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European tank storage and changing geopolitical landscapes

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Table of Contents

1.	Introduction	1
2.	The role of strategic storage in navigating the energy crisis	2
3.	A changing geopolitical landscape	6
4.	Volatility and uncertainty in oil and gas markets (2-3 years)	8
5.	Decarbonization and new markets (10-20 years)	13
6.	Moving forward: recommendations	16
	References	17

1. Introduction

Global energy markets have experienced a series of destabilising events in 2022 that culminated in the imposition of a European embargo on Russian maritime oil and -products, pipeline restrictions, G7 price caps, and the replacement of Russian natural gas in the European Union (EU). In a world that was still recovering from Covid-19 and the rapid economic rebound that followed, the war in Ukraine completed a perfect storm. As of 2023, the geopolitical landscape is transitioning toward volatility and fragmentation.

The global oil and natural gas markets are in search of a new equilibrium that can be best understood through a geopolitical lens. Multilateralism is changing shape as the world is increasingly governed by emerging geopolitical blocs, new allegiances and a new trading system based on minimising dependencies on non-aligned blocs. Europe is finding ways to attract affordable fuel streams from more reliable sources. The United States has become one of its most important oil and gas suppliers. China, India and Turkey are maintaining relations with Russia and reaping the benefits of importing large amounts of Russian oil and gas. OPEC countries (Organization of Petroleum Exporting Countries) are maintaining relations with both western countries and Russia, but primarily acting in their own interest to maximize profit.

Moving forward, maintaining a competitive EU requires industries to decarbonize and innovate, reduce dependencies on the import of energy, critical minerals and strategic industrial components, and establish new supply chains. The energy transition is rich in opportunities – innovation and the accelerated deployment of green energy technology can make Europe a global leader in sustainability. The successful integration of industrial and climate policies can bring important advantages for European strategic autonomy. Yet this is becoming increasingly difficult considering the growing global protectionism for strategic technologies and raw materials. The United States Inflation Reduction Act (IRA) and China's Belt and Road Initiative (BRI) are competing with European industries that must often undergo more difficult conditions in terms of funding, permitting and public support.

This paper assesses these geopolitical developments, focussing on the impact of the war in Ukraine on European energy security and decarbonization, with a specific focus on the tank storage sector. First, it looks at the impacts of the war on market volatility and supply security in the short term (2-3 years). Second, it provides an overview of the challenges and opportunities arising from the transition on a longer term (10-20 years). Finally, recommendations are derived to support a smooth transition from fossil fuels to green technologies and ensure supply security in the process.

This publication builds on the *Energy storage in transition* series, developed since 2020 by *The Hague Centre for Strategic Studies*. The series consists of the following publications:

- [The European tank storage sector and the global energy landscape](#)
- [European tank storage in today's global value chains: What role does it play in our economy?](#)
- [European tank storage in global supply chains: Outlook to 2030](#)
- [The European tank storage sector: 2050 and beyond](#)
- [Energy trade in the Netherlands: Past, present and future](#)

2. The role of strategic storage in navigating the energy crisis

In the immediate aftermath of the war in Ukraine, sanctions from countries condemning Russian aggression abounded. Russian individuals, banks, businesses and exports were targeted by the EU, US, United Kingdom (UK), Australia, Japan and others. One of the most intricate sanctions packages was the European (EU and UK) embargo on the maritime imports of Russian oil and products, coming into force in December 2022 and February 2023. The price caps agreed in coordination with G7 partners were enforced at the same time as the sanctions.

European tank storage companies played a key role in mitigating the energy crisis that followed the war in Ukraine due to their various roles in liquid bulk supply chains (Box 1).

Box 1. The role of tank storage companies



European tank storage companies fulfil four functions in liquid bulk supply chains



Energy



Chemicals



Edible oils

Logistics	Tank storage is part of the logistics networks that supply liquids to industries, households, ports, airports and military assets.
Regional industry	The close proximity of tank storage to industrial centers ensures the availability of supplies and enhances productivity and efficiency.
Strategic storage	Strategic reserves of crude oil and products are stored by tank storage companies.
International trade	Tank storage acts as a buffer in global markets, contributing to price stability and reducing uncertainty.

Boycott on Russian oil

Strategic storage of crude oil and oil products was key in efforts to stabilize global markets. A month after the invasion of Ukraine, the US released 180 million barrels of crude oil from its Strategic Petroleum Reserve in an attempt to bring down global prices in the short-term.¹

Global oil prices increased progressively reaching peak levels in the summer of 2022, contributing to inflation and insecurity of supply.² When the sanctions came into force end 2022 and early 2023, the impacts were less severe than anticipated. The price of Brent remained under 90 \$/barrel from the end of November 2022 until the end of March 2023.³ This was possible due to several conditions.

- First, the sanctions phase-in period gave companies and governments time to build inventories and strategic reserves. Building inventories of at-risk products ensured that the boycott on Russian oil did not lead to major price shocks or shortages in Europe in the winter of 2023. Russian oil exports increased throughout the second half of 2022 before imports would become illegal.⁴ Even after the ban on crude oil on December 5th came into place, the EU remained Russia's main export market for oil in December 2022, in preparation of the ban on oil products in February 2023.⁵ More than 8 million barrels of Russian diesel were imported by European countries in the first two weeks of January 2023.⁶ A large part of it was placed in both commercial and strategic storage to mitigate the effects of the ban on Russian oil products that came into force on February 5th.
- Second, countries with maritime import capabilities rapidly diversified their suppliers and stressed logistics infrastructure from ports to rail to cope with a surge in maritime imports, while countries in Central and Eastern Europe could still rely on limited Russian supply through the Druzhba pipeline and a redevelopment of alternative pipeline, road, rail and inland waterway supply routes. The EU replaced Russian oil with imports from the US, Norway, Saudi Arabia, Angola and Iraq.⁷ However, many countries are land-locked, meaning that it remained relatively difficult to bring alternative supplies through maritime routes. Oil imports through Druzhba have also been interrupted several times.⁸ European countries have been actively trying to replace this oil to take away the Kremlin's ability of causing disruptions. Germany stopped its imports through Druzhba as of January 2023.

