okay with Ukraine losing some land', Euractiv, 17 January 2023 (<https://www.euractiv.com/section/politics/news/half-of-spaniards-okay-with-ukraine-losing-some-land/>).
 - (27) Eurobarometer, 'EP Spring 2022 survey: Rallying around the European flag – Democracy as anchor point in times of crisis', June 2022 (<https://europa.eu/eurobarometer/surveys/detail/2792>).
 - (28) European Centre for Medium-Range Weather Forecasts (ECMWF), 'Updated – How models predict a possible outline of winter weather in Europe', 12 November 2022 (<https://www.ecmwf.int/en/about/media-centre/news/2022/how-models-predict-possible-outline-winter-weather-europe>); Weaver, M. and Lawson, A., 'Colder early winter in Europe could worsen cost of living crisis, say forecasters', *The Guardian*, 3 October 2022 (<https://www.theguardian.com/uk-news/2022/oct/03/winter-europe-cost-of-living-crisis-la-nina-eu-meteorological-agency>).

inflationary pressures adding to the markets' malaise⁽²⁹⁾. Curtailment of industrial output is already widespread, along with factory closures. And the latest economic data indicates a Europe-wide inflation rate of more than 10 %⁽³⁰⁾. All of this is extremely concerning. Therefore, enhancing the flexibility of the energy system and avoiding the crisis spiralling into a full-blown economic and social disaster should be set as a strategic priority superseding other commitments in the short term.

Targeted and anticipatory mechanisms should be deployed urgently to bolster the EU's response to Russia's weaponisation of gas supplies, and strengthen the energy system's resilience to supply shortage and disruptions in the current context as well as under a carbon-constrained environment in the future. The recommendations set out below should be considered as a matter of urgency.

RECOMMENDATIONS

Immediate measures

- > **Demand destruction:** Irrespective of gas inventories, and the availability of alternative supply injections, in the event of a protracted and cold winter, Europe might have struggled to secure sufficient capacity. Mild weather and China's delayed reopening

proved fortuitous for Europe for the 2022/23 winter season. Yet, conditions might not prove as auspicious in the winter of 2023/24 and the risk of scarcity remains elevated. Demand-side management should be implemented on a large scale to curtail non-essential consumption during peak demand periods⁽³¹⁾. This remains imperative today. In addition, measurement of effective load-carrying capabilities (the ability to perform at peak stress on the power grid) should be executed to assess resource agility within the power system. The EU's gas emergency plan, whereby Member States agree to reduce their gas demand by 15 % by April 2023, is a step in the right direction. However, the headline target is subject to various loopholes and exemptions, rendering it less effective and entailing the risk of free-riding by some Member States. Moreover, paradoxically, despite Member States endorsing the target, current measures across the Union counterintuitively subsidise consumption, virtually eliminating the consumers' incentive to curtail use⁽³²⁾. The schizophrenic tendency to approve a policy target only to then disavow it in practice weakens Europe's energy security. One option worthy of consideration is enabling power market flexibility via monetisation of demand reduction (a sort of a pay-for-no-use system). In France, the EcoWatt mechanism, a sort of exchange market where companies are rewarded for adjusting power demand, is gaining traction⁽³³⁾. This could serve as the basis for an EU-wide scheme. The

(29) Aggregated Gas Storage Inventory Database, op.cit.

(30) Eurostat, 'Inflation in the euro area', 30 November 2022 (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Inflation_in_the_euro_area). The inflation rate varies widely across Member States, with France and Malta registering the lowest levels at 6.6 % and 7 % respectively, or three times less than Estonia for example, which has an inflation rate of 25.2 %. The group of Central and East European Countries all register higher levels of inflation. Inflation in the EU reached a 40-year historic peak of 10.7 % on 31 October 2022. It appears that the level has decreased to 8.5 % eurozone inflation in January 2023.

(31) 'Europe's energy crisis conundrum', op.cit.

(32) Among the most flagrant examples of this are the 'solidarity tax' introduced in Romania covering the difference between a set reference price (€93/MWh) and the monthly sale price; the Austrian government's 'electricity price break' allowing households to consume 80 % of their electricity at a subsidised lower tariff; or the virtual freezing of electricity price increases to a maximum of 4 % in France. See: EuroActiv, 'Romania extends energy price caps by a year', September 2022 (<https://www.euractiv.com/section/energy-environment/news/romania-extends-energy-price-caps-by-a-year/>). For an overview of the different measures consult Euronews, *Energy bills are soaring*, 26 October 2022 (<https://www.euronews.com/next/2022/09/05/energy-bills-are-soaring-in-europe-what-are-countries-doing-to-help-you-pay-them>).

(33) Flemming, S. and Abboud, L., 'Europe's energy plan: is it enough to get through winter?', *The Financial Times*, 29 September 2022 (<https://www.ft.com/content/d40c434a-01db-48a2-a535-3dd502354736?shareType=nongift>).

recent decision of the European Commission on auctioning tenders for reducing power usage is warranted ⁽³⁴⁾. Notwithstanding, the fiscal implications (the incentive must be financed by state budgets) and potential impact on gas markets (given that in some cases electricity is an alternative to gas, so incentives to reduce electricity use can lead to higher demand for gas) need serious consideration.

➤ **Infrastructure optimisation:**

Pooling EU gas demand and developing mechanisms for the joint purchase of gas and its distribution across the Union is necessary to optimise for scarcity, avoid competition for gas supplies among Member States, and enable pragmatic use and reinforcement of existing infrastructure, investing in the maintenance and upgrade of existing interconnectors and constructing new links as and where necessary. The IMF surmises that the severance of Russian gas supplies in an isolated market would amount to a loss of up to 2.7 % of the EU's GDP or five times the loss in an integrated market, also demonstrating the financial argument for better integration ⁽³⁵⁾. Capacity extensions must be coordinated by an independent European agency whose remit is to eliminate bottlenecks in terms of gas and power flows across the Union and ensure that LNG supply is dispatched to markets that are most in need (the existing EU Agency for the Cooperation of Energy Regulators (ACER) could undertake this role). The agency should also eradicate systemic inefficiencies in the system: for example, the lack of integration of the Iberian Peninsula, which currently holds a quarter of Europe's

An artificially lowered price will distort market signals and encourage wasteful consumption.

LNG regasification capacity, with the continental European gas grid, or natural gas odorisation regulations creating artificial bottlenecks when interconnections do exist (as is the case between France and Germany). Eliminating such inefficiencies is critical for market functioning and security, as well as for cost optimisation. Furthermore, the Regional Energy Groups idea of the mid-2010s should be revived and such

groupings encouraged and empowered to achieve tangible regional market integration. Grid resilience and capacity should also be modernised. The ambition set out in the REPowerEU package for a massive expansion of renewable energy sources needs to be matched by adequate planning and financing mechanisms to ensure that the grid is able to accommodate

the extra capacity and avoid bottlenecks in the system. The drive to scale up investment in clean energy technologies should also urgently be complemented with a targeted industrial strategy to ensure access to key minerals and metals, but also strategic autonomy in manufacturing capacity for wind turbines, blades, solar panels and batteries. This is something that is currently not considered, despite the fact that all supply chains are currently controlled by China, which produces 96 % of the wafers for solar panels, 83 % of offshore wind blades, and 70 % of the world's batteries ⁽³⁶⁾. The country is also the world's leading refiner of rare earths and metals – responsible for 60 % and 70 % respectively of lithium and copper processing.

- **Price caps discussion:** The imposition of a price cap on Urals crude by the G7 countries will oblige Russian oil importers to abide by

(34) European Commission, Non-paper on Emergency Electricity Market Interventions, September 2022 (<https://www.euractiv.com/wp-content/uploads/sites/2/2022/09/Non-paper-emergency-electricity-interventions.pdf>).

(35) See: Albrizio, S., Bluedorn, J.C., Koch, C., Pescatori, A. and Stuermer, M., 'Market size and supply disruptions: Sharing the pain of a potential Russian gas shut-off to the European Union', Working Paper No 2022/143, International Monetary Fund, 18 July 2022 (<https://www.imf.org/en/Publications/WP/Issues/2022/07/18/Market-Size-and-Supply-Disruptions-Sharing-the-Pain-of-a-Potential-Russian-Gas-Shut-off-to-520928>).

(36) IEA, *Solar PV Global Supply Chains*, Special Report, July 2022 (<https://www.iea.org/reports/solar-pv-global-supply-chains>).

a set price ceiling in order to obtain insurance on the cargo. Currently, 90 % of global vessels have Western insurance coverage, demonstrating the potency of the measure⁽³⁷⁾. Nevertheless, the scheme can only be successful if major importers agree to it, meaning India and China. The announced retaliation by Russia has the potential to violently disrupt global markets in the short to medium term (in addition to permanently damage production capacities within Russia)⁽³⁸⁾. Therefore, it can be considered a symbolic gesture rather than a measure that could be effectively implemented, especially given the impossibility of confirming that other trade being carried out is not in fact a cover for oil being purchased at a higher price, or of monitoring offshore ship-to-ship transfers of oil. As indicated, the provision of sovereign insurance by Russia itself, but also China, India and Türkiye, as well as Russia's acquisition of a vast fleet of ghost vessels, could further weaken the effectiveness of the measure.

In terms of gas, the situation is slightly different, and imposing a price cap on gas is under serious consideration in Europe⁽³⁹⁾. At the 14th and last Extraordinary Energy Council of 2022, EU energy ministers agreed to impose a price cap on gas if month-ahead TTF prices both exceed €180/MWh and are €35/MWh higher than global gas prices for three consecutive days⁽⁴⁰⁾. The measure entered into force on 15 February 2023 for a renewable period of one year and applies to one-month,

three-month and one year-ahead derivative contracts. ACER has been tasked to trigger the 'dynamic bidding limit' for natural gas futures transactions not exceeding the LNG reference price + €35/MWh. The mechanism will be automatically deactivated once prices drop below the reference threshold or if the Commission declares an emergency. The latter may include spikes in gas consumption, a fall in imports, gas supply and demand imbalance leading to 'rationing' or a drop in TTF trading volumes.

But tinkering with market mechanisms in this way is problematic because the price cap does not necessarily drive lower demand, rather the contrary – an artificially lowered price will distort market signals and encourage wasteful consumption, and thus not prevent scarcity. In this vein, the price cap agreed on 19 December seems to have little tangible impact on markets. It

is also fiscally prohibitive and once the mechanism expires consumers will be confronted with steep bill increases, potentially leading to social and political unrest. Moreover, contracts that can be subjected to a price cap account for only about 20 % of EU demand, excluding Russian volumes (assuming Russia will simply discontinue all supply) and pipeline gas supplies from Azerbaijan, Algeria and Libya, as well as LNG contracts that are oil-indexed, and spot LNG⁽⁴¹⁾. Intra-day exchanges as well as unlisted over-the-counter (OTC) trades are also excluded from the market correction mechanism, further reducing its scope and impact. In addition, a price cap in the TTF trading zone might reduce the flow of LNG cargoes to Europe if set below the

The tectonic jolts in the energy market could trigger an insolvency catastrophe.

(37) Within the EU, the implementation of the price cap mechanism might require an alteration of the 6th sanctions package adjusting the insurance ban provision. See: 'How would a G7 price cap on Russian oil work?', op.cit.

(38) Ibid.

(39) Hancock, A., Foy, H and S. Fleming, 'EU spurs over proposal to cap Russian gas prices', *The Financial Times*, 9 September 2022 (<https://www.ft.com/content/c7e2644d-5726-4f3e-8f72-a141b5185ee6>).

(40) Council of the EU, 'Council agrees on temporary mechanism to limit excessive gas prices', Press Release, 19 December 2022 (<https://www.consilium.europa.eu/en/press/press-releases/2022/12/19/council-agrees-on-temporary-mechanism-to-limit-excessive-gas-prices/>); Taylor, K., 'EU seals deal on gas price cap after months of wrangling', Euractiv, 20 December 2022 (<https://www.euractiv.com/section/energy-environment/news/eu-seals-deal-on-gas-price-cap-after-months-of-wrangling/>).

(41) OIES, 'OIES webinar – Price caps in Europe's energy markets', 27 September 2022 (<https://www.oxfordenergy.org/publications/oies-webinar-price-caps-in-europes-energy-markets/>).

spot market price; conversely, if set too high, it could divert cargoes away from developing nations in a way that would reflect egregious hypocrisy on the part of the EU. Lastly, the 'dynamic price corridors' proposed by some Member States would prove very challenging to implement⁽⁴²⁾. Despite the effort at flexibility the price cap in its latest iteration seems to suggest, the most viable way forward is to leave market mechanisms balance demand and supply, while governments target support to the most vulnerable segments of society, an approach that still remains pertinent today⁽⁴³⁾. Jettisoning market principles even in the throes of an unprecedented crisis seems not only premature but also unwise.

- > **Strategic gas reserve:** A strategic gas reserve with minimum inventory levels has to be mandated across the Union and potentially modelled on the IEA Strategic Oil Reserve⁽⁴⁴⁾. The gas storage obligation introduced in June 2022 is important and should become a mandatory, permanent feature of the market. To optimise the system, going forward, a supervisory body should be established that, first, ensures that the pace of replenishment is adequate and that storage inventory levels are sufficient and, second, that there is a capacity balance among Member States, i.e. avoiding a situation where certain storage sites operate at suboptimal capacity while other storage facilities are being filled prematurely. Making the joint procurement platform a functioning mechanism is also critical. Member States at present compete to access

resources in the global market, thereby compromising the functioning of the platform, and weakening the resilience of the European energy system. Lastly, in 2021, Gazprom-owned storage facilities located mainly in Germany were emptied ahead of the winter season which contributed to the market tightness in September 2022. Going forward, the EU should mandate that all gas storage facilities within the Union are owned by EU countries or market actors without links to third-country regimes⁽⁴⁵⁾.

- > **Preventing a collapse of the energy markets:** The tectonic jolts in the energy market could trigger an insolvency catastrophe. A large-scale financial shock is becoming plausible due to an acute liquidity squeeze in electricity markets – an issue that has been ignored until now by policymakers, but that has the potential to create an economic debacle within Europe. Despite European utilities making record profits largely due to the marginal pricing model for power delivery, electricity companies are simultaneously facing soaring collateral requirements that generate a liquidity squeeze across the industry, with some commentators even prophesying doomsday scenarios of a Lehman Brothers-style collapse and a domino effect of corporate meltdowns across the EU⁽⁴⁶⁾. The collateral requirement might be in the range of €1.5 trillion or 5 % of Europe's GDP, hinting at the extent of the collapse possible. Filings for bankruptcy have significantly increased since October 2021, accelerating rapidly

(42) Taylor, K., 'Four EU countries float "dynamic" price corridor for gas', Euractiv, 5 October 2022 (<https://www.euractiv.com/section/energy/news/four-eu-countries-float-dynamic-price-corridor-for-gas/>).

(43) 'Europe's energy crisis conundrum', op.cit.

(44) Ibid.

(45) It is important to dispel the misconception that high inventory levels are sufficient to respond to scarcity without regular export flows. Storage is there to provide stability to the system in the face of market fluctuations while flows from imports continue. Without Russian gas in the system, the EU would face a heightened risk of supply disruptions even with storage inventories at 90 % of capacity. See: IEA, 'Even with gas storage at 90 %, the European Union would face heightened risk of supply disruptions if there is a complete Russian cut-off' (<https://www.iea.org/data-and-statistics/charts/even-with-gas-storage-at-90-the-european-union-would-face-heightened-risk-of-supply-disruptions-if-there-is-a-complete-russian-cut-off>).