1 'DOE Announces Final Contract Awards From President Biden's Emergency Release From the Strategic Petroleum Reserve', Department of Energy, November 2022, <https://www.energy.gov/articles/doe-announces-final-contract-awards-president-bidens-emergency-release-strategic-petroleum>.

2 'Crude Oil Prices Increased in First-Half 2022 and Declined in Second-Half 2022', Energy Information Administration, January 2023, <https://www.eia.gov/todayinenergy/detail.php?id=55079>.

3 'Brent Crude Oil - 2023 Data', Trading Economics, accessed 20 January 2023, <https://tradingeconomics.com/commodity/brent-crude-oil>.

4 Cahill, 'EU's Latest Sanctions on Russian Oil'.

5 CREA, 'EU Oil Ban and Price Cap Are Costing Russia EUR 160 Mn/Day, but Further Steps Can Multiply the Impact'.

6 Cooban, 'Europe's Ban on Russian Diesel Could Send Pump Prices Even Higher'.

7 Eurostat, 'EU Imports of Energy Products - Recent Developments', 2023, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_imports_of_energy_products_-_recent_developments.

8 Marek Strzelecki and Jason Hovet, 'Russia Halts Pipeline Oil to Poland Says Refiner PKN Orlen', *Reuters*, 25 February 2023, sec. Commodities, <https://www.reuters.com/markets/commodities/russia-halts-pipeline-oil-supplies-poland-pkn-orken-ceo-says-2023-02-25/>.

- Third, the high price environment led to a degree of demand destruction across Europe in the fourth quarter of 2022.⁹ The decreasing demand for road transport fuels and feedstock for petrochemical industry led to an overall reduced oil consumption in the European Organisation for Economic Co-operation and Development (OECD).¹⁰ This decline was partly offset by the increased consumption of jet fuel and gas-to-oil switch in countries like Germany.
- Fourth, the severity of sanctions' impacts depended on domestic characteristics. The hub function of the ARA region (Amsterdam-Rotterdam-Antwerp) ensured the availability of different oil grades in relatively large quantities in the Netherlands, Belgium and Germany. Oil refineries in the Netherlands can use a large variety of crude oils as feedstock, meaning that the difference in yield from non-Russian crude was relatively small. Even though Germany had been dependent on Russian pipeline oil before, oil imports from the ARA region were able to fill the gap. While throughput from refineries in East Germany has decreased significantly, the low demand before the summer of 2023 prevented further issues.

In anticipation of the sanctions on Russian oil, Italy had significantly increased imports of Russian oil. The sanctions on Russia led European banks to stop credit lines to the Sicily-based Lukoil refinery, which unintendedly made the refinery only purchase Russian crude oil.¹¹ Since then, the refinery has been sold from its Russian ownership, allowing operations to continue. Italy does not only produce most of the oil products it consumes domestically, but it is also an exporter. As of 2023, Italian refineries were able to replace Russian imports without major impacts on the country's supply security.

The dependency on Russian oil was limited for Spain, France and the UK even before the sanctions due to their geographical location facilitated trade with non-Russian suppliers. Spain and France import most of their oil from North and Central Africa – Nigeria, Libya, Algeria – but also the US, Mexico and Brazil.¹² The UK's main suppliers are Norway and the US.¹³

9 IEA, 'Oil Market Report', June 2022, <https://www.iea.org/reports/oil-market-report-june-2022>.

10 IEA.

11 Silvia Sciorilli Borrelli and Harry Dempsey, 'Italy Imports More Russian Oil to Feed Refineries', *Financial Times*, 20 May 2022, sec. EU energy, <https://www.ft.com/content/83fa3e90-e36d-463a-a4db-9ea24f22964f>.

12 'Crude Petroleum in Spain', OEC - The Observatory of Economic Complexity, accessed 26 April 2023, <https://oec.world/en/profile/bilateral-product/crude-petroleum/reporter/esp>; 'Crude Petroleum in France', OEC - The Observatory of Economic Complexity, accessed 26 April 2023, <https://oec.world/en/profile/bilateral-product/crude-petroleum/reporter/fra>.

13 'Trends in UK Imports and Exports of Fuels', Office for National Statistics, June 2022, <https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/articles/trendsinukimportsandexportsoffuels/2022-06-29#a-closer-look-at-oil>.

Natural gas retaliation

In response to European sanctions on Russian oil, the Kremlin weaponized gas exports to the EU, inducing unprecedented price increases for gas and electricity and pushing the EU to intervene in energy markets.

When Russia invaded Ukraine in February 2022, the EU looked for ways to decouple from Russia and hurt the Kremlin's federal revenues. Despite sanctions on importing a wide range of goods – including energy products – restrictions on natural gas were not imposed in order to protect European consumers. Replacing Russian pipeline gas with LNG was to a large extent possible albeit a costly process. LNG imports from the US and Qatar increased significantly but did not completely replace Russian LNG, which continued flowing in absence of targeted sanctions packages.¹⁴ Moreover, not all European countries benefited from LNG import infrastructure and cross-border interconnections. As such, in the first months after the invasion, Russian (pipeline) natural gas continued flowing to Europe.