(46) Power companies under current market regulations hedge current sales by short positions in futures markets and are required to post additional margin if the asset price rises, which in the current context of skyrocketing prices has imposed huge costs on utilities, depleting their credit lines. This creates a liquidity squeeze across the sector that might result in a complete collapse. For an excellent overview of the collateral requirements mechanisms see: Wilson, T., 'Why are Europe's power producers running out of cash?', *The Financial Times*, 6 September 2022 (<https://www.ft.com/content/3a188669-7eeb-4154-91a8-f808ed8ced71>).

since July 2022 and exposing the fragility of the sector⁽⁴⁷⁾. Emergency credit lines to energy companies are already being provided in some Member States (Finland and Sweden announced credit guarantees of €10 and €23 billion respectively on 4 September)⁽⁴⁸⁾. In Germany, some of the 1,000 municipal utilities are at present exposed to a risk of bankruptcy; the utility giant Uniper was bailed out in July and fully nationalised in September; CEZ and EDF were also nationalised in autumn 2022. Uncoordinated nationalisation programmes could lead to the collapse of commodity market players in poorer Member States with a significant contagion impact on their ability to access and supply energy. This is a worrying prospect that urgently needs to be discussed and coordinated at EU level, but which at the moment is completely ignored.⁽⁴⁹⁾

Measures to avoid a market collapse and the potential suspension of the European power derivatives market also need to be coordinated. The 'shock therapy' advocated by the European Commission should be examined in view of its potential systemic distortion of market

mechanisms; plans to mandate peak power demand reductions, cap revenue for inframarginal technologies via an 'electricity emergency tool' and redistribute windfall profits can only be perceived as temporary measures – allowing them to become structural ingredients of the European power market would only weaken it and lead to an exodus of clean energy investment outside of the EU⁽⁵⁰⁾. The framework currently being deliberated is further undermined by lack of clarity. For instance, the proposed €180/MWh price cap for 2023 would likely impact different Member States differently based on the various energy mixes with system modelling showing that 90 % of generation in Romania will be capped versus only 30 % in Cyprus, accentuating divisions across the Union⁽⁵¹⁾. Questions on how the revenue from the inframarginal caps will be collected and distributed also remain to be addressed and might create bureaucratic challenges in a number of Member States. The caps could also bring about a switch from gas to electric heating, thus undermining the original intention behind the measure. The financing source is also not specified: extending the 'crisis framework' for state aid that

(47) Maura, G., 'Bohemia energy goes bankrupt, leaving almost one million Czech customers without a supplier', *Brno Daily*, 13 October 2021 (<https://brnodaily.com/2021/10/13/news/bohemia-energy-goes-bankrupt-leaving-almost-one-million-czech-customers-without-a-supplier/>); HopEnergie, 'Faillite des fournisseurs d'énergie en Europe : et la France ?', 31 August 2022 (<https://www.hopenergie.com/comparateur-energie/faillite-fournisseur-energie>); Euractiv, 'Energy crisis looms large over Germany's local utilities', 6 September 2022 (<https://www.euractiv.com/section/energy/news/energy-crisis-looms-large-over-germanys-local-utilities/>); Euractiv, 'Berlin bails out Uniper for €15 billion', 22 July 2022 (<https://www.euractiv.com/section/energy/news/berlin-bails-out-uniper-for-e15-billion>); Euractiv, 'Austria's largest energy supplier urgently needs government support', 30 August 2022 (<https://www.euractiv.com/section/energy-environment/news/austrias-largest-energy-supplier-urgently-needs-government-help/>).

(48) Euractiv, 'Sweden, Finland step in to avert Lehman-like situation for power companies', 5 September 2022 (<https://www.euractiv.com/section/economy-jobs/news/sweden-finland-step-in-to-avert-lehman-like-situation-for-power-companies/>).

(49) To avoid collapse, Member States could either directly provide government credit to utilities or alter the market rules around collateral requirements, the latter being a more optimal solution, yet with hidden uncertainties – if the level of the collateral is lowered by regulation, this could create new systemic instability if clearing houses implode in the future. Extending the range of collateral assets utilities could use might be a more judicious option. This has been implemented in the United States where utilities can use uncollateralised bank loans. For more technical explanations, see: 'Power producers call for collateral change to avert "Lehman" moment', *Financial Times*, 5 September 2022 (<https://www.ft.com/content/3ef49eed-6698-49f5-aac1-12854d84f897>). The European Commission seems to have adopted a hybrid approach of both expanding the type of collateral assets as well as raising the commodities clearing threshold via a temporary (1 year) delegated act: see European Commission, 'Implementing and delegated acts – OTC Derivatives, Central Counterparties and Trade Repositories Regulation (EMIR)' (https://finance.ec.europa.eu/regulation-and-supervision/implementing-and-delegated-acts/otc-derivatives-central-counterparties-and-trade-repositories_en).

(50) Henceforth, some type of exemption should be embedded in the system and rebates allowed for generators that have incurred losses due to the collateral requirements. For a list of proposed interventions, see: S&P Global, 'EU lawmakers details energy interventions in shock therapy for crisis', 14 September 2022 (<https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/eu-lawmakers-detail-energy-interventions-in-shock-therapy-for-crisis-72115659>).

(51) ICIS models that 32 % of generation would remain uncapped with substantial variations across the EU, Germany and France accounting for 43 % of the EU's capped generation in 2023: Jones, M., Lead Analyst at ICIS, LinkedIn Profile Page, 'A few thoughts on the impact of the proposed €180/MWh price cap in 2023, based on our latest European power modelling', 2022 (https://www.linkedin.com/feed/update/urn:li:activity:697794338155336320/?utm_source=share&utm_medium=member_ios).

was introduced during the Covid-19 pandemic seems plausible⁽⁵²⁾. To alleviate already inflated budget deficits, money can also be drawn from the pandemic recovery funds, only 15 % of which have been disbursed so far⁽⁵³⁾. In the long term, elaborating mechanisms to provide consumers with a clear price signal and thus ensure demand price elasticity seems prudent to navigate the energy system tightrope, but such mechanisms have to be built and embedded in the system already today.

- > **Industrial production:** Soaring electricity costs have prompted the closure of businesses and the loss of key industrial capacity across Europe, posing an 'existential threat' to the European metals supply chain⁽⁵⁴⁾. In the course of 2022, 50 % of aluminium and zinc production capacity and 30 % of silicon production across the EU were forced offline, with market shortages being covered by Chinese supply, which today accounts for 60 % and 75 % of global aluminium and silicon production respectively⁽⁵⁵⁾. The industrial closures are likely to lead to critical scarcities later in the decade, as Europe progresses on its ambitious decarbonisation journey: 1 MWh of photovoltaic capacity requires 20 tonnes

A domestic price spike in the US might lead to curtailment of flows to Europe.

of aluminium, with industry roadmaps projecting that reaching the EU net-zero goals would increase demand for aluminium and silicon by 33 % and 50 % respectively for applications such as grid expansion and strengthening, increased deployment of EVs infrastructure and electrolyser capacity as well as the scaling up of the clean energy technology uptake⁽⁵⁶⁾. Some 10 % of Europe's crude steel production has ground to a halt with 40 % of steel furnaces' production and 70% of fertiliser production halted, with eastern Europe being particularly hit by capacity shut-downs⁽⁵⁷⁾. Termination or relocation of operations of strategic industries can have implications also for the global geopolitical, climate and sovereignty agenda, with increased EU reliance on non-European markets for strategic commodities and supply chains, as well as an increase in more emissions-intensive production processes in countries with less strenuous emissions regimes.

The recently announced Critical Raw Materials Act, as well as previous initiatives such as the European Battery Alliance and the Critical Raw Materials Alliance, demonstrates a recognition that new dependencies might derail European energy

(52) Flemming, S. and Espinoza, J., 'Brussels aims to relax state aid rules to ease energy sector cash crunch', *The Financial Times*, 5 September 2022 (<https://www.ft.com/content/051c214c-5ca3-4f80-9302-9de88a232ca6>).

(53) 'How to prevent Europe's energy crunch spiralling into an economic crisis', *The Economist*, 1 September 2022 (<https://www.economist.com/leaders/2022/09/01/how-to-prevent-europes-energy-crunch-spiralling-into-an-economic-crisis>).

(54) European Association of Metals (Eurometaux), 'Europe's non-ferrous metals producers call for emergency EU action to prevent permanent deindustrialisation from spiralling electricity and gas prices', Letter to the President of the European Commission Ursula von der Leyen, President of the European Parliament Roberta Metsola, President of the European Council Charles Michel; Executive Vice Presidents Frans Timmermans, Margrethe Vestager, Valdis Dombrovskis; Commissioners Thierry Breton, Paolo Gentiloni, Ms. Kadri Simson, European Commissioner for Energy, September 2022 (<https://eurometaux.be/media/qnhn5k30/non-ferrous-metals-ceo-letter-on-energy-crisis-06-09-2022.pdf>).

(55) An updated list of closures and curtailments in the non-ferrous metals sector since September 2021 is available in the Annex of the Eurometaux letter, *ibid*.

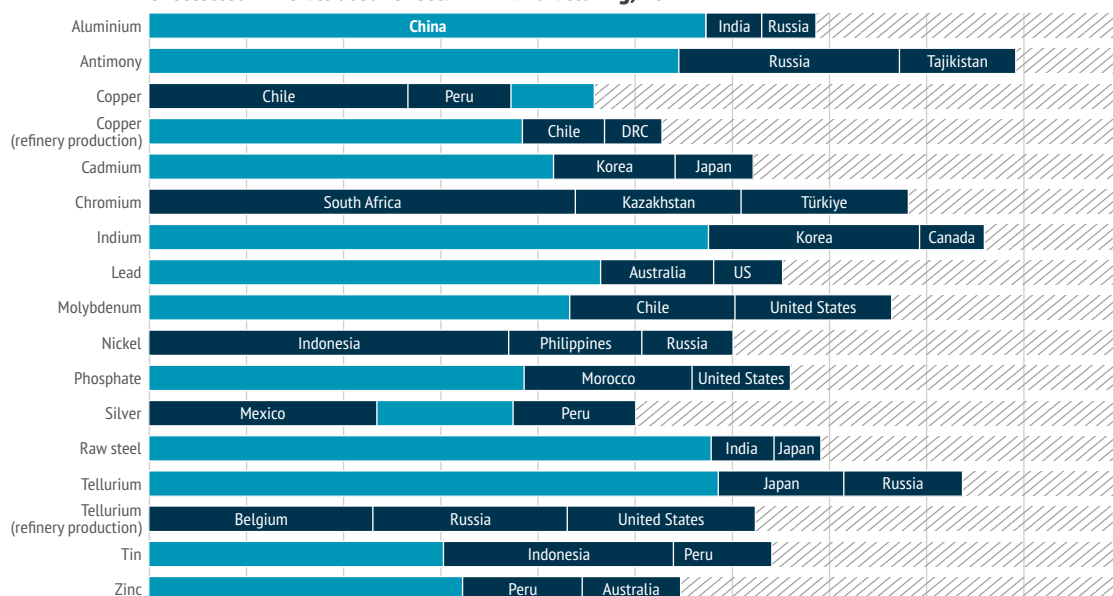
(56) KU Leuven & Eurometaux, 'Snapshot of Report Outcomes – Metals for Clean Energy: Pathways to solving Europe's raw materials challenge', 25 April 2022 (<https://eurometaux.eu/media/jsfneooy/final-slides-ku-leuven-study-presentation-25-4.pdf>).

(57) 'Will the energy crisis crush European industry?', *The Financial Times*, 19 October 2022 (<https://www.ft.com/content/75ed449d-e9fd-41de-96bd-c92d316651da>).

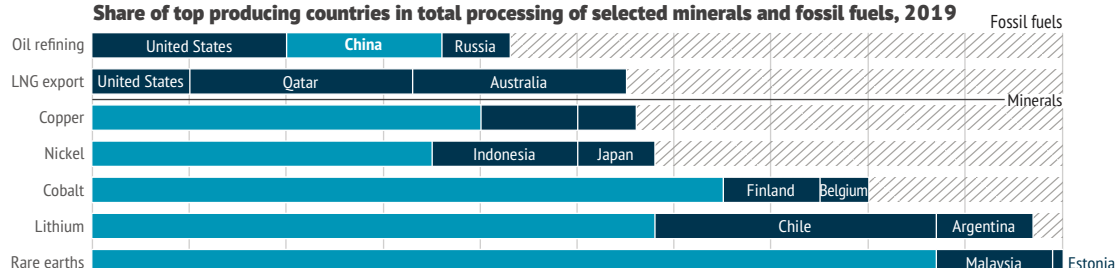
China: a world leader in clean tech?

China's control over the production and processing of energy transition metals and minerals exceeds that exerted by oil and gas producing nations over hydrocarbons by a factor of 9 to 1. Apart from controlling the solar PV production and supply chain, China also dominates global refining for critical metals and minerals such as lithium (60 %), nickel (35 %), rare earths (90 %) and cobalt (70 %); accounts for more than half of the global battery market, as well as of global EV manufacturing, almost 100 % of solar wafer manufacturing, and is increasingly taking the lead in wind turbine manufacturing, particularly in the offshore sector where it accounts for a share of over 80 % in the manufacture of offshore wind blades. The country is also a key producer of steel, aluminium, zinc and silicon – critical for electrification, grid expansion and clean energy components. Chinese mining companies are also active in the Democratic Republic of Congo (cobalt), Indonesia (nickel), Chile and Australia (lithium). China's quasi-monopoly on the production and processing of these critical commodities presents an acute geopolitical challenge for global clean tech ambitions.

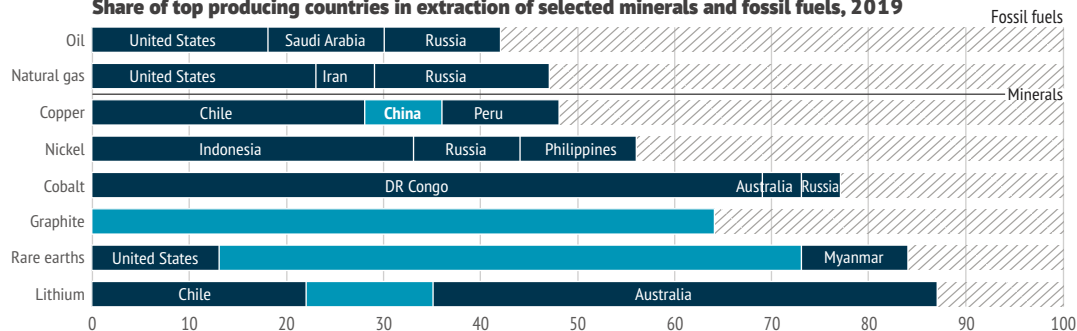
Top three producing countries' shares in global production of selected minerals used for solar PV manufacturing, 2021



Share of top producing countries in total processing of selected minerals and fossil fuels, 2019



Share of top producing countries in extraction of selected minerals and fossil fuels, 2019



security and climate goals in the upcoming decades⁽⁵⁸⁾. Yet these initiatives focus on green commodities, ignoring the fact that smelters closures will create bottlenecks hindering the transition of not less critical dimensions than the access constraints related to key minerals. Such oversight could potentially lead to a major economic and security crisis. The Critical Raw Materials Act must be revamped therefore into a Critical Commodities and Industries Act.