Once the oil boycott and price cap were announced, however, Russia retaliated by significantly reducing gas exports. Gas flowing through Nord Stream 1 to Germany was reduced by 75% in June 2022 and completely interrupted for 10 days one month later.¹⁵ The overall amount of pipeline imports from Russia fell by 75% in the third quarter of 2022.¹⁶ This sequence of interruptions led to record wholesale gas and electricity prices in the second half of the year.

The exceptionally high prices attracted LNG cargos meant for other regions in the world who could no longer outbid European consumers. For instance, Bangladesh and Pakistan experienced electricity blackouts and were unable to fulfil industrial needs because they could not afford to pay for the high LNG prices.¹⁷ This may bring long-term consequences for the strategic relationship between Europe and developing economies that indirectly suffered from Europe's energy crisis.

The EU and its governments took decisive action to support domestic consumers in paying their energy bills, reduce demand and stabilize prices.¹⁸ Ensuring sufficient levels of natural gas in storage, as well as facilitating fuel substitution from natural gas to mineral oil and coal in power generation and industrial processes, became key instruments to mitigate supply insecurity. EU countries adopted a regulation in June 2022 that ensures that natural gas storage capacity was sufficiently filled before the winter months of 2022-2023, to prevent further price increases.¹⁹ The mild weather conditions during that winter and filling of gas reserves contributed to the market stabilization but it remains uncertain how global political and economic developments will impact the EU gas market in the coming years.²⁰

14 'Where Does the EU's Gas Come from?', European Council, 7 February 2023, <https://www.consilium.europa.eu/en/infographics/eu-gas-supply/>.

15 'Nord Stream 1: How Russia Is Cutting Gas Supplies to Europe', *BBC News*, September 2022, <https://www.bbc.com/news/world-europe-60131520>.

16 'Gas and Electricity Market Reports', European Commission, accessed 26 April 2023, https://energy.ec.europa.eu/data-and-analysis/market-analysis_en.

17 Irina Slav, 'Europe's Insatiable Thirst For LNG Is Causing Blackouts In Developing Countries', *OilPrice.com*, 11 July 2022, <https://oilprice.com/Energy/Energy-General/Europes-Insatiable-Thirst-For-LNG-Is-Causing-Blackouts-In-Developing-Countries.html>; Ann Koh, 'Global Gas Crunch Leaves Bangladesh Facing Blackouts Until 2026', *Bloomberg.Com*, 1 August 2022, <https://www.bloomberg.com/news/articles/2022-08-01/global-gas-crunch-leaves-bangladesh-facing-blackouts-until-2026>.

18 'EU Action to Address the Energy Crisis', European Commission, accessed 26 April 2023, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/eu-action-address-energy-crisis_en.

19 'Council Adopts Regulation on Gas Storage', European Council, 27 June 2022, <https://www.consilium.europa.eu/en/press/press-releases/2022/06/27/council-adopts-regulation-gas-storage/>.

20 Jorge Liboreiro, 'Europe's Gas Prices Reach Pre-War Levels amid Unusually Warm Weather', *euronews*, 5 January 2023, <https://www.euronews.com/my-europe/2023/01/05/europes-gas-prices-reach-pre-war-levels-as-2023-kicks-off-under-unusually-warm-weather>.



3. A changing geopolitical landscape

The EU responded to the growing geopolitical competition by trying to consolidate and enhance its own position through strategic autonomy.

Over the last decade, great power competition between the United States and China has become the defining feature of geopolitics. This power struggle is impacting political, economic, military, and technological spheres, pushing third countries to define their role in this new geopolitical setting. The EU responded by trying to consolidate and enhance its own position through boosting its strategic autonomy. The changing global order has been pushed by the war in Ukraine even further toward protectionism and geopolitical bloc forming. International trade remains essential for the supply security of a range of strategic industrial and energy products, but it is taking place under increasingly challenging conditions.

The Covid-19 pandemic and the Russian invasion of Ukraine in early 2022 accelerated the global move toward strategic competition. Over time, global supply chains had been established based on relative competitive advantage to reach the most efficient market equilibria. The disruptions in food, energy and manufacturing supply chains during the pandemic and the war in Ukraine showed the importance of resilience in case of crisis. Reducing import dependencies in strategic sectors and expanding domestic capabilities became the core of strategic competition.