- > **Clean energy generation:** The flagship RePowerEU prescribes streamlined permitting processes to allow faster renewable energy deployment across the Union. Individual Member States are also accelerating national clean energy capacity extensions⁽⁵⁹⁾. This is necessary and important. Yet, supply-chain disruptions adversely impact clean energy deployment. Schneider Electric SE has announced considerable delays to its renewable projects from Spain to the Nordic states due to supply chain bottlenecks for semiconductors and other key materials and equipment, as well as soaring costs of raw materials⁽⁶⁰⁾. The European wind industry, including manufacturing powerhouses such as Vestas, Siemens Gamesa and Orsted, has also flagged significant difficulties at the start of 2023 despite robust demand⁽⁶¹⁾. Delays are also being incurred across the Atlantic for the same reason. The uncertainty behind future supply could impact the ambitious upscaling strategies for EVs and other key clean energy technologies. The EU should

immediately establish a Critical Materials Task Force, potentially in cooperation with the United States and Canada, comprising both public and private stakeholders, to collectively ensure supply chain fluidity for clean energy generation technologies and add critical production capacities for the entire array of such technologies. Tensions related to a potential exodus of EU industry to the United States, following the adoption of the Inflation Reduction Act (IRA), providing for subsidies for US-generated green innovation, including for the crucial battery supply chains, should also be tackled as a matter of urgency to avoid Allied competition for critical net-zero industries.

Medium-to-long term considerations

- > **Gas procurement and geopolitics of LNG:** Most gas volumes on global markets are sold on a contractual basis, with less than 15 % sold on the spot markets. Currently, the entirety of global uncommitted volumes is shipped to Europe, due to price premiums but also subdued Chinese demand. Europe has also diverted volumes destined for developing markets. A side effect of the European quest for gas is that global LNG production capacities are reaching maximum levels, with announced capacity extensions in Qatar and the United States potentially adding tangible volumes to the market in the 2025–2027 timeframe. Other

(58) According to the International Energy Agency, the world needs the equivalent of 30–50 new lithium mines, 41–60 new nickel mines and 11–17 new cobalt mines by 2030 just to meet projected global EV demand. IEA, *Global Supply Chains of EV Batteries Report*, 2022 (<https://iea.blob.core.windows.net/assets/4eb8c252-76b1-4710-8f5e-867e751c8dda/GlobalSupplyChainsOfEV Batteries.pdf>). On the Critical Raw Materials Act, see Commissioner Thierry Breton, Blog, 'Critical Raw Materials Act: securing the new gas & oil at the heart of our economy', 14 September 2022 (https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_22_5523).

(59) Germany, Denmark, Belgium and the Netherlands collectively committed to achieving 150 GWt (representing a tenfold increase) of North Sea wind power capacity by 2050 in May; in August the Baltic Sea states (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden) committed to 20 GWt (a sevenfold increase) of wind power generation by 2030. The latest combined targets of Member States for offshore wind almost double the EU's original 2030 target of 60 GW bringing it to 111 GW, and up to 317 GW by 2050. See: European Commission, 'Member States agree new ambition for expanding offshore renewable energy', Press release, 19 January 2023 (https://energy.ec.europa.eu/news/member-states-agree-new-ambition-expanding-offshore-renewable-energy-2023-01-19_en).

(60) 'Europe's energy crisis threatens to slow green transition', *Wall Street Journal*, 1 August 2022 (<https://www.wsj.com/articles/europes-energy-crisis-threatens-to-slow-green-transition-11659346200>).

(61) Hodgson, C., 'Europe's wind industry flags further weakness in 2023 despite energy demand', *The Financial Times*, 29 January 2023 (<https://www.ft.com/content/74ff8f7-8009-413a-8f2e-2a3c34695d78>).

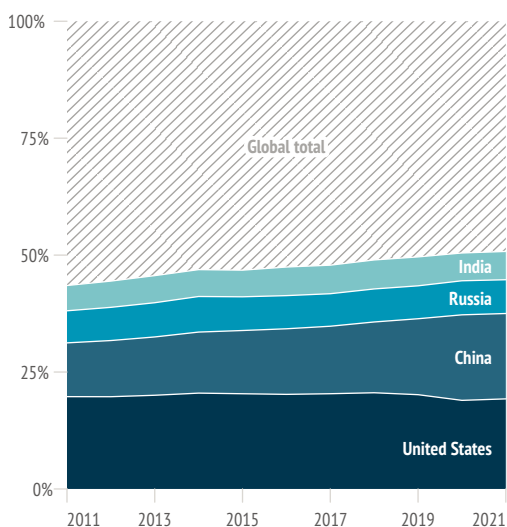
actors, many of which the EU has courted over the past couple of months, lack the infrastructure and technical capacity to supply volumes before the 2030s, if indeed ever. This emerging tightness should be factored into the EU's medium-term planning. In addition, as argued previously, the shift away from long-term contracts has been revealed as premature – prices under such contracts tend to be lower than on the spot market, and volumes contracted provide certainty to both producers and importers. Therefore the EU needs to overcome its aversion to such contracts to provide certainty to investors for ramped-up capacity expansion.

Beyond the immediate concern of securing volumes, the EU should focus and strategise on the geopolitical dimension of the LNG market trends. Over the next decade, the global LNG market will experience considerable restructuring with supply increasingly dominated by the United States and Qatar. This would provide these two countries with considerable leverage in arbitraging LNG flows, with all the related risks that this incurs for EU energy security. For instance, it is not difficult to imagine that a domestic price spike in the US might lead to curtailment of flows to Europe. Such a scenario would be compounded by the US shale industry's focus on capital discipline, hence decelerated production, and Qatar's signalling that it will not be able to provide sufficient volumes to Europe⁽⁶²⁾. Furthermore, QatarEnergy has steadily increased its ownership of global LNG infrastructure, being a key stakeholder in US export terminals, as well as plants in Italy and the UK, giving it a significant degree of control over where cargoes are sent in the future⁽⁶³⁾.

The power of the few – oil refining capacity

Four producer nations accounted for 51 % of global refinery output in 2022

Global refining capacity has dropped by a historic 4 mb/d in the past two years, leading to scarcity and strong inflationary pressures on the price of refined products such as petrol and diesel globally. The embargo and price caps imposed on refined products of Russian origin on 5 February might augur further market tightening and inflationary pressures on prices for such products amidst global demand growth.



Data: BP, 2022

A competition for scarce volumes between the EU and Asia, particularly China, once its economy picks up again, presents further uncertainties and would make securing LNG volumes a prohibitively costly and arduous endeavour for the EU, particularly for the 2023/24 winter season, when the approximately 90 bcm of Russian gas Europe received in 2022 will have to be supplied from elsewhere – this represents almost one third of the global LNG market⁽⁶⁴⁾. Wildfires or other

(62) Comments by leading US producers in September 2022 indicate such an eventuality. Jacobs, J., Brower, D. and McCormick, M., 'US shale bosses tell Europe: "There's no bailout coming"', *The Financial Times*, 14 September 2022 (<https://www.ft.com/content/ef4fb2b8-1b28-43f3-b34f-13e98c769e63>); Cacciatore, L., 'Emir: Qatar can't supply Europe with gas, urges end to conflict', *Newsmax.com*, 15 September 2022 (<https://www.newsmax.com/world/globaltalk/emir-qatar/2022/09/14/id/1087508/>); England, A., 'Europe at risk of "much worse" energy crisis next year, warns Qatar', *The Financial Times*, 18 October 2022 (<https://www.ft.com/content/96611190-3c09-48b7-8ded-7b2651590f94>).

(63) 'The war in Ukraine has reshaped the world's fuel markets', *The Economist*, 24 September 2022 (<https://www.economist.com/interactive/briefing/2022/09/24/war-in-ukraine-has-reshaped-worlds-fuel-markets>).

(64) Ibid.

natural or man-made disasters and disruptions can curtail throughput capacity and/or discretionary volumes earmarked for export as well (the fire at the Freeport facility in the United States in June 2022, accounting for 20 % of American LNG exports, cannot be considered an isolated accident). These are all risks that currently do not feature in policy planning. This omission has to be rectified as a matter of urgency if the EU is to avoid another energy crunch happening as early as in 2023.

> **Global oil markets:** The focus on gas should not overshadow the tightness of global oil markets. Curtailed investment in new exploration, depletion of reserves and OPEC+ discipline are harbingers of acute market tightness in the oil sector that will be exacerbated by the potential reduction of Russian supply, currently representing 10 % of the global market ⁽⁶⁵⁾. Yet, the issue of refining capacity is more consequential, particularly for the EU. According to the Oil Refining Industry Insights report by the International Energy Forum, global refining capacity has dropped by a historic 4 mb/d in the past two years, leading to scarcity and strong inflationary pressures on the price of refined products such as petrol and diesel globally ⁽⁶⁶⁾. The increasing dearth of investment in developing such capacity, mainly induced by the trend towards decarbonisation in previous years, may be an omen of future bottlenecks in global fuel markets. Today, Russia and China are the only countries with spare refining capacity, in the former case due to the imposition of sanctions and in the latter case due to export quotas imposed by the Chinese

The issue of refining capacity is more consequential for the EU.

government. In addition, refineries in the EU are designed for Russian crude, making the replacement of the 1.5 mb/d of Russian products or about a quarter of EU imports additionally difficult ⁽⁶⁷⁾. The ban on Russian refined products that entered into force on 5 February has prompted record imports in the EU over the past six months, with imports reaching historic heights in December and January and current inventories providing some security for the upcoming months. Notwithstanding, US refiners are also operating at 93 % capacity (the level considered sustainable is 85 % ⁽⁶⁸⁾). Importing more refined products from India and potentially China, if it opts to release its export quota, would lead to Russian oil indirectly reaching European markets via refined products (the EU already imports refined products from India against the backdrop of skyrocketing imports of Russian oil in that country, raising some uncomfortable questions for the bloc).

These factors also raise the worrying prospect of a future crunch that would impact negatively on the Union. The ban on refined products would also lead to removing capacity from the global market, given that Russia would not be able to redirect exports of refined products to India or China who have abundant refining capacity themselves. Taking capacity out of the market would lead to price spikes that would impact Europe particularly strongly. This scenario is currently ignored. Therefore, contingency plans need to be developed to foresee such disruptions and avoid them paralysing the EU economy. One course of action – probably the most optimal – is to mandate inventories of refined products across

(65) The latest OPEC+ cut of 2 mb/d (an actual reduction of about 1 mb/d due to unfulfilled quotas) generated a price hike of 10 % further increasing revenue for producing states, including Russia, to the consternation of the West.

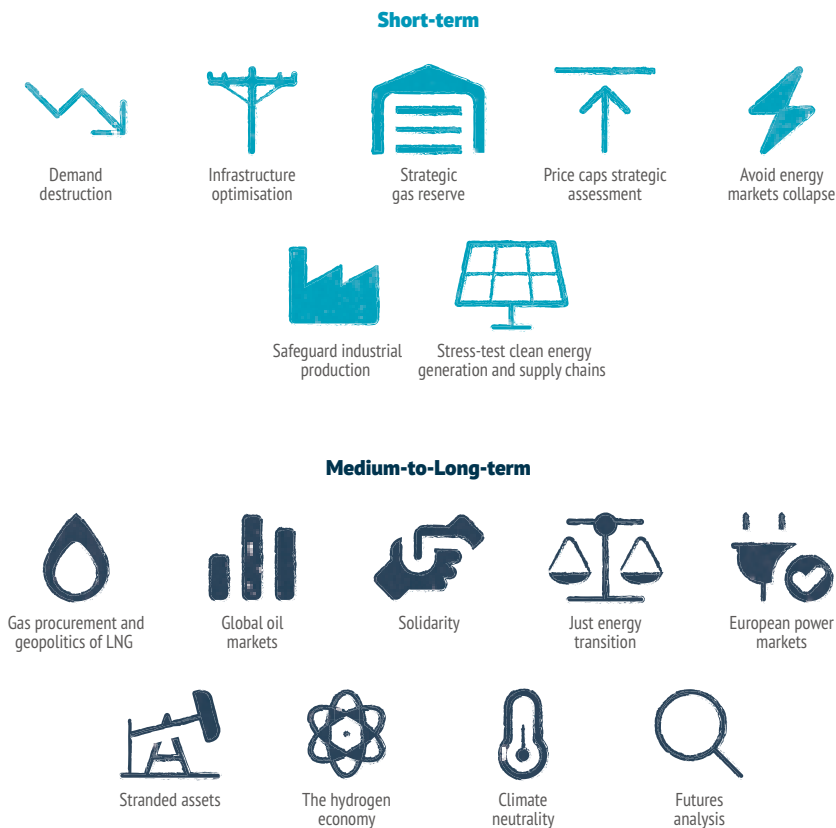
(66) International Energy Forum, *Oil Refining Sector Insights Report: Stretched sector fuels market volatility*, 2022 (<https://www.ief.org/news/ief-oil-refining-sector-insights-report-stretched-sector-fuels-market-volatility>).

(67) The unprecedented increase – 22 % year-on-year of the EU's imports of Russian diesel in July as well as record imports in December – is an important signal.

(68) 'The war in Ukraine has reshaped the world's fuel markets', op.cit.

Strategic measures to build resilience to energy market volatility

The interlinkages between physical, meteorological, cyber and geopolitical shocks and upheavals and the evolving notion of energy security will only strengthen on the path to net-zero. EU policymakers need to advance energy and climate goals in tandem to mitigate the volatility that will define the system.



the Union, along the same model as the Oil Strategic Reserves but in addition to crude oil inventories ⁽⁶⁹⁾. In the long term, investing in expanding domestic refining capacity is also worthwhile.

> **Solidarity:** Competition for scarce resources is already evident among Member States, displaying a blatant disregard for the

principle of solidarity. Apart from trying to secure alternative supplies for their domestic markets, potential embargoes on energy exports or transit to neighbours might start to be discussed in cases of acute supply scarcity internally. In a surprising move on 9 September 2022, the Croatian government announced plans to ban gas exports ⁽⁷⁰⁾. The decision of Germany to

(69) IEA, *Oil stocks of IEA countries* (<https://www.iea.org/data-and-statistics/data-tools/oil-stocks-of-iea-countries>). The current EU levels are mostly composed of crude oil (45.5 mt), gas/diesel oil (35.9 mt) and gasoline (9.8 mt). See: Eurostat, *Emergency oil stocks statistics* ([https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Emergency_oil_stocks_statistics#:~:text=The%20current%20levels%20are%20mostly,gasoline%20\(9.8%20million%20tonnes\)](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Emergency_oil_stocks_statistics#:~:text=The%20current%20levels%20are%20mostly,gasoline%20(9.8%20million%20tonnes).)).

(70) Euractiv, 'Croatia to ban gas exports, ups ante with Hungary', 8 September 2022 (<https://www.euractiv.com/section/energy-environment/news/croatia-to-ban-gas-exports-ups-ante-with-hungary/>).

proceed with the mothballing of nuclear reactors is also attracting criticism, with Swedish politicians proposing to cut the Baltic cable ⁽⁷¹⁾. In addition, numerous Member States were already negotiating bilateral gas contracts from various countries across the world days after they agreed on an EU collective purchasing platform.

Therefore, competition for reduced volumes might escalate and disrupt the integrity of the European gas market. There is a danger that the divisions generated by the energy crisis may spiral into lasting disagreement on the trajectory of the energy system and compromise or stall advances made in high-carbon divestment and structural resilience. This could potentially herald an era of heightened energy market volatility, escalating competition for scarce resources among Member States and in-between regions and polities, and ultimately an uncertain planetary future.

- > **Just energy transition:** The current crisis also brings to the fore the reality of a transition process which has deepened existing inequalities across the Union. The energy price surge has disproportionately impacted people who are already considered energy vulnerable. This has exacerbated divisions and inequalities both in societies within Member States and between Member States. These inequalities fuel social discontent and are grist to the mill of populist politicians who peddle anti-transition narratives contributing to market chaos.

Eradicating the scourge of energy poverty in one of the world's most affluent continents will be of the utmost importance as the Union embarks on the next phase of its domestic energy transformation and pursues its global climate leadership ambitions ⁽⁷²⁾.

In a system with high levels of intermittency, demand for power system flexibility will dramatically increase.

Shielding consumers is important but this has to be achieved via social policies and targeted support rather than via a blanket price freeze or non-income adjusted subsidisation. In addition, to maintain public support for the energy transformation, the EU needs to invest more in communicating the rationale for its decarbonisation strategy to citizens, as acknowledging

the risks and marshalling public support for the measures taken is essential. Upscaling efficiency standards for appliances, construction and production processes is also imperative, as is embarking on insulation mega-projects, and pan-European awareness campaigns aimed at promoting more sustainable lifestyles. Financial incentives for energy saving should also be introduced and scaled up across the continent.

- > **European power markets:** The uncoordinated palliative measures taken by Member States to shield consumers from soaring electricity prices are at odds with the central dictums of the single energy market. The imposition of a cap on the price of gas for power generation in Spain might explain the subsequent decline in the volume of power transfers to the French market

(71) Aanstoot, T., Twitter post, September 2022 (https://twitter.com/storklompem/status/1567232240291037185?s=20&t=QofF9y_UovUrXNsMFy7aug).

(72) See 'Europe's energy crisis conundrum', op.cit. There is no common definition of 'energy poverty' across the EU, which might result in a statistical misrepresentation. An assessment by the Joint Research Centre in 2019 classified 50 million people as energy poor. Some other estimates point to as many as 80 million people. See Gangale, F. and Mengolini, A., *Energy poverty through the lens of EU Research and Innovation projects*, JRC Science for Policy report, Publications Office of the European Union, Luxembourg, 2019 (<https://op.europa.eu/en/publication-detail/-/publication/434fed3-b988-11e9-9d01-01aa75ed71a1/language-en>); European Cooperation in Science and Technology, '80 million European households struggle to stay warm. Rising energy costs will make the problem worse', 12 November 2021 (<https://www.cost.eu/80-million-european-households-struggle-to-stay-warm-rising-energy-costs-will-make-the-problem-worse/>).

(with Iberdrola even terminating supply to its French customers) ⁽⁷³⁾. The same pressures have been noticed in Norway and Portugal. Italy announced that from October, its gas will no longer be based on the EU benchmark (TTF) but will instead be linked to Italian gas contracts ⁽⁷⁴⁾. The largely domestic-focused interventionist approach to ease the pressure on domestic power markets might lead to high price imbalances across the continent and imperil the functioning of cross-border exchange ⁽⁷⁵⁾. But clearly, in a system with high levels of intermittency, demand for power system flexibility will dramatically increase (the IEA projects a fourfold increase); therefore, current practices should be reversed and achieving and exceeding the electricity interconnection target of 15 % by 2030 be made a paramount objective. This increases security (France seamlessly imported electricity when faced with the sudden domestic output curtailment in summer 2022), connects optimal generation with demand sites and shields supply from intermittency challenges and sudden supply shocks. Grid integration also brings cost-optimisation to systems exceeding €30 billion per year ⁽⁷⁶⁾.

- > **Stranded assets:** The measures deployed across the Union to protect the consumer from soaring energy prices paradoxically fuel demand for more hydrocarbons, thereby compounding the crisis dynamics and

jeopardising the climate agenda. To avoid locking fossil fuel use into the system, innovative schemes need to be imagined. One avenue is mandating that all new fossil fuel projects are equipped with CCUS technology. In addition, establishing a better carbon pricing regime where projects pay for their environmental externalities seems a better solution than the outright financial ban on such projects that has fuelled the market liquidity problems. Widespread discussion on the timeline of the projects and how their capacity will be utilised once Europe does not need them anymore is another critical aspect. Dramatic price swings and advances in decarbonisation might depress gas demand in the next decade, potentially creating a glut in global gas markets. This can be avoided if coal-to-gas switching is activated in Asian and African markets where buoyant economies will require more and more energy. Europe should reconsider its excessive and misguided reticence *vis-à-vis* gas infrastructure investments in developing countries for domestic use (while approving such projects for exports, especially to its own shores). Such a posture could in fact imperil rather than facilitate global decarbonisation, not to mention expose Europe to accusations of hypocrisy.

- > **The hydrogen economy:** In-depth analysis on the prospects for hydrogen is urgently needed. Currently, green hydrogen is widely perceived as the Holy Grail of

(73) The price cap for gas used in electricity generation in Spain has been subsidised by taxpayers' money. It has led to a substantial reduction in the price of electricity in the domestic market and ironically to increased demand for gas. The unforeseen, yet logical, consequence of such a unilateral measure is that exporting subsidised power becomes politically unpalatable. See: Reuters, 'Spain's Iberdrola terminating thousands of French retail power contracts as prices soar', 19 August 2022 ([https://www.reuters.com/business/energy/spains-iberdrola-terminating-thousands-french-retail-power-contracts-prices-soar-2022-08-19/#:~:text=PARIS%2C%20Aug%2019%20\(Reuters\),customers%20change%20to%20another%20supplier.](https://www.reuters.com/business/energy/spains-iberdrola-terminating-thousands-french-retail-power-contracts-prices-soar-2022-08-19/#:~:text=PARIS%2C%20Aug%2019%20(Reuters),customers%20change%20to%20another%20supplier.)); On rumours about France and Norway contemplating similar steps, see Bloomberg, 'France denies it's mulling halting exports to Italy', Bloomberg, 17 September 2022 (<https://www.bloomberg.com/news/articles/2022-09-17/france-s-edf-may-halt-power-exports-to-italy-for-two-years?leadSource=uverify%20wall>); Bloomberg, 'Norway faces pressure to curb power exports as prices surge', 22 April 2022 (<https://www.bloomberg.com/news/articles/2022-04-22/norway-seeks-talks-with-eu-on-power-exports-as-prices-surge>).

(74) 'EU gas unity tested as Italy drops regional benchmark from bills', Bloomberg, 22 August 2022 (<https://www.bloomberg.com/news/articles/2022-08-01/eu-gas-unity-tested-as-italy-drops-regional-benchmark-from-bills>).

(75) The fragmented and uncoordinated approach might have been partly the result of the delayed attention to the need to overhaul the scarcity pricing model. While the idea is gaining support now, due to the complexity of the exercise it cannot be expected to be accomplished before the end of 2023, proving virtually impotent today to calm the market or avoid the potential suspension of gas market operations.

(76) According to a report by the ACER comparing cross-border power exchange to a system of isolated national markets. See: EU Agency for the Cooperation of Energy Regulators (ACER), *ACER's Final Assessment of the EU Wholesale Electricity Market Design*, April 2022 (https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER's%20Final%20Assessment%20of%20the%20EU%20Wholesale%20Electricity%20Market%20Design.pdf).

decarbonisation for hard-to-abate sectors, for seasonal balancing and for storage solutions. A closer look at this premise exposes its limitations. The EU plans to achieve the target of 20 million tonnes of hydrogen by 2030 – 10 mt from domestic production and 10 mt from exports⁽⁷⁷⁾. In practice this ambition represents a colossal endeavour: it would mean increasing current renewable energy generation by 70 % (with the addition of roughly 500 TWh); and imports equivalent to 40 NEOM (the futuristic Saudi Arabian megapolis) projects by the end of the decade⁽⁷⁸⁾. Three further constraints merit attention: first, it remains to be proven that gas infrastructure can easily be retrofitted to accommodate hydrogen transportation; second, the required renewable capacity extensions to achieve the green hydrogen target capacity amount to a mammoth task, that could virtually cannibalise clean energy capacity for power generation; third, scaling up electrolysis technologies to the extent necessary to meet the targets would also be a Goliath task, not least in terms of finding available sites for the construction of electrolysis installations. At present, uncertainties related to the EU's ambitions *vis-à-vis* the importation of green hydrogen, particularly with regard to transportation costs and security, exact volumes, and the viability of such supply chains for earmarked producer markets such as Egypt and Namibia, appear to be entirely overlooked. Eschewing an honest debate on the potential of hydrogen is a dangerous pathway, and therefore it is important that this issue is discussed as a matter of urgency if the EU is to avoid a system hobbled by embedded

structural bottlenecks tomorrow. The EU should focus on activating local economic transformation and industrial modernisation in the countries concerned, promoting local sustainability initiatives, skilling and reskilling local workforces, and facilitating the location of manufacturing plants in proximity to production sites. This would counter accusations of exploitation and neo-colonialism, and raise the profile of the EU as a provider of smart technology and concessional finance, while also ensuring it is a key node in the new supply chains related to green hydrogen – not a small feat in a fiercely competitive emerging market.

- > **Climate neutrality:** The energy crisis has also fuelled a certain amount of backlash against the climate agenda. Proposals on watering down the 45 % renewable energy generation target within the RePowerEU package were floated last autumn⁽⁷⁹⁾. On 30 August, the Polish prime minister Mateusz Morawiecki openly called for a temporary suspension of the EU's flagship Emission Trading System (ETS) in order to stabilise power prices and on 5 September he called on the EU to 'put the fight against climate change on the back burner'⁽⁸⁰⁾. The carbon price rally has indeed added some price premium, albeit a negligible amount (estimated to be at roughly 6 %), yet campaigns in individual Member States have associated the ETS system with the surge in energy prices. Alarming signals have begun to emerge: the German government has suspended the increase in its national carbon price for one year, while Spain has also proposed price caps on carbon emissions

(77) European Commission, 'A hydrogen strategy for a climate-neutral Europe', Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2020) 301 final, 8 July 2022 (<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0301>).

(78) Columbia Energy Exchange, 'The Gas Crisis Deepens', Podcast, 19 July 2022 (<https://www.energypolicy.columbia.edu/gas-crisis-deepens>).

(79) Euractiv, 'EU countries eye scrapping the 45% renewable energy target – document', 15 October 2022 (<https://www.euractiv.com/section/energy/news/eu-countries-eye-scrapping-45-renewables-target-document/>).

(80) Minder, R., 'Poland warns against plans for EU windfall levy on power producers', *The Financial Times*, 8 September 2022 (<https://www.ft.com/content/6123bda2-12d7-48ae-a139-efd89f4a1034>).

permits ⁽⁸¹⁾. This could quickly spiral into a backlash against the main tool for emissions reduction – a dangerous predicament for the EU and the world. The narrative on the weak correlation between carbon prices and electricity bills needs to be promoted by the European Commission via targeted campaigns driving home the message to the public that the green agenda is the solution to, rather than the trigger of, their income predicament.

- > **Futures analysis:** Ultimately, the Union should develop a horizon scanning system to enhance capacity to anticipate, withstand and recover quickly from a supply shock and/or wild swings in the energy market. The interconnectedness of markets means that a crunch in one geographical region will reverberate across the world and in the unfortunate event of a ‘perfect storm’ of mutually reinforcing negative forces, like the one which we are currently experiencing, Europe might be left paying the highest price. The freezing weather and its impact at the beginning of 2021 in the United States, unusually low wind speeds in northern Europe, and droughts and alterations to the hydrological cycle in Latin America in the summer months of 2021 should have served as a signal to the EU that supplies might be curtailed. Likewise, economic data from China auguring economic recovery, hence increased demand for energy in 2021. It is of paramount importance that such an energy security monitoring and early warning system be put in place. This should also critically include regular exercises simulating renewable energy generation under changing weather conditions, and in-depth analysis of the global terrestrial stilling phenomenon, ⁽⁸²⁾ alterations in the Gulf Stream and El Nino, cyber resilience and security, market gyrations across the globe, as well as projecting what

mitigating measures should be deployed in different timescales to avoid compromising the stability of the energy system. The ability to conduct such exercises, develop strategic foresight on systemic disruptors and set in place anticipatory mechanisms to tackle them quickly and efficiently will define energy security and energy system resilience in the net-zero age. The current energy price crisis was perhaps not so easy to predict, but could easily have been simulated as part of an energy security planning exercise of the type proposed above. Such exercises need to be institutionalised to sustain and shield the energy transition going forward.

Disruption to energy markets might become a regular phenomenon in the years and decades ahead, fuelled by the impact of rising temperatures on climatic patterns, poorly managed transition processes, supply-demand imbalances and systemic inefficiencies. To boost resilience to the combined impact of physical, meteorological, cyber and geopolitical shocks and upheavals, EU policymakers need to deploy imaginative solutions to advance climate goals and harden the energy grid in tandem. The strategic responses outlined in this chapter can and should inform the process.

DIVERSIFICATION OPTIONS AND THEIR VIABILITY

The prospects for Algerian, Egyptian and Israeli but also Senegalese, Tanzanian and Mozambique gas resources have been widely explored of late. Over the summer of 2022, confronted with the increasing likelihood of a

(81) Euractiv, ‘Berlin freezes carbon price in the name of crisis relief’, 5 September 2022 (<https://www.euractiv.com/section/emissions-trading-scheme/news/berlin-freezes-carbon-price-in-the-name-of-crisis-relief/>); Reuters, ‘Spain to propose to EU a cap on carbon emission permit prices, PM says’, 29 July 2022 ([https://www.reuters.com/markets/commodities/spain-propose-eu-cap-carbon-emission-permit-prices-pm-says-2022-07-29/#:~:text=MADRID%2C%20July%2029%20\(Reuters\),a%20news%20conference%20on%20Friday](https://www.reuters.com/markets/commodities/spain-propose-eu-cap-carbon-emission-permit-prices-pm-says-2022-07-29/#:~:text=MADRID%2C%20July%2029%20(Reuters),a%20news%20conference%20on%20Friday)).

(82) The term denotes the decrease in global average surface wind speed which has been observed over the last four decades.

complete halt of gas supply from Russia, high-ranking EU officials, including the EU Energy Commissioner, the President of the European Commission, and the head of the European Council, visited various countries, signed memoranda, and expressed support for new gas exploration projects from Azerbaijan to Egypt, from North America to Norway, and Senegal to Nigeria. Concurrently, either in unison or unilaterally in competition, individual Member States started assiduously courting gas-rich countries: days after the historic agreement on the establishment of a common European gas purchasing platform, Eni, the Italian energy company, managed to enter into a 4.5 bcm/y LNG deal with Congo, an LNG deal with Egypt providing for 3 bcm to be sent to Europe by the end of 2022, and concluded a gas partnership agreement with Angola⁽⁸³⁾; together with Total from France and Occidental from the United States, Eni also agreed a deal with the Algerian national gas and oil company Sonatrach for an additional USD 4 billion-worth of gas supplies, doubling export capacity to the Italian market by 2024 to 18 bcm; EnBW, the German giant, signed a long-term contract (for 20 years) with Venture Global; the Polish PGNiG Group secured a 20-year contract with US LNG providers; and Engie, the French multinational utility company, secured commitments (no specific volumes have been announced) from Algeria

Algeria and Egypt will struggle to supply the gas volumes that the Union seems to assume will be available.

following the official visit of President Emmanuel Macron⁽⁸⁴⁾. While there has certainly been an intense flurry of activity in recent months, diplomatic visits and high-level political pronouncements on the prospects of securing alternatives to Russian gas supplies

have peaked and ebbed at various intervals over the past decade. Therefore, it is important to bear several factors in mind in order to put the current diversification drive into perspective. This section will focus exclusively on the prospects for North African gas supply, and particularly the emphasis placed on Algeria and Egypt as suppliers able to provide a solu-

tion to the EU's energy woes – a promise that could prove elusive if not illusory once carefully assessed. Analysis of the prospects with regard to other potential sources, such as Azerbaijan and Norway, will also feature in the examination that follows.