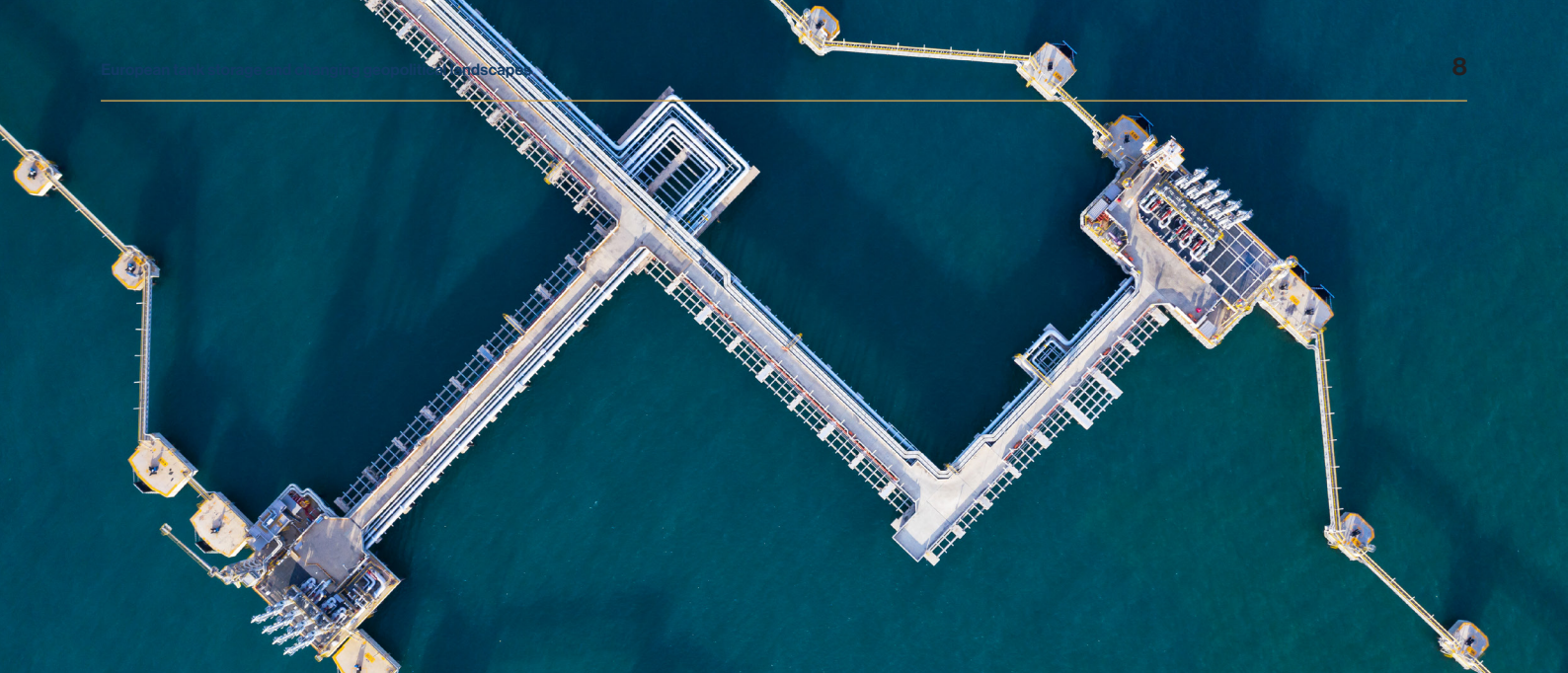
The push to develop strategic domestic capabilities is leading to protectionism and increased state support for strategic sectors. China, the US, Japan and the EU have introduced plans to increase self-sufficiency in digital technologies (chips, artificial intelligence), energy (critical minerals and green tech), space and defence. The Belt and Road Initiative and Made in China 2025 have been guiding the activity of Chinese state-owned companies for years. The Japanese government has strengthened its national resource strategy in 2020, when

it announced – among others – ambitions to stockpile strategic minerals in addition to the existing oil and petroleum gas obligations.²¹

Such an approach is less familiar to US and EU governments, who primarily relied on market forces and the export of standards and regulation to ensure competitiveness until now. The US Inflation Reduction Act (IRA) set aside massive governmental budgets to support domestic strategic industries. In response, the EU came out with the Critical Raw Materials Act (CRMA) and Net Zero Industry Act (NZIA) to accelerate the move toward a competitive green economy. Whereas critics debated the dangers of state subsidies disrupting market equilibria, supporters applauded the much-awaited strong vision put forward by Western governments, in particular to build up capacities for technologies critical to achieving the energy transition.

In the energy sector, increased self-sufficiency will be achieved progressively as green technologies overtake fossil fuels. For now, the EU remains dependent on imports of oil and natural gas from the US, Norway, and OPEC+, leading to a continued importance for storage companies active in energy logistics. The actions of global energy players have a direct impact on the European economy and consumers.

21 'International Resource Strategy - National Stockpiling System', IEA, 27 October 2022, <https://www.iea.org/policies/16639-international-resource-strategy-national-stockpiling-system>.



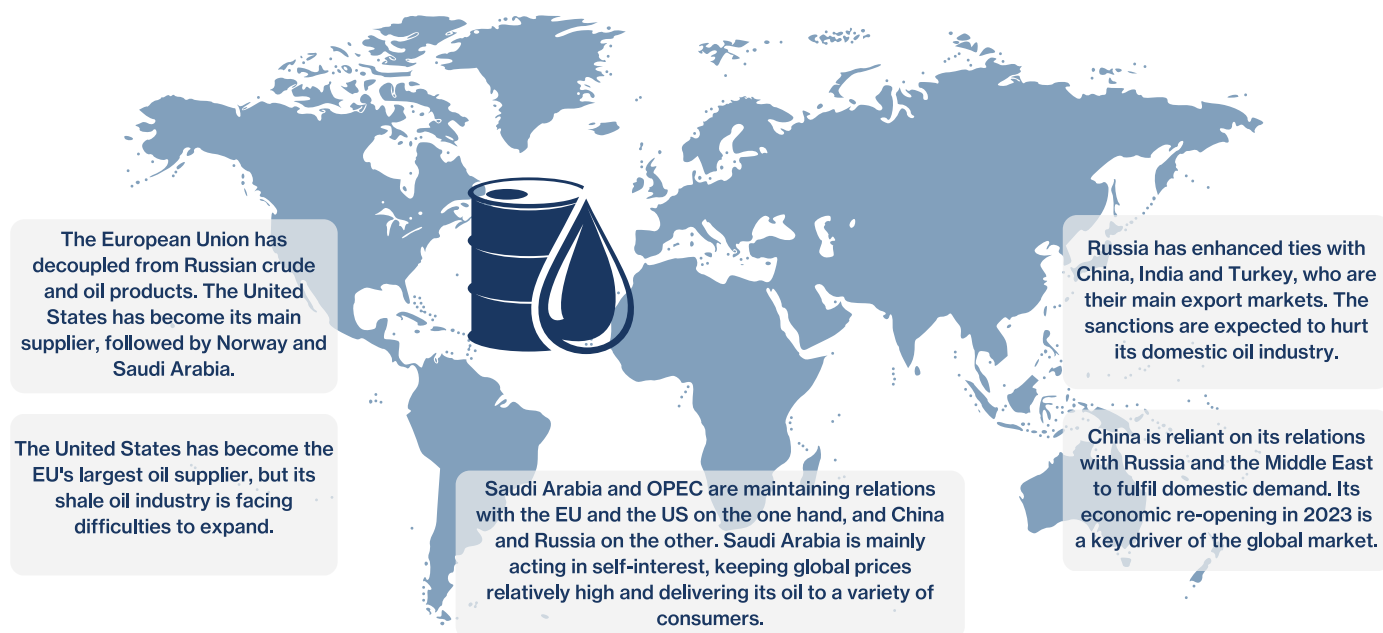
4. Volatility and uncertainty in oil and gas markets (2-3 years)