Firstly, the Eastern Mediterranean resources and their potential to alleviate gas scarcity in European markets should be examined with caution⁽⁸⁵⁾. The most recent memorandum of understanding (MoU) between the EU, Egypt and Israel which would allow Israeli gas to reach Europe via Egyptian LNG facilities is the latest of a series of iterations over the past decade predicated on the prospects of the EastMed gas reserves, particularly the Zohr, the Leviathan and the Aphrodite fields,

(83) 'The Republic of Congo and Eni agree to increase gas production and supply', ENI, Press Release, 21 April 2022 (<https://www.eni.com/en-IT/media/press-release/2022/04/republic-congo-and-eni-agree-increase-gas-production-supply.html>); 'Eni and EGAS agree to increase Egypt's gas production and supply', ENI, Press Release, 13 April 2022 (<https://www.eni.com/en-IT/media/press-release/2022/04/eni-and-egas-agree-increase-egypt-s-gas-production-and-supply.html>); Pinto, J., 'Africa as an alternative energy source for Europe', GIS, 7 July 2022 (<https://www.gisreportsonline.com/tr/africa-alternative-energy/>); Wilson, T., 'Eni calls for south-north energy axis between Europe and Africa', *The Financial Times*, 6 January 2023 (<https://www.ft.com/content/8f00aa32-de56-4c8c-b065-2544ba16a460>).

(84) Euractiv, 'Algeria a "reliable" gas supplier: EU chief Michel', 6 September 2022 (<https://www.euractiv.com/section/energy-environment/news/algeria-a-reliable-gas-supplier-eu-chief-michel/>); 'Le premier ministre Mario Draghi obtient un accord de l'Algérie pour plus de gaz à l'Italie', *Sud Ouest*, 11 April 2022 (<https://www.sudouest.fr/international/afrique/algerie/le-premier-ministre-italien-a-alger-pour-solliciter-plus-de-gaz10566371.php>).

(85) For an in-depth evaluation of the Eastern Mediterranean gas reserves and implications for the geopolitics of energy in the Euro-Mediterranean area, see Popkostova, Y., *Geopolitics of Energy à la Méditerranéenne: key issues, latest developments and future prospects for the Eastern Mediterranean Gas*, European Centre for Energy and Geopolitical Analysis (ECEGA), 2017.

for EU energy security⁽⁸⁶⁾. Despite being hailed as revolutionary, the MoU does not specify any concrete volumes (unlike the MoU with Azerbaijan committing 20 bcm/y by 2027)⁽⁸⁷⁾, but just a time horizon – a twice renewable 3 year-agreement that commits to utilise infrastructure efficiently, to encourage European companies to invest in gas exploration and production in Israel and Egypt, and to explore ways to make funds available to develop technologies regarding natural gas decarbonisation. Indeed, Israel is already connected to Egypt's LNG facilities and the two countries together with Cyprus, France, Greece, Italy, Jordan and Palestine established the East Med Gas Forum in 2019, a platform designed to promulgate regional energy cooperation⁽⁸⁸⁾. Notwithstanding, the region remains fraught with multiple tensions and potential conflict 'hot spots' – the unresolved tensions between the Greek and Turkish Cypriots, the impasse between Israel and Lebanon, domestic instability in Egypt, Lebanon, Israel and Palestine among others – making large-scale exploration of resources implausible in the short to medium term⁽⁸⁹⁾. The technical complexity of deep-water offshore drilling, plus challenging geological terrain in the region, would also make intensive drilling and pipeline development prohibitively expensive.

Second, many of the volumes discussed with various stakeholders might not come to market any time soon or indeed at all. This is particularly the case for the most courted region – the

African continent. In terms of production, the African continent holds the equivalent of about one third of Russian inventories (257.5 bcm vs. 702 bcm), with North Africa holding the bulk of these volumes (about 180 bcm)⁽⁹⁰⁾. However, political instability, technical bottlenecks and growth in domestic demand constitute a major hindrance to fulfilling expansive European ambitions. Insurgency in Mozambique recently halted gas exploration activities, and political risk will negatively impact drilling activity going forward⁽⁹¹⁾. Europe may not be able to rely on the supply of resources from Niger and Nigeria due to political risks and tensions in those countries. Algeria and Egypt, the two countries that currently attract the most interest from the EU, will also struggle to supply the volumes that the Union seems to assume will be available. An in-depth understanding of the constraints the two countries face is essential to inform the EU supply roadmap for the upcoming decade. This is also necessary to avoid the Union succumbing to the lure of unrealistic and widely inflated supply projections that would ultimately compromise Europe's already fragile energy security outlook.

Algeria: the *déjà-vu* of reliable gas supply?

Algeria is a key gas producer: the largest on the African continent accounting for one third of continental production; the tenth-largest

(86) Memorandum of Understanding on cooperation related to trade, transport, and export of natural gas to the European Union between the Arab Republic of Egypt, the state of Israel and the European Union (https://www.marefa.org/w/images/8/83/MoU_EU-EG-IL_consolidated_FINAL.pdf); France24, 'EU signs gas agreement with Egypt and Israel to reduce "dependency" on Russian fuel', 16 June 2022 (<https://www.france24.com/en/europe/20220616-eu-signs-gas-agreement-with-egypt-and-israel-to-end-dependency-on-russian-fuel>).

(87) Euractiv, 'Azeri president says investors discussing expansion of TAP gas link', 2 September 2022 (<https://www.euractiv.com/section/energy/news/azeri-president-says-investors-discussing-expansion-of-tap-gas-link/>).

(88) Eastern Mediterranean Gas Forum (<https://emgf.org/>).

(89) Popkostova, Y., *The North African Power Systems: In-depth analysis and assessment of critical regulatory, policy, legal, technical and geopolitical aspects pertaining to the power sectors of Algeria, Egypt, Libya, Morocco, and Tunisia*, European Commission, Joint Research Centre and European Centre for Energy and Geopolitical Analysis (ECEGA), 2022; *Geopolitics of Energy à la Méditerranéenne*, op.cit.

(90) BP, *BP Statistical Review 2022*, 71st Edition, 2022 (<https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-full-report.pdf>).

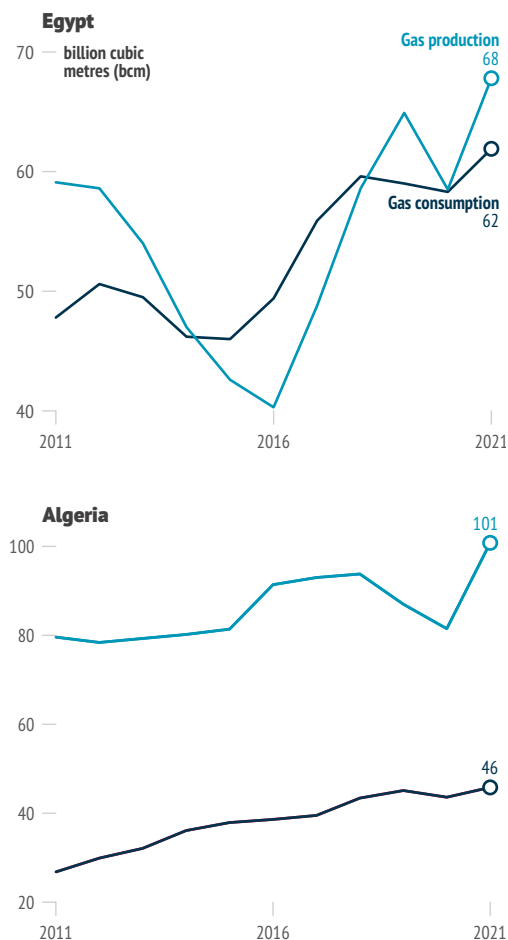
(91) This has prompted the EU to increase its military aid as part of the European Peace Facility against the threat posed by the Islamic insurgency to gas projects in the Cabo Delgado province. Mozambique has the third-largest proven gas reserves in Africa, after Nigeria and Algeria. Euractiv, 'EU plans new military aid for gas rich Mozambique amid energy crisis', 9 September 2022 (<https://www.euractiv.com/section/defence-and-security/news/eu-plans-new-military-aid-for-gas-rich-mozambique-amid-energy-crisis/>).

in the world; also holding the third-largest shale gas reserves in the world ⁽⁹²⁾. Prior to the Russian invasion of Ukraine, it was the third-largest supplier of gas to the EU market, accounting for about one tenth of imports (12.6 %) – supplied by pipeline (60 %) and via LNG (40 %) ⁽⁹³⁾. Three pipelines connect Algeria to the EU: the TransMed Pipeline connects Algeria with Italy via Tunisia (32 bcm capacity); the Gaz Maghreb Europe Pipeline supplies gas to Spain via Morocco (12 bcm capacity), and the MedGas Pipeline (10.5 bcm) provides a direct link to Spain. The Spanish and Italian markets absorb about 55 % of Algerian gas exports to Europe with Algerian gas representing 30 % and 20 % of the Spanish and Italian market respectively ⁽⁹⁴⁾. The country also has two LNG terminals in Arzew (which is the world's first LNG facility, operational since 1964) and Skikda with a collective export capacity of about 34 bcm/y, delivering volumes to France and Italy as the primary destinations within the EU (Türkiye attracts the most Algerian LNG volumes). Notwithstanding the country's extensive infrastructure capacity, which in principle should allow for seamless expansion, a few issues seem to evade attention, whether by design or oversight, when Algerian capacity increases are considered by the EU.

First, the existing infrastructure capacity has among the highest underutilisation rates in the world: out of an overall pipeline export capacity of roughly 60 bcm, actual volumes reaching Europe on average have been in the vicinity of 26–30 bcm (34.1 bcm in 2021); underutilisation of LNG capacity also stands at 50 % with 15.4 bcm reaching Europe in 2021 out of the total capacity of 34 bcm. This indicates insufficient volumes but also chronic underinvestment in maintenance that cannot be resolved overnight.

The thirst for gas

Growth in domestic gas consumption in both Algeria and Egypt cuts into potential export volumes



Data: BP, 2022

Second, political risk remains elevated and Algeria has used its gas supply as a tool to exert political pressure in the recent past. There are ongoing tensions between Algiers and Rabat,

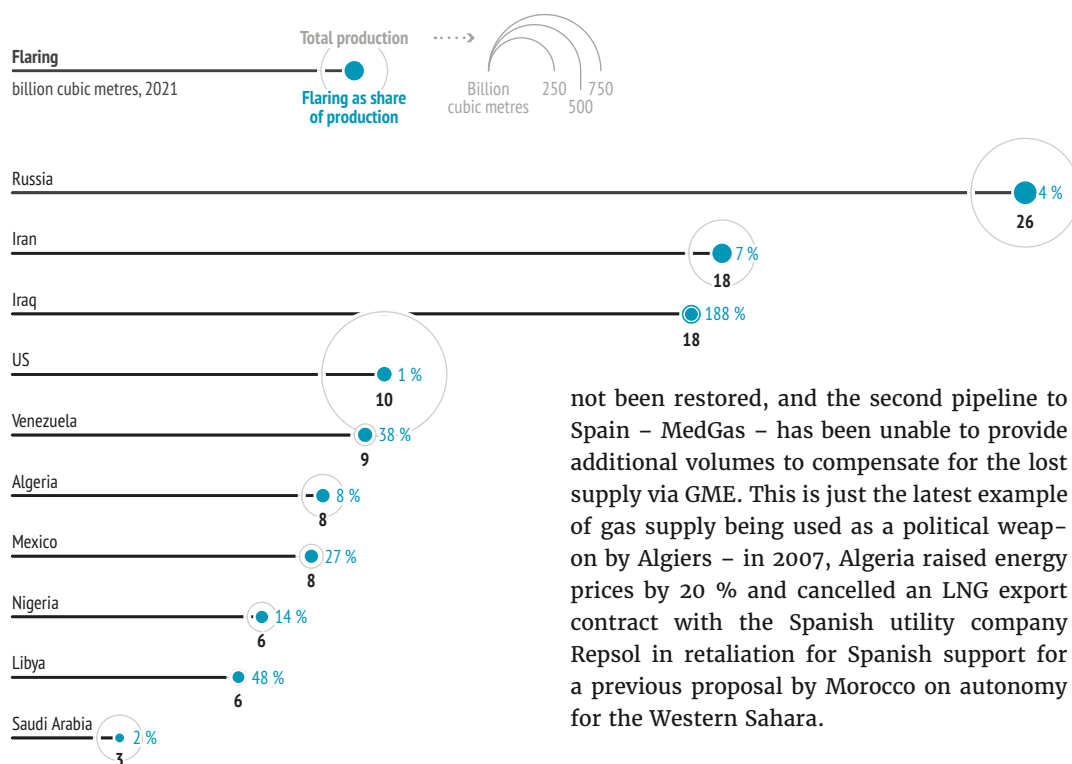
⁽⁹²⁾ US International Trade Administration, Algeria – Country Commercial Guide, 'Oil and gas – hydrocarbons', 2021 (<https://www.trade.gov/country-commercial-guides/algeria-oil-and-gas-hydrocarbons#:~:text=In%20terms%20of%20market%20size,largest%20untapped%20shale%20gas%20resources>).

⁽⁹³⁾ European Commission, 'In Focus: Reducing the EU's dependence on imported fossil fuels', 20 April 2022 (https://ec.europa.eu/info/news/focus-reducing-eus-dependence-imported-fossil-fuels-2022-apr-20_en); BP, *Statistical Review of World Energy 2022*, 2022 (<https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-full-report.pdf>); Statista, 'Share of Natural Gas Exports into the EU from Algeria from 2015 to 2020' (<https://www.statista.com/statistics/1292835/share-of-natural-gas-imports-to-eu-from-algeria/>).

⁽⁹⁴⁾ BP, *Statistical Review of World Energy 2022*, op. cit.

Waste in time of scarcity?

10 biggest flarers' natural gas production and flaring as share thereof



Data: BP, 2022

posing a risk to the functioning of the Gazoduc Maghreb Europe Pipeline (GME). In November 2021, Algeria's disapproval of Morocco's *rapprochement* with Israel, and newly erupted tensions over the Western Sahara impasse, resulted in the suspension of the 10 % transit fee to Morocco and a swift interruption of gas flows soon afterwards, imperilling Morocco's power generation, which relies almost exclusively on gas, and Spanish gas market stability⁽⁹⁵⁾. In 2022, Spanish support for Morocco's plan on Western Sahara's semi-autonomy also prompted Algiers to suspend the bilateral friendship treaty and recall its ambassador⁽⁹⁶⁾. By the end of 2022, GME volumes had

not been restored, and the second pipeline to Spain – MedGas – has been unable to provide additional volumes to compensate for the lost supply via GME. This is just the latest example of gas supply being used as a political weapon by Algiers – in 2007, Algeria raised energy prices by 20 % and cancelled an LNG export contract with the Spanish utility company Repsol in retaliation for Spanish support for a previous proposal by Morocco on autonomy for the Western Sahara.