International energy markets in 2023

Energy markets are following suit to the changing geopolitical setting of strategic competition and bloc forming, with large consequences for Europe (Figure 1). European countries were able to prevent oil, gas and electricity prices from increasing in the winter of 2022-2023, but global economic and political developments will impact their ability to prevent further price increases and secure supply in the next 2-3 years.²² In the short term, the EU needs resilient infrastructure and supply chains, as well as strategic reserves of oil and natural gas to mitigate price shocks and supply shortages. In the long term, similar interventions may be necessary to secure supplies of future energy carriers.

²² Jorge Liboreiro, 'Europe's Gas Prices Reach Pre-War Levels amid Unusually Warm Weather', euronews, 5 January 2023, <https://www.euronews.com/my-europe/2023/01/05/europes-gas-prices-reach-pre-war-levels-as-2023-kicks-off-under-unusually-warm-weather>.

Figure 1. The international oil market 2023



Russian oil has found alternative markets, although its export revenues have decreased since the imposition of EU sanctions and G7 price caps.²³ While not linear, the impact of restrictions is starting to show. Since the beginning of 2023, China and India have been the largest importers of Russian fossil fuels.²⁴ In addition, Turkey, South Korea, Malaysia and the United Arab Emirates have been import markets of Russian crude oil, oil products and chemicals in 2023.²⁵ About 55% of Russian crude oil shipments are affected by the G7 price cap.²⁶ Deliveries to China through the East Siberia-Pacific Ocean (ESPO) pipeline are sold at around USD 64-67, slightly above the USD 60 price cap.²⁷ At the beginning of 2023, Russian export revenues fell but rebounded in March-April 2023 due to monitoring issues by G7 states. In the second half of May 2023, Russian revenues seem to have slightly dropped once again.²⁸

Lifting Covid-19 restrictions in China and its projected economic growth are key drivers of global oil and LNG demand in the second half of 2023. Despite a slow start to 2023, China's

23 CREA, 'Russia Fossil Tracker – Payments to Russia for Fossil Fuels since 24 February 2022', accessed 13 April 2023, <https://www.russiafossiltracker.com/>.

24 Isaac Levi and Hubert Thieriot, 'Weekly Snapshot - Russian Fossil Fuels 15 to 21 May 2023', Centre for Research on Energy and Clean Air, 26 May 2023, <https://energyandcleanair.org/weekly-snapshot-russian-fossil-fuels-15-to-21-may-2023/>.

25 Meri Pukarinen and Jan Lietava, 'Weekly Snapshot - Russian Fossil Fuels 1 to 7 May 2023', Centre for Research on Energy and Clean Air, 12 May 2023, <https://energyandcleanair.org/weekly-snapshot-russian-fossil-fuels-1-to-7-may-2023/>; Meri Pukarinen and Jan Lietava, 'Weekly Snapshot - Russian Fossil Fuels 10 to 16 April 2023', Centre for Research on Energy and Clean Air, 21 April 2023, <https://energyandcleanair.org/weekly-snapshot-russian-fossil-fuels-10-to-16-april-2023/>.

26 Levi and Thieriot, 'Weekly Snapshot - Russian Fossil Fuels 15 to 21 May 2023'.

27 Levi and Thieriot.

28 'Russia Fossil Tracker – Payments to Russia for Fossil Fuels since 24 February 2022', CREA (blog), 29 May 2023, <https://www.russiafossiltracker.com/>.

oil demand could increase by 900 kb/d throughout the year.²⁹ In the second quarter of 2023, IEA has revised its baseline expectation compared to quarter 1 as China's oil demand seems to be growing faster than anticipated.³⁰ Projections on Chinese LNG demand show that the growth is more modest than initially expected. The IEA's base scenario expects an increase compared to 2022 that would, however, not reach 2021 levels.³¹

The continued cooperation with Russia after the invasion of Ukraine brings strategic advantages for the Chinese government. Unlike the EU and G7 countries, China has refrained from placing sanctions on Russia for its aggression in Ukraine. Rather, it has benefitted from an increase in imports of Russian oil and gas ever since the decoupling with the EU.³² China has become the largest export market for Russian energy.³³ Despite no official endorsement for Putin's war, the visit of Xi Jinping to Russia in March 2023 points to a mutual commitment to closer collaboration.³⁴ Similarly, the ongoing conversation on the Power of Siberia 2 pipeline highlight continued cooperation on energy trade, although Beijing concurrently develops agreements with a variety of other suppliers too.³⁵