The GME supply conundrum was compounded in summer 2022, when a largely incident on the subsea route led to an interruption of supply via MedGas, the second pipeline to Spain, on 24 July. The incident happened soon after Spain reversed gas flows on the GME to help Morocco, raising some speculation about the timing of the interruption. Overall, the latest Middle East Economic Survey shows that Algeria's exports for 2022 were lower compared to 2021 (18 % lower year-on-year for the first two economic quarters) while the peak of exports to Europe was reached in the early 2000s⁽⁹⁷⁾. Technical and political conditions therefore seem inauspicious for capacity extensions of the Algerian natural gas supply to Europe at the current point in time.

(95) S&P Global, 'Spotlight: GME pipeline transit renewal at risk as Algeria cuts diplomatic ties with Morocco', 1 September 2021 (<https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/082621-spotlight-gme-pipeline-transit-renewal-at-risk-as-algeria-cuts-diplomatic-ties-with-morocco>).

(96) Euractiv, 'Algeria threatens to cut gas contract with Spain', 28 April 2022 (<https://www.euractiv.com/section/globaleurope/news/algeria-threatens-to-cut-gas-contract-with-spain/>).

(97) 'Algeria a "reliable" gas supplier: EU chief Michel', op.cit.

Furthermore, and hardly a negligible consideration *vis-à-vis* the EU's import strategies, is the fact that the authoritarian regime in Algeria, adept at leveraging its energy resources for political purposes, is also on particularly good terms with the Russian Federation, with which it has engaged in a complex web of major energy and arms deals ⁽⁹⁸⁾. Algiers abstained in the vote condemning the Russian invasion of Ukraine at the United Nations; it also voted against the suspension of Russia from the Human Rights Council. Apart from this hardly reassuring political affinity with the very state from which the EU is seeking to disentangle itself, the country's record is far from exemplary: it scores particularly badly on civil and political freedom, in relation to which the Freedom House Index categorises it as 'not free' ⁽⁹⁹⁾. The national energy company Sonatrach is a behemoth monopoly plagued by political interference, resembling to a large extent the functioning of Gazprom in Russia. Henceforth, replacing current long-standing dependencies on authoritarian regimes with new ones can hardly be perceived as a coherent or laudable strategy for the EU. Also, the view that Algeria is a reliable supplier, frequently expressed by the Union's top leadership, is puzzling especially in the light of the supply interruption incidents alluded to above that were politically motivated ⁽¹⁰⁰⁾. Moreover, it should not be forgotten that until last year Russia was similarly assessed as a reliable supplier. The most recent price review of contracts signed between Sonatrach and the Spanish gas operator Naturgy two decades ago also demonstrates the leverage Algiers might try to seek in the new high price and scarcity environment, adding an additional element to the debate on reliability.

Third, Algeria's growth in domestic demand reduces the potential of volume increase for exports even if the above technical and political

hindrances are resolved. As examined in a previous section, Algeria utilises almost half of its roughly 100 bcm/y output to cater for its soaring domestic demand. Domestic gas demand has grown consistently over the past decade at an annual rate of approximately 6 %, increasing from 26.8 bcm/y in 2011 to 45.8 bcm/y in 2021, and therefore largely outpacing the 1 % growth of gas output (during the same period consumption in Europe dropped by 20 bcm). The country today consumes 30 % (roughly 45 bcm) of overall African gas consumption. Against the backdrop of such a steady increase in domestic consumption, recent announcements of the discovery of a major 4 bcm/y deposit in the existing Hassi R'mel field would likely not provide additional volumes to Europe but be absorbed by the domestic market. Supply volumes via Morocco as well as LNG exports have been registering a steady decline over the past few years (running at less than half capacity as indicated above).

It should also not be overlooked that production fields in Algeria are maturing – an issue exacerbated by poorly maintained infrastructure, suboptimal governance of the energy sector, as well as technical deficiencies and chronic corruption. Ambitious plans, announced by the Algerian national oil company Sonatrach over the summer, to ramp up production to 140 bcm by the end of 2023 seem rather implausible given technical and legal bottlenecks, and a business environment that fails to attract and retain international capital.

Given the above constraints, going forward, as suggested in chapter 2 of this volume, the only plausible option for capacity extension from Algeria in the current context would be the EU investing in solar capacity extensions in Algeria to free up some of the gas used domestically for European markets – a strategy that would also be important to facilitate Algeria's

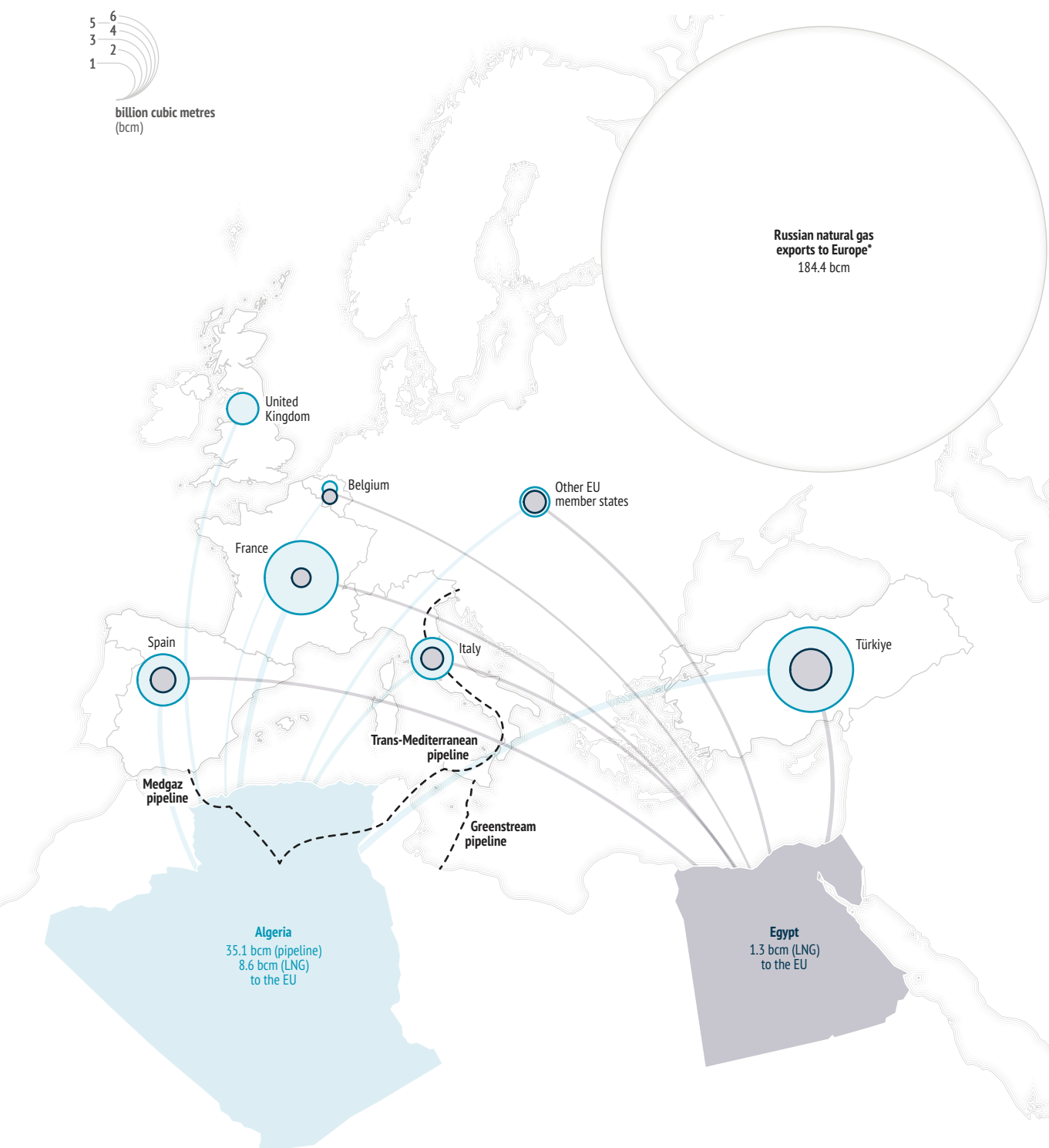
(98) Statista, 'Distribution of arms imports into Algeria between 2017 and 2021 by country of origin' (<https://www.statista.com/statistics/1244018/distribution-of-arms-imports-into-algeria-by-country-oforigin/#:-:text=Russia%20is%20the%20main%20supplier,trade%20between%202016%20and%202020>).

(99) Freedom House Index, Freedom in the World 2021, 'Algeria' (<https://freedomhouse.org/country/algeria/freedom-world/2021>).

(100) 'Algeria a "reliable" gas supplier: EU chief Michel', op.cit; Euractiv, 'EU energy chief praises Algeria partnership', 12 October 2022 (<https://www.euractiv.com/section/energy/news/eu-energy-chief-praises-algeria-partnership/>).

Gas pipedreams

Algerian and Egyptian natural gas
trade with Europe, 2021



* Total pipeline and LNG; Data: BP, 2022

own transition. The current sought volume increase from Algeria contradicts the EU's Renewed Partnership with the Southern Mediterranean (February 2021)⁽¹⁰¹⁾ and the Union for the Mediterranean Declaration on Energy (June 2021) where the EU calls upon concerned countries to halt new hydrocarbon project development and phase out fossil fuel subsidies. Since the invasion of Ukraine, the EU's engagement with Algeria has led to the opposite result – the demand for more gas volumes has led to capacity expansion plans, as well as the reversal of some green transition reforms within Algeria – mainly in terms of phasing out energy price subsidies⁽¹⁰²⁾. The proposed solution would thus potentially avert domestic transition plans being jettisoned and help the EU salvage its rapidly deteriorating climate leadership reputation.

Another avenue for Europe is to focus on gas flaring: Algeria is among the worst performers in the world when it comes to vented or flared gas, estimated to lose about 8 bcm annually. The EU could provide technology and assistance to reduce flaring, mitigate its negative effects from an environmental, health and financial point of view, and secure some of the recovered volumes for its markets. Currently, no such discussions are being pursued, yet exploring this option could provide an advantage to Europe both in terms of concrete volume commitment but also in terms of repairing its tarnished image of being a somewhat hypocritical entity when it comes to the climate agenda and its promises to developing countries.

The EU could provide technology and assistance to reduce flaring and mitigate its negative effects.

Egypt: a regional energy hub – but for who?

The factors constraining the capacity additions in Egypt differ, but the ultimate result is identical – a considerable shortfall of available versus expected volumes. Egypt holds the third-largest gas reserves on the African continent and is the 14th largest gas producer in the world⁽¹⁰³⁾. Like Algeria, the country has a growing domestic gas market, accounting for about 62 bcm/y or almost 40 % of entire African continental consumption. Gas consumption domestically rose constantly in the period up to 2019 fuelled by generous consumption subsidies that paradoxically made Egypt a net importer of natural gas in 2015. IMF-imposed reforms led to the reduction of subsidies in

2019, which has translated to a lowered, albeit not stalled, rate of demand growth. In addition, the disposable capacity, or production output that is not absorbed by the domestic market, is for the main part already contracted under long-term agreements with Asian buyers (primarily China), making potential volumes for Europe a complex quantitative exercise.

Egypt does not have a pipeline connection with Europe but is home to the Idku and Damietta LNG terminals – among the largest in North Africa – sending volumes predominantly to India, Pakistan and China, accounting for 80 % of exports. In recent years, Egypt has enacted reforms that have mainstreamed the operational and investment environment in the country's energy sector, and as a consequence is considerably better positioned to explore its reserves than Algeria, where the national behemoth Sonatrach still

⁽¹⁰¹⁾ European Commission, 2021, 'Joint Communication: Renewed partnership with the Southern Neighbourhood', SWD(2021) 23 final, 2021 (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021SC0023&from=EN>).

⁽¹⁰²⁾ Ouki, M., *Algerian Gas in Transition: Domestic transformation and changing gas export potential*, The Oxford Institute for Energy Studies, 2019 (<https://www.oxfordenergy.org/publications/algerian-gas-in-transition-domestic-transformation-and-changing-gas-export-potential/>).

⁽¹⁰³⁾ BP, 'A global view of gas in maps and charts', 2017 (<https://www.bp.com/en/global/corporate/news-and-insights/reimagining-energy/global-view-of-gas-infographic.html>).

monopolises the sector. The discovery of the Zohr gasfield in 2015 and the priority placed on its fast exploration has made Egypt a significant player in the MENA energy market, and it is expected to export approximately 12 bcm in the next two years. Its LNG capacity has been expanded and modernised, making the country also well-positioned to process volumes from the EastMed countries, thus establishing it also as a regional energy hub in the decade to come (Israel has already signalled interest in expanding its export capacity utilising Egyptian LNG export terminals⁽¹⁰⁴⁾). The East Med Gas Pipeline already connects the Israeli Leviathan and Tamar fields to the Egyptian infrastructure. Plans to directly link the Idku LNG terminal to the Leviathan field have also been discussed. Yet, even if domestic instability and current financial constraints (Egypt is experiencing severe inflationary pressure and currency depreciation⁽¹⁰⁵⁾) do not hamper such ambitions, their realisation will not immediately bring volumes to the market, and even less so to the shores of the EU, given the nature of contracts already signed. The launch of the Arab Gas Pipeline connecting Egypt to Jordan, Syria and Lebanon, as well as to Israel through a connecting link, makes it much more likely that any additional volumes will be earmarked for exclusively regional consumption.

The available evidence therefore would seem to indicate that the EastMed and North African gas resources could prove less significant for EU gas markets than public statements seem to suggest. This being the case, these options should be evaluated rationally and pragmatically to avoid precipitous and misguided investment decisions that could lead to future scarcity.

Other supply options

Other options, such as the possibility of re-activating natural gas supply from **Nigeria**, **Libya** and **Angola**, are also both politically and technically complex. Libya's political situation is dangerous and volatile, making exploration of its reserves a difficult prospect. Insufficient infrastructure and inept governance cast doubt on the certainty and viability of these reserves. Today, Italy is the sole recipient of Libyan natural gas via the Greenstream pipeline (accounting for 5 % of its domestic needs). Expanding LNG imports from Nigeria (currently about 12 bcm/y) can be envisioned, but this would require overcoming a certain number of domestic inefficiencies and infrastructure gaps not to mention the dimension of political risk. The same is valid for potential supply from Mozambique, Tanzania and Ghana.

As regards the plan for a pipeline linking Nigeria to the Algerian pipeline system via Niger and from there to Europe, the project is nonsensical at best. The so-called Trans-Saharan Gas Pipeline or NIGAL pipeline with a capacity of about 30 bcm/y would require massive investment (USD 20 billion) and run through over 4 000 kilometres of politically contested and perilous territory, notably the notorious Sahel region, hence should not be considered at all, neither under current conditions nor in the future.

Azerbaijan is also fraught with uncertainty. Despite commitments to increase supply almost threefold by 2027 to 20 bcm from about 8 bcm, pragmatism is needed (Europe imported an aggregate 350 bcm last year, 155 bcm of which originated from Russia)⁽¹⁰⁶⁾. The most recent eruption of the conflict between Armenia and Azerbaijan testifies to the ongoing military clashes scarring the region (the

(104) Ministry of Energy of Israel, Press Statement - 'Launch of fourth offshore bid round for new natural gas exploration licenses in the EEZ of the State of Israel', 30 May 2022 (https://www.gov.il/en/departments/news/press_300522).