Moreover, China has been solidifying its position as a trusted partner of OPEC countries. Over the last decade, China's foothold in the Middle East has grown through numerous investments, diplomatic outreach and strategic partnerships mainly under the Belt and Road Initiative.³⁶ The Chinese have been consolidating diplomatic, economic and energy relations given – among others – their need for oil imports and ambitions to grow geopolitical influence. The China-brokered deal between Saudi Arabia and Iran in 2023 after years of tensions is a clear sign that China is growing closer to OPEC.³⁷

The closer relations between China and the Middle East contrast the increasing tensions with the US and EU. Over the last few years, the EU had been making steps to strengthen ties with the Gulf States. The EU Communication on the Strategic Partnership with the Gulf was published in May 2022 and sets out a framework for cooperation.³⁸ Since the invasion of Ukraine, the US government has been vocal about the (perceived) insufficient response of OPEC+ (excluding Russia) to the global energy crisis.³⁹ After months of misalignment, President Joe Biden visited Saudi Arabia to discuss, among others, imbalances in global

29 'Oil Market Report - January 2023', IEA, January 2023, <https://www.iea.org/reports/oil-market-report-january-2023>.

30 'Oil Market Report - May 2023', IEA, May 2023, <https://www.iea.org/reports/oil-market-report-may-2023>.

31 IEA, 'Gas Market Report, Q2-2023', May 2023, <https://www.iea.org/reports/gas-market-report-q1-2023>.

32 Dominique Patton, Muyu Xu, and Emily Chow, 'Factbox: How China Benefits from Western Sanctions on Russia's Energy Exports', *Reuters*, 22 March 2023, <https://www.reuters.com/business/energy/how-china-benefits-western-sanctions-russias-energy-exports-2023-03-20/>.

33 Meri Pukarinen, 'Weekly Snapshot - Russian Fossil Fuels 10 to 16 April 2023', Centre for Research on Energy and Clean Air, 21 April 2023, <https://energyandcleanair.org/weekly-snapshot-russian-fossil-fuels-10-to-16-april-2023/>.

34 'President Xi Jinping Holds Talks with Russian President Vladimir Putin', Ministry of Foreign Affairs of the People's Republic of China, March 2023, https://www.mfa.gov.cn/eng/zxxx_662805/202303/t20230322_11046184.html.

35 Yuan Yang, Anastasia Stognei, and Joe Leahy, 'Power of Siberia: China Keeps Putin Waiting on Gas Pipeline', *Financial Times*, 25 May 2023, sec. Natural gas, <https://www.ft.com/content/541f8b-cb-118a-419e-869f-3273fcc9ce92>.

36 Camille Lons et al., 'China's Great Game in the Middle East – European Council on Foreign Relations', *ECFR* (blog), 21 October 2019, https://ecfr.eu/publication/china_great_game_middle_east/.

37 Maria Fantappie and Vali Nasr, 'A New Order in the Middle East?', *Foreign Affairs*, 22 March 2023, <https://www.foreignaffairs.com/china/iran-saudi-arabia-middle-east-relations>.

38 'Joint Communication to the European Parliament and the Council: A Strategic Partnership with the Gulf (European Commission, June 2022)', <https://doi.org/10.1093/law-oeeu/e66.013.66>.

39 Aya Batrawy, 'Oil, Human Rights, Security: Here's What's in Store for U.S.–Gulf Relations in 2023', *NPR*, 12 January 2023, sec. World, <https://www.npr.org/2023/01/12/1147818054/saudi-arabia-gulf-nations-us-relations>.

energy markets and ways to mitigate the negative consequences.⁴⁰ OPEC+ and specifically Saudi Arabia as the bloc's largest producer have long been considered oil market balancers. When prices were too high or too low, increases or decreases in oil production and export would contribute to the stabilization of global prices. However, since the US became the world's largest oil producer in 2018, the decisions of OPEC+ have a significant impact on its domestic industry and oil revenues.⁴¹ The US and Saudi Arabia remain close partners in the security and economic sectors, but their relation is increasingly shaped by mistrust and disagreement.⁴²

The US global energy position has become more dominant since the invasion of Ukraine. The US is one of Europe's main suppliers of crude oil and LNG.⁴³ Geopolitically, its energy exports are favoured given perceived reliability and trustworthiness compared to Russia or the Middle East. Economically, the US has also been gaining from the high oil and gas prices. Although its shale industry has been facing challenges over the last years due to low investments and poor maintenance, the global energy crisis could be a catalyst for US companies to expand their oil and gas exploration and production and export routes into Europe.⁴⁴

The role of storage companies in supply chain resilience

Storage and import terminals remain central actors in supporting Europe's security of supply of oil and LNG at least up to 2025. On the one hand, as the EU is increasingly dependent on longer and volatile supply chains, readily available domestic storage capacity can help mitigate shocks. On the other hand, as industrial actors may be moving their operations away from Europe, import dependency on liquid bulk may increase.

- The realignment of the energy market has not yet been completed, making actors much more susceptible to shocks and less resilient to their effects. Europe is more vulnerable to supply shocks due to longer trade routes that may be impacted by weather and logistics bottlenecks. European oil now comes from a variety of different sources including the US and Saudi Arabia, and must cross large distances to arrive in European ports. Similarly, natural gas is primarily sourced as LNG rather than pipelines, and the competition with other markets will remain dominant in absence of long-term contracts. Moreover, the ability of the EU to source relatively affordable LNG cargoes in the third quarter of 2022 was based on a 85% decline in Chinese LNG imports and higher than average temperatures

40 'Results of Bilateral Meeting Between the United States and the Kingdom of Saudi Arabia', The White House, 15 July 2022, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/07/15/fact-sheet-results-of-bilateral-meeting-between-the-united-states-and-the-kingdom-of-saudi-arabia/>.