(105) YahooNews, 'Egypt pound plunges in third devaluation in less than year', Bloomberg, 3 January 2023 (<https://www.bloomberg.com/news/articles/2023-01-04/egypt-s-pound-heads-for-biggest-drop-since-october-devaluation>).

(106) Muradov, M., 'Europe turns to Azerbaijan for gas: How big could this be?', The Royal United Services Institute for Defence and Security Studies (RUSI), 5 October 2022 (<https://www.rusi.org/explore-our-research/publications/commentary/europe-turns-azerbaijan-gas-how-big-could-be>).

Nagorno-Karabakh conflict has remained unresolved for over 4 decades, making it one of the longest-running ethnic and territorial disputes in the world). Furthermore, and in addition to the country's dismal record on human rights and corruption, allegations of war crimes being committed by Azerbaijan, including 'ethnic cleansing', adds to the EU's dilemma, if it wishes to avoid being accused of double standards in its approach to gas supply diversification⁽¹⁰⁷⁾. The Caucasian region is increasingly unstable with skirmishes between Tajikistan and Kyrgyzstan, and instability in Kazakhstan and Uzbekistan compounded by the increasing collusion of interests of regional powers such as Russia, Türkiye and China which might further complicate the security of volumes traversing the region to energy-famished Europe. In this vein, disruption of the supply of Kazakh oil to Europe, which currently transits through the Black Sea port of Novorossiysk (1 mb/d), is a real possibility. The Southern Gas Corridor could also be impacted. So far the Eastern Partnership initiative or the more recent European Political Community (EPC) seem not to have succeeded in imposing the EU's agency in the region⁽¹⁰⁸⁾.

The most plausible diversification option is ramping up imports from **Norway** – it is the seventh-largest oil and fourth-largest gas exporter in the world, two thirds of its gas reserves are still unexplored, and it benefits from substantial hydropower capacity to satisfy domestic demand, resulting in almost

100 % export potential for its natural resource endowment. Today, 70 % of gas (115 bcm/y) and 70 % of oil exports from Norway are destined for the EU, accounting for one quarter of the EU's total imports (3 pipelines with Germany – 55 bcm/y; two with France – 35 bcm/y; and a new one with Poland – 10 bcm/y)⁽¹⁰⁹⁾. While the additional volumes will surely not suffice to compensate for the Russian supply gap, it is probably the most viable option going forward, given Norway's reliability and geographical and ideological proximity⁽¹¹⁰⁾. Norway has successfully requested European support for new oil and gas exploration (the country currently produces at full capacity of existing fields) as well as a long-term commitment from the EU embedded in an EU-Norway energy cooperation agreement signed on 23 June that will increase gas exports from Norway to Europe by roughly 10 % per year. This can serve as a model for other such commitments in order to provide certainty to investors⁽¹¹¹⁾.

Ultimately, and in addition to the discussions on tangible volume availability outlined above, the European quest for gas is nourished by the implicit conviction that the gas volumes Europe currently aims to secure will serve as a short-term, temporary solution. High-level pronouncements by the European Commission President Ursula von der Leyen, the Vice-President for the Green Deal Frans Timmermans, as well as the Energy Commissioner Kadri Simson, signal this position. The

(107) Radio Free Europe, 'EU Envoy calls for probes into videos exacerbating tensions between Armenia, Azerbaijan', 3 October 2022 (<https://www.rferl.org/a/eu-envoy-probes-videos-tensions-armenia-azerbaijan/32062931.html>); Euractiv, 'EU overlooks Azeri energy graft risk', 3 October 2022 (https://www.euractiv.com/section/politics/short_news/eu-overlooks-azeri-energy-graft-risk/); AFP, 'Armenia Asks UN Court To End Karabakh "Ethnic Cleansing"', 30 January 2023 (<https://www.barrons.com/news/armenia-asks-un-court-to-end-karabakh-ethnic-cleansing-01675091408>).

(108) Reuters, 'Kyrgyz-Tajik border conflict death toll nearly 100', 18 September 2022 (<https://www.reuters.com/world/kyrgyzstan-says-death-toll-border-conflict-rises-36-2022-09-18/>); "'We were running from bullets': Kazakhstan's biggest city recovers from unrest', *The Financial Times*, 22 January 2022 (<https://www.ft.com/content/81527802-96c1-4851-b747-612e38737efa>); 'Uzbek government backs down after plan for constitution sparks protest', *Financial Times*, 3 July 2022 (<https://www.ft.com/content/020eb3ac-fe95-4bfb-97bf-2aa71388e992>).

(109) BP Statistical Review 2022, op.cit.

(110) An excellent graph on how Norway compared to Russia on key governance indicators such as Corruption Perception, Resource Governance, Government Effectiveness, Regulatory Quality, Rule of Law, Political Stability and Accountability may be found in Nakhle, C., 'Will Norway turn the energy crisis into opportunity?', GIS, 2 August 2022 (<https://www.gisreportsonline.com/tr/norway-energy-crisis/>).

(111) Nevertheless, fields that contain further important resources are mostly in the Barents Sea, making it a politically contentious issue, with the North Sea's potential virtually exhausted. In addition, in November 2022, Norway signalled its intention to revoke new licences for oil and gas exploration, backtracking on the aforementioned commitment. See, Milne, R., 'Norway postpones new oil and gas exploration licences until 2025', *The Financial Times*, 29 November 2022 (<https://www.ft.com/content/08e7daac-9f2a-4d80-afcc-93c785f7b244>).

dominant narrative across the Union remains structured around a determination to transition to non-fossil fuel energy systems. Yet, this same narrative is distorted within producing nations with official EU and Member State delegations urging them to invest in new production and transport infrastructure. The discrepancy between signals conveyed to domestic audiences and to third countries intensifies the level of uncertainty already affecting hydrocarbon producers and will likely impact the investment environment. In addition, states that prove susceptible to European pressure and invest in expanding capacity to satisfy European market demand today could ultimately find themselves burdened by a large-scale stranded asset conundrum when the EU decides that these resources are not needed anymore. The consequences for public finances and trade balances in these nations will be dire – as will be the impact on the global climate agenda. This is an important, yet largely ignored, facet of the quest for gas within the European Union.

In this vein, the EU should develop a blueprint for action for resource rebalancing in the decade following 2030, exploring and providing certainty on how the global market will be rebalanced once it does not need more gas volumes. One avenue of deliberation could be a scenario where both FSRU units but also trade flows are redirected to satisfy demand in Africa and Asia to replace coal capacity. For this to happen effortlessly, the EU could and should initiate such rebalancing plans in cooperation with the African Union (AU), but also the Association of Southeast Asian Nations (ASEAN) community, starting today. Foresight is needed on how to align the short-term demand in Europe with long-term prospects for the sector, which adds a layer of uncertainty and investment

precarity. Unfortunately, if the Union opts to ignore these imminent market problems, it risks playing a major contributing role in a future market implosion as well as becoming a potential casualty of the impact this would have on liquidity, trade flows and geopolitical power dynamics.

Going forward, it is also important to start reflecting already today in the context of the quest for gas across the Mediterranean but also in other regions, on how to develop the hydrogen economy. A positive sign is the signature of the EU-Egypt Hydrogen Partnership as well as the joint US-Germany USD 500 billion initiative for the deployment of 10GWt of REN and the closure of 5 GW of gas plants by 2030 ⁽¹¹²⁾. Initiatives should also be directed towards catalysing the development of local hydrogen economies and value chains where energy-intensive manufacturing operations are located close to hydrogen production facilities, thereby obviating the need for hydrogen to be transported long distances in the EU for

instance. This would not only reduce exorbitant transportation costs but also resource wastage incurred in the transportation process. Critically, this will be a vector of economic development, employment and decarbonisation that will uplift concerned countries and help them achieve a sustainable developmental pathway for their populations, rather than serve

as a source of critical raw materials, energy and energy carriers for the rich economies. The above partnerships need to be emulated with Algeria, Ghana, Senegal, Tanzania and Israel. The EU should buttress such vital discussions with tangible initiatives, including capital flow commitments, access to funds for non-EU hydrogen stakeholders, joint hydrogen innovation hubs and public-private partnerships, as well as access to concessional

Foresight is needed on how to align the short-term demand in Europe with long-term prospects for the gas sector.

(112) European Commission, 'Joint Statement on the EU-Egypt Renewable Hydrogen Partnership', 9 November 2022 (https://ec.europa.eu/commission/presscorner/detail/en/statement_22_6646); 'Joe Biden's flying visit to COP27 disappoints developing nations', *The Financial Times*, 11 November 2022 (<https://www.ft.com/content/a284cf49-3fe6-4433-8e23-13238a25a614>).

finance. Such partnerships can also put the region on a pathway to more peace and regional cooperation and security via extended energy partnerships and allow for more consequential leaps forward into decarbonisation and regional energy trade flows, as well as the establishment of hydrogen value chains and trade infrastructure that could prevent the risk of stranded gas infrastructure assets by the end of the decade and provide wealth generation opportunities for concerned countries under a carbon-constrained global market scenario. By spearheading and facilitating such developments, the EU will position itself as the partner of choice for smart, empowering and inclusive growth.

ENERGY RESILIENCE VERSUS CLIMATE MELTDOWN

In what amounts to an indictment of the systemic failure of the EU to establish a robust and resilient energy system or fulfil the promises of the long-forgotten Energy Union, today citizens across the bloc have to contend with unprecedented price rises and industry with rationing power consumption or plant closures. Member States are having to come to grips with hastily introduced measures designed to accelerate mechanisms to optimise demand aggregation and management, thermal efficiency and better interconnectiveness – mechanisms which were frequently discussed prior to the crisis but never actually implemented. This is happening against the backdrop of an increase in fossil fuel demand and an uptick in drilling activity with potentially dire climate consequences.

The turbulence in the markets, and the climate of geopolitical and social volatility, could

impact the pace of the energy transition – especially if scarcities intensify in the course of 2023 due to aforementioned factors, and rationing of energy across Europe and prioritisation of industries for limited supplies become a real possibility. As the time horizon for recovery or normalisation remains unclear, EU citizens might become less inclined to support the climate agenda. The prospect of such a trend materialising beyond Europe are even more concerning, given Europe's small share of global emissions. And indeed, the current context marked by the contradictory pull between short-term energy security and affordability priorities and long-term sustainability concerns seems to incline the pendulum towards short-termism. The underlying danger is the reversal of advances made in emissions reduction and fossil fuel eradication. Thus, the future of oil and gas markets should also be discussed in the context of the worsening climate crisis, exploring the role of oil and gas producers *vis-à-vis* energy security but also in the clean energy transition.

The way forward: key steps for the EU

Firstly, the EU needs to immediately take concrete steps towards establishing 'climate clubs' to ensure that while the world grapples with the energy crisis, it also moves forward with the climate agenda. This is becoming even more critical in the context of the growing bifurcation of the global political system. Under the EU-US trade agreement from October 2021, a shared approach to dealing with carbon-intensive industries and activities was to be elaborated (Section 232 trade tariffs)⁽¹¹³⁾. This work has stalled because of the war in Ukraine. It has to resume as a matter of urgency. A global carbon price will be difficult to institute, especially in the current highly volatile international climate, yet the EU could and should be at the vanguard of establishing,

(113) Foroohar, R., 'We need a grand bargain on energy', *The Financial Times*, 13 March 2022 (<https://www.ft.com/content/5c1140e8-5cd5-4b74-8ee6-4b70f22ca6ba>).

The quest for energy – deals in 2022

Rhetoric vs. conduct

Despite political rhetoric about accelerating the net-zero transformation, the energy procurement race among several EU Member States was predominantly fossil-fuel focused.

Energy deals struck in 2022



Data: ECFR, Energy Deals Tracker, 2023

in cooperation with the United States, power alliances around clean energy research and technology sharing; global standards for emissions measuring and monitoring; as well as collective stockpiling of and co-innovation around critical raw materials and clean-energy technologies, thereby avoiding competitive transatlantic dynamics that benefit third stakeholders such as China. Skirmishes over the IRA's alleged protectionism are not just pointless but counterproductive. Furthermore, recent announcements that G7 companies are failing to deliver Paris-agreed goals makes for an uncomfortable basis for the bloc to advocate for higher ambition in developing countries for example⁽¹¹⁴⁾. Analysis from the end of November also demonstrates that few of the EU-27 Member States are on track to meet their climate goals and that some have been assessed as 'not on course to be "Fit-for-55"'⁽¹¹⁵⁾.

This requires immediate attention and clearly companies must be pressured to do more; such pressure can be facilitated by the EU within the bloc but also via trade conditionality and imposing strict rules for third-country businesses. Preparatory work on the issue can be started today and a formal announcement made at the upcoming COP28 in the UAE. G7 countries have focused on reaching an agreement on imposing price caps on Russian oil, but they would be well-advised to join efforts to reach a consensus on a G7 carbon pricing regime, given that they account for one quarter of global greenhouse gas emissions. The EU could be well-positioned to push for such a process. In the context of the recently adopted Carbon Border Adjustment Mechanism (CBAM), the BRICS countries are assessed as

The impact of the current global energy scarcity is already emerging as catastrophic for developing nations.

primarily affected by the measure's initial emphasis on five key sectors. This being said, the welfare impacts on developing nations will be extremely negative, with the poorest countries most harshly impacted by the initiative⁽¹¹⁶⁾. Trade with the EU will become prohibitively costly due to the high carbon footprint of the products, while at the same time these countries lack access to finance and technology to clean exports. In this respect, revenue from CBAM should be redirected to facilitate the transition to clean energy technologies and the upgrading of manufacturing facilities and activities in such states, to avoid them becoming double victims of climate degradation, which they have not caused, and climate conditionality *vis-à-vis* which their economies are ill-poised to adapt.

Satisfying the world's insatiable thirst for growth and energy means that hydrocarbons will be an equally enduring feature in a net-zero world. The current crisis can also become a testament to the world's lamentable record on climate action where siloed approaches led to gaps in the energy system's flexibility and resilience, while also adversely impacting ecosystems. Going forward, discussions here need to focus on how to incentivise oil and gas producers to use their historic windfall profits for the benefit of the climate cause. Oil majors reportedly made profits of over USD 200 000 billion, while producing states' windfall profits amounted to USD 4 trillion in 2022. Rystad Energy projected that oil corporations would make 70 % more profits in 2022 than in 2021, or in the vicinity of an additional USD 900 billion. The EU can initiate talks with oil majors, IOCs and NOCs, under the auspices of the G7 or a newly-established

(114) Euractiv, 'G7 firms failing on Paris climate goals, despite EU lead', 6 September 2022 (<https://www.euractiv.com/section/energy-environment/news/g7-firms-failing-on-paris-climate-goals-despite-eu-lead/>).

(115) ScopeGroup, 'EU climate goals: few countries on course to be "Fit for 55"; further reforms needed', 23 November 2022 (https://www.scopegroup.com/dam/jcr:89fe023-f310-4022-bc50-444380b409b1/EU%20climate%20mitigation_Report_Final.pdf).

(116) Center for Global Development (CGD), 'An EU tax on African carbon – Assessing the impact and ways forward', Blog post, 10 February 2022 (<https://www.cgdev.org/blog/eu-tax-african-carbon-assessing-impact-and-ways-forward>).

transatlantic climate club on how to use accumulated profits to facilitate the energy transition using the alarming findings of the UNEP Emissions Gap Report as a guide to where the gaps are, and what technologies could be deployed to reduce the emissions gap.