41 'U.S. Becomes World's Largest Crude Oil Producer and Department of Energy Authorizes Short Term Natural Gas Exports', Department of Energy, September 2018, <https://www.energy.gov/articles/us-becomes-worlds-largest-crude-oil-producer-and-department-energy-authorizes-short-term>.

42 Aziz El Yaakoubi and Ghaida Ghantous, 'Security Drives U.S., Saudi Efforts to Overcome Tensions', *Reuters*, 17 February 2023, sec. World, <https://www.reuters.com/world/security-drives-us-saudi-efforts-overcome-tensions-2023-02-17/>.

43 Eurostat, 'Crude Oil Imports by Field of Production - Monthly Data', accessed 13 April 2023, https://ec.europa.eu/eurostat/databrowser/view/NRG_TI_COIFPM_custom_5710917/default/table?lang=en; 'EU-US Cooperation on Energy Issues', European Commission, accessed 26 April 2023, https://energy.ec.europa.eu/topics/international-cooperation/key-partner-countries-and-regions/united-states-america_en.

44 Irina Slav, 'Five Reasons Why U.S. Shale Production Won't Soar In 2023', *OilPrice*, December 2022, <https://oilprice.com/Energy/Crude-Oil/Five-Reasons-Why-US-Shale-Production-Wont-Soar-In-2023.html>.

The long supply chains that the EU is now dependent on and the growing geopolitical tensions highlight the need for sufficient available storage capacity and strategic stocks to mitigate possible short term market shocks.

in the winter of 2022-2023, but a change in these conditions can severely impact global prices in the coming years.⁴⁵

- European industrial competitiveness and attractiveness for investment could be hurt if energy prices remain high in the coming years and mitigating responses lack. The chemical industry, one of Europe's largest manufacturing sectors, uses oil products and natural gas as feedstock and energy source.⁴⁶ Energy prices in Europe are already a key hurdle for industries to overcome if they want to remain competitive internationally. Throughout 2022, lower energy-intensive sectors managed to maintain output while decreasing their natural gas demand, but higher intensity sectors struggled.⁴⁷ In October 2022, BASF announced its permanent downsizing in Europe due to the high associated costs.⁴⁸ Import volumes, especially of high energy-intensive products, increased, in order to replace the decline in domestic production.⁴⁹

The EU will remain dependent on long supply chains, spot markets and uncertain geopolitical relations. The longer distances that tankers and cargoes must travel to bring energy to Europe make the latter vulnerable to geopolitical developments, weather events and logistics blockades. This highlights the need for sufficient available storage capacity and strategic stocks to mitigate possible short term market shocks across a range of current and future energy carriers and industrial inputs.

45 Paolo Agnolucci, Peter Nagle, and Kaltrina Temaj, 'Bubble Trouble: What's behind the Highs and Lows of Natural Gas Markets?', World Bank Blogs, 22 February 2023, <https://blogs.worldbank.org/opendata/bubble-trouble-whats-behind-highs-and-lows-natural-gas-markets>.

46 Anouk Honoré, 'European Gas Demand Fundamentals' (The Oxford Institute for Energy Studies, 2023), <https://a9w7k6q9.stackpathcdn.com/wpcms/wp-content/uploads/2023/04/Insight-127-European-gas-demand-fundamentals.pdf>.

47 Francesco Chiacchio et al., 'How Have Higher Energy Prices Affected Industrial Production and Imports?', European Central Bank, 14 February 2023, https://www.ecb.europa.eu/pub/economic-bulletin/focus/2023/html/ecb.ebbox202301_02-8d6f1214ae.en.html.

48 'BASF to Cut 2,600 Jobs on High Costs in Europe', CNBC, 24 February 2023, <https://www.cnbc.com/2023/02/24/basf-to-cut-2600-jobs-on-high-costs-in-europe.html>.

49 Chiacchio et al., 'How Have Higher Energy Prices Affected Industrial Production and Imports?'



5. Decarbonization and new markets (10-20 years)

The energy transition entails two parallel but interrelated processes – the decarbonization of Europe's current industry and the establishment of new industries in strategic sectors.

Europe's supply security concerns and carbon neutrality plans are heavily impacted by great power competition and the race for technological leadership. The energy crisis following the war in Ukraine has seen the most significant governmental involvement in European energy markets since their liberalisation in the 1990s. Energy security is once again considered an integral component of national and economic security.

The energy transition entails two parallel but interrelated processes – the decarbonization of Europe's current industry and the establishment of new industries in strategic sectors. On the one hand, the EU is introducing legislative packages to increase the mandatory consumption of biofuels by 2030, specifically through the Renewable Energy Directive III (REDIII) and RePowerEU.⁵⁰ On the other hand, the Critical Raw Materials Act (CRMA)⁵¹ and Net Zero Industry Act (NZIA)⁵² are a push to a governmentally-led industrial development, competing with the large-scale subsidies announced in the US Inflation Reduction Act (IRA)⁵³. The IRA commits USD 370 billion to the energy sector and innovative technologies, primarily through tax incentives, loan guarantees and grants.⁵⁴

50 European Commission, 'Renewable Energy Directive', accessed 26 April 2023, https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en.