Secondly, potential repercussions in developing nations are a matter for concern. The impact of the current global energy scarcity is already emerging as catastrophic for developing nations. Emerging markets – the likes of Pakistan, Bangladesh, Sri Lanka, etc., but also El Salvador, Ghana, Tunisia – are being priced out of the global market in the competition for scant LNG volumes ⁽¹¹⁷⁾. Switching to coal is one option for these economies, but due to the heightened demand for coal, the prices of the commodity have skyrocketed as well, meaning that many of these countries are also priced out of the coal markets. In combination with rising interest rates, this will lead to paralysed economies, debt defaults of wartime proportions and escalation of social tensions that Europe would need to tackle pre-emptively by facilitating global debt restructuring discussions as well as clean energy technology transfers.

The chaos in emerging markets would also lead them to renege on their climate engagement, potentially further delaying the transition to a climate neutral world. In this context, the importance of climate finance becomes even more critical. The danger however is that Europe, in view of its domestic problems, might roll back on its active promotion of the USD 100 billion per year finance pledge for mitigation and adaptation, already missed

several times, and thus stall essential transitions in developing markets. Indeed, with spiralling inflation and a deepening energy crisis, widespread rationing and the risk of social unrest, it might be difficult to make the case for sending money abroad. Worryingly, only two EU leaders opted to attend the Rotterdam Climate Finance Summit, incurring the anger of the seven African leaders who were present ⁽¹¹⁸⁾. Yet Pakistan's 'perfect storm' in September of last year where floods submerged one third of the country and killed about 1 000 people reveals how imperative investment in climate adaptation is, amidst the dual energy and climate crisis with which the world is wrestling ⁽¹¹⁹⁾. Monsoon rains and landslides in Nepal and India in mid-September further highlighted the emergency behind climate adaptation ⁽¹²⁰⁾. These events painfully expose systemic and deteriorating gaps in infrastructure defences, technical capacity and human readiness to respond to extreme weather hazards. Such disasters could also well happen across the Mediterranean where public services are ill-equipped to deal with or recover from similar calamities. According to the Mediterranean Experts on Climate and Environmental Change (MedECC), the Mediterranean Basin is warming faster than most other regions across the globe and may turn into a hotspot for climate disasters of unprecedented magnitude ⁽¹²¹⁾. Fires in Morocco and Algeria in 2022 were illustrative of this trend. Moreover, extreme weather hazards could impact energy infrastructure and critical links that the EU is eager to develop such as new interconnectors and export facilities, apart from incurring ecosystem destruction and potentially fuelling social tensions ⁽¹²²⁾.

(117) Hussain, M., 'Russia-Ukraine war is propelling us into a new age of global political upheaval', *The Intercept*, 27 July 2022 (<https://theintercept.com/2022/07/27/russia-ukraine-war-sri-lanka-energy/>).

(118) 'EU spars over proposal to cap Russian gas prices', op.cit.

(119) 'Pakistan's perfect storm is an urgent call to action', *The Financial Times*, 7 September 2022 (<https://www.ft.com/content/762f4c68-abd8-4c7d-891b-73cc9dd7b48e>).

(120) 'Heavy monsoon rains, landslides kill 48 people in Nepal, India', *The New Arab*, 18 September 2022 (<https://english.alaraby.co.uk/news/monsoon-rains-landslides-kill-48-people-nepal-india>).

(121) Tuel, A., and Eltahir, E.A.B., 'Why Is the Mediterranean a climate change hot spot?', *Mediterranean Experts on Climate and Environmental Change (MedECC), Journal of Climate*, Vol. 33, July 2020, pp. 5829–5843 (<https://doi.org/10.1175/JCLI-D-19-0910.1>).

(122) AFP, 'Moroccans protest price hikes and "repression"', 4 December 2022 (<https://www.msn.com/en-us/news/world/moroccans-protest-price-hikes-and-repression/ar-AA14Tv9W>).

The bloc missed a chance to promote the issue at the COP27 discussions in Egypt; now, as 2023 gets underway, the EU should unveil a targeted programme for the Mediterranean region, as the geographical area most at risk and at closest proximity to the territory of the Union. The EU should also redouble efforts to ensure global climate finance pledges are delivered and expanded, with a special financial vehicle directed at the Mediterranean Basin, and position itself again for leadership on the global climate agenda leading up to COP28 in the UAE. The Union should be at the forefront of efforts to facilitate the design and deployment of both hard and soft adaptation measures to large-scale climate-induced disasters. The bloc should also activate its diplomatic machinery to promote debt restructuring for emerging and developing countries.

Thirdly, the role that hydrocarbons can play in a carbon-neutral economy needs to be clearly identified and acknowledged. This should have been advanced as a fundamental discussion in COP27 in Egypt. Given the aforementioned gaps in delivering on climate finance pledges, the discussions in Sharm-el-Sheikh were bound to be fraught with contradictions. The debate over the role of hydrocarbons compounded these tensions. Already last year, in the aftermath of the long-forgotten COP26 which promised that by COP27 coal would be consigned to history, developing countries, particularly the African Union group led by the outspoken Macky Sall, were lambasting the hypocrisy of the EU, which demands that African states abandon the hydrocarbon-intensive development trajectory, while it engages in a quest for more natural gas and is experiencing

The role that hydrocarbons can play in a carbon-neutral economy needs to be clearly identified.

a coal renaissance domestically. Indeed, since 2021, the EU has released about USD 50 billion to fund new LNG and gas infrastructure, including 19 floating and 7 onshore LNG terminals; in June 2022 the bloc reversed a ban on investment in hydrocarbons in third countries⁽¹²³⁾. With the reactivation of mothballed coal power plants, recent frantic investment and a flurry of diplomatic visits to regional capitals from Algiers to Dakar to Doha in an endeavour to secure more gas supplies for Europe, the criticism is bound to loom over discussions at COP28, as well as have an adverse impact on the unity behind the climate cause. The EU's decision to waive the do-no-significant harm requirement in May 2022 and use the selling of additional carbon permits to finance some of the REPowerEU measures has contributed to the perception that it is guilty of hypocrisy. Hence, the EU should carefully calibrate its position on energy transitions and energy system resilience in third countries, potentially reconsidering its opposition to hydrocarbon investments, designing a blueprint for rebalancing the global gas market in the 2030s, as well as facilitating the energy trilemma advances in developing countries through targeted financial, technical and engineering support. Again, this should inform preparations for COP28. Average power consumption in Africa is 185 kWh compared to 6 500 kWh in Europe and almost 13 000 kWh in the United States – electrifica-

tion is key to uplifting the continent and delivering on the Sustainable Development Agenda, and it cannot be done solely via renewable energy, not least because of intermittency. The IEA reckons that the electrification of the continent would require adding 250 GW

(123) REPowerEU earmarked only €12 billion for fossil fuel infrastructure and supply. See analysis by EMBER for *The Financial Times*: 'Europe's new dirty energy: the "unavoidable evil" of wartime fossil fuels', *The Financial Times*, 6 September 2022 (<https://www.ft.com/content/b209933f-df7f-49ae-8f82-edc32ed622a6>). According to Bruegel, 20 bcm of new capacity came online in 2022, with an additional 51 bcm expected in 2023, and 17 bcm/y in 2024, 34 bcm/y in 2025, 35 bcm/y in 2026, 13 bcm/y in 2027 and 6 bcm/y in 2028. See Bruegel, 'National energy policy responses to the energy crisis', Dataset (<https://www.bruegel.org/dataset/national-energy-policy-responses-energy-crisis>).

of generation capacity in the next 7 years at an estimated cost of USD 1.2 trillion⁽¹²⁴⁾. Grid expansions, building regional interconnectors and infrastructure modernisation would potentially double or triple these costs. And the high cost of capital (seven times higher than in Europe) would preclude private capital financing this development while public finance has been restricted by pledges not to invest in hydrocarbon projects for domestic use, creating a Catch-22 situation. Yet, even if we increase electrification fivefold in Africa and use only natural gas to power the added new capacity, this will increase global emissions by a mere 1 % according to a modelling scenario published in *The Economist*. Concessional finance schemes such as the hydrogen project in Namibia are good models to upscale and replicate in order to circumvent these financial hurdles⁽¹²⁵⁾. The EU should abandon misguided ideologically-driven positions and consider the above in preparing its energy and climate diplomacy for the remainder of the decade and robustly promote such pragmatism at COP28.

Lastly, despite enthusiastic talk about the accelerated decarbonisation trajectory, current supply chains continue to experience scarcity and obstructions, with soaring prices and access constraints for critical raw materials fuelling global competition. This is a challenge of unforeseen proportions and might well produce a situation in the near future where nations compete for anything from oil, gas and coal to lithium, ammonia and hydrogen, ultimately pricing poorer nations out of the market and having a devastating impact on critical global ecosystems. In addition, beyond policy pronouncements on the potential of hydrogen, current policy frameworks are aspirational at best. Scaling up hydrogen infrastructure to the required volumes is a massive challenge, the financing for which has still not been ensured. Uncertainty as to transport and value-chains is also not resolved; as examined in the previous section, the virtues of fossil fuels have

been extolled amid recent discussions with nations in the Middle East and the EU's southern neighbourhood, ignoring the importance of developing the clean energy value chains that will be critical for the economic trajectory of these nations, potentially setting them on a dangerous economic and environmental course with dire social consequences. This is concerning from an economic, environmental and moral standpoint. Therefore, the EU would be well-advised to facilitate co-innovation and co-generation of clean energy technologies in these states, to foster domestic transitions, economic well-being and climate risk resilience. The bloc should also seek to nurture the development of local clean industries and manufacturing capacity, human capital and skills development for local workforces, and market and value chains linked to Europe. The alternative will be a neighbourhood plagued by energy security and climate risk concerns, that would inevitably adversely impact the EU's energy and climate trajectory and the global climate agenda.

In the febrile context of global energy market volatility and an escalating climate emergency, action on energy stability and resilience cannot ignore the urgent imperative of avoiding a climate crisis. The energy and climate agendas are now more than ever exposed as interlinked in a fragile yet tightly-knit correlation. The EU stands at a critical juncture where it must bolster its energy security and ensure the stability of its energy system while moving forward with its net-zero transformation. The ability of the bloc to rebalance this critical relationship will anchor its global climate leadership and pre-determine the global economic and societal transformation that must be achieved to alleviate quasi-existential pressures on markets, ecosystems and geopolitics.

(124) International Energy Agency, *Africa Energy Outlook 2022*, June 2022 (<https://www.iea.org/reports/africa-energy-outlook-2022>).

(125) 'Africa will remain poor unless it uses more energy', *The Economist*, 3 November 2022 (<https://www.economist.com/middle-east-and-africa/2022/11/03/africa-will-remain-poor-unless-it-uses-more-energy>).

CONCLUSION

THE NET-ZERO TRAJECTORY

Navigating the shifting sands of the energy transition

The clean energy transition inflicts considerable strain on the legacy oil and gas industry with far-reaching impacts on producers' business models, economic sustainability and people's employment prospects. The major ongoing reconfiguration of the geopolitical order adds an additional layer of complexity and uncertainty to this endeavour.

This paper has examined the key pillars of the process, also exposing fundamental shortcomings and deficiencies in the foresight guiding it. It has also identified prerequisites for the oil and gas economy to navigate and thrive under a carbon-constrained reality and in a context of market volatility. The key premise of the *Chaillot Paper* is that failure of the oil and gas producers to adapt will have profound and adverse impacts on the net-zero transformation. The paper has also sought to expose the negative consequences of short-sighted policymaking that can induce market tightness, inflationary pressures and cost-of-living crises, exploring the energy crisis conundrum facing the European Union and proposing a series of strategic measures to tackle it. A concerted effort to limit emissions and manage a lasting transition away from polluting hydrocarbons is vital, yet it should be enacted along both the supply and demand axis, otherwise the alternative will be a repetitive cycle of energy crises with baleful repercussions for economies and societies and little tangible impact on combating climate change. Such an outcome can also spell a protracted period of volatility that will paralyse the oil and gas industry's ability to adapt and hamper the

evolution of the clean energy economy, thus leading to a series of systemic failures, friction within and between states and a future where cataclysmic ecosystem collapse is no longer headline news.

ABBREVIATIONS

ACER

Agency for the Cooperation
of Energy Regulators

ASEAN

Association of Southeast
Asian Nations

AU

African Union

bcm

billion cubic metres

bcm/d

billion cubic metres per day

bcm/y

billion cubic metres per
year

b/d

barrels per day

boe

barrel of oil equivalent

BRICS

Brazil, Russia, India, China
and South Africa

CBAM

Carbon Border Adjustment
Mechanism

CCS

Carbon Capture and Storage

CCUS

Carbon, Capture, Utilisation
and Storage

CEO

Chief Executive Officer

COP

Conference of the Parties

ESG

Environment, Social and
Governance

ETS

Emission Trading System

EV

Electric Vehicle

FSRU

Floating Storage
Regasification Unit

GCC

Gulf Cooperation Council

GDP

Gross domestic product

GME

Gazoduc Maghreb Europe
Pipeline

GW

Gigawatts

IGB

Bulgaria–Greece
Interconnector

IOCs

International oil companies

IRA

Inflation Reduction Act

KSA

Kingdom of Saudi Arabia

IEA

International Energy
Agency

IMF

International Monetary
Fund

IPCC

Intergovernmental Panel
on Climate Change

IPRs

Intellectual Property Rights

IRENA

International Renewable
Energy Agency

LNG

Liquefied Natural Gas

mb/d

million barrels per day

MENA

Middle East and North
Africa

mmt

million metric tonnes

MoU

Memorandum of
Understanding

MS

Member States

mt

million tonnes

mt/y

million tonnes per year

MWh

megawatt-hour

MWt

megawatt thermal

NNPC

Nigerian National
Petroleum Corporation

NOCs

National oil companies

NS1

Nord Stream 1 pipeline

OGMP

Oil and Gas Methane
Partnership

OPEC

Organization of the
Petroleum Exporting
Countries

OPEC+

Group of 23 oil-producing
nations led by Saudi Arabia
and Russia

PCI

Projects of Common
Interest

REN

Renewable energy (sources)

RES

Renewable energy sources

SMEs

Small and medium-sized
enterprises

SPR

Strategic Petroleum
Reserve

SWF

Sovereign Wealth Fund

TTF

Title Transfer Facility

TWh

terrawatt-hour

UAE

United Arab Emirates

UK

United Kingdom

UNEP

United Nations
Environment Programme

US

United States

USSR

Union of Soviet Socialist
Republics

In the light of the energy crisis engulfing Europe and the world since autumn 2021, this *Chaillot Paper* examines the transformation of the global energy system and its concrete implications for the EU in terms of its energy and national security, strategic sovereignty and geopolitical ambitions.

The volume presents an overview of the reconfiguration of global energy markets triggered by the Russian invasion of Ukraine and the Western response to the war, exploring future market and supply chain dynamics for oil, natural gas and coal, but also LNG, hydrogen, and minerals and metals. In particular, it focuses on how the world's oil and gas majors and hydrocarbon-producing states might adapt to a carbon-constrained environment, placing the emphasis on energy resilience within a wider framework that considers ecosystems and climate prerogatives, as well as peace and security.

The paper proposes a series of targeted measures that the EU might pursue in the short, medium, and long term to enhance the bloc's energy security and strategic resilience.