51 'Critical Raw Materials Act', European Commission, 2022, https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_22_5523.

52 'Net Zero Industry Act', European Commission, 16 March 2023, https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en.

53 'Inflation Reduction Act Guidebook | Clean Energy', The White House, accessed 5 April 2023, <https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/>.

54 'Inflation Reduction Act Guidebook | Clean Energy', The White House, accessed 5 April 2023, <https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/>.

Transforming Europe's petroleum and energy-intensive industries contributes to the path towards strategic autonomy. For instance, oil refineries can be transformed to produce sustainable biofuels or integrated downstream with petrochemical plants.⁵⁵ Import terminals and storage units that are used for diesel or gasoline can be transformed into facilities for liquid organic hydrogen carriers (LOHC).⁵⁶ Grey ammonia has already been used for decades in the fertiliser industry, so ramping up low-carbon ammonia is not an entirely new process.

European governments have high ambitions to integrate synthetic fuels, green methanol and hydrogen in their energy and transport systems. These markets are under development and could support the decarbonization of energy intensive industries as well as maritime transport and aviation. Hydrogen may serve both as an energy source and feedstock for the European industrial base.

At the same time, Europe must build new industries for digital and low-carbon technologies to increase its autonomy in the transition. The financial and policy environment for industries in Europe has been challenging due to the uneven international playing field when compared to the lower energy costs in the US or the generally low manufacturing costs in China.⁵⁷ The CRMA and NZIA are meant to level this playing field by accelerating permitting processes and opening up funding opportunities for green technology providers.

However, as European governments and companies are looking to establish new – foreign and domestic – supply chains for hydrogen-based products, critical raw materials, wind turbines or electric vehicles, the world is moving toward mistrust, competition and protectionism. Countries are not trying to merely secure supplies, but they are also competing for technological leadership and strategic advantage over their counterparts. Between 2009 and 2020, lithium trade increased by 438%, the largest increase compared to other minerals.⁵⁸ The export and import concentration of these minerals allow governmental involvement and export barriers to play a dominant role in the trade of minerals. The increase in export restrictions has been significant since 2009 for all raw materials – pointing to geopolitical competition that extends more broadly than critical minerals. China has applied 20% of all raw material export restrictions between 2009-2020, followed by Indonesia with 15%.⁵⁹ To mitigate possible supply risks, the German government closed a \$800 million deal with commodity trading house Trafigura to ensure secure mineral supplies for its energy transition.⁶⁰

Protectionist policies for strategic technologies highlight the need for Europe to invest in its own industries as well as in reliable supply chains through near- and friend-shoring. Globally,

55 Jordan Blum, 'Cleaner Refining in the Future Means Biofuels and More Efficient Conventional Fuels', S&P Global, 7 December 2021, <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/oil/120721-cleaner-refining-in-the-future-means-biofuels-and-more-efficient-conventional-fuels>.

56 'Path to Hydrogen Competitiveness: A Cost Perspective' (The Hydrogen Council, 20 January 2020), 27, https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf.

57 'U.S. Natural Gas Price Will Fall to Levels Not Seen Since 1970s, IHS Markit Says', IHS Markit, September 2019, https://news.ihsmarkit.com/prviewer/release_only/slug/energy-us-natural-gas-price-will-fall-levels-not-seen-1970s-ihs-markit-says; 'Why Cheap US Gas Costs a Fortune in Europe', POLITICO, 15 November 2022, <https://www.politico.eu/article/cheap-us-gas-cost-fortune-europe-russia-ukraine-energy/>; CRISIL, 'Chinese Blessing for the Chemicals Industry', 2019, <https://www.crisil.com/content/dam/crisil/our-analysis/reports/Research/documents/2019/may/chinese-blessing-for-the-chemicals-industry.pdf>.

58 Przemyslaw Kowalski and Clarisse Legendre, 'Raw Materials Critical for the Green Transition' (OECD, April 2023), <https://www.oecd.org/publications/raw-materials-critical-for-the-green-transition-c6bb598b-en.htm>.

59 Kowalski and Legendre.

60 'Trafigura Signs USD800 Million Loan Agreement Guaranteed by the Federal Republic of Germany', Trafigura, 2022, <https://www.trafigura.com/press-releases/trafigura-signs-usd800-million-loan-agreement-guaranteed-by-the-federal-republic-of-germany/>.

As European governments and companies are looking to establish new energy supply chains, the world is moving toward mistrust, competition and protectionism.

some of the new energy markets will likely be more regional (electricity, waste, some hydrogen-based products), others international (critical raw materials, ammonia, some hydrogen-based products).⁶¹ As such, it is important to assess Europe's competitive advantage and invest in domestic strategic sectors, while also acknowledging the continued need for international trade to secure supplies.

The European Union expects about half of the hydrogen consumed in 2030 to be produced domestically and the other half to be fulfilled by imports.⁶² The national characteristics of each European country will determine the balance between domestic production and imports when it comes to the supply of hydrogen. Some countries may focus more intensively on domestic production capabilities, while others may seek to act as a trade hub.⁶³ In general, high domestic demand and incentives from the government can foster an attractive market for investors, creating economies of scale and encouraging technological innovation. Extensive infrastructure offering efficient processes and optionality across storage facilities, transport modalities, and types of customers makes it attractive for investors to choose Europe for the development of hydrogen import or production hubs.

On the path towards a competitive green economy, European infrastructure will go through significant changes. Spatial planning is necessary to ensure that the import, production, storage and transport of new energy carriers within and between European countries is done effectively. Hydrogen-based fuels have a much lower energy density than fossil fuels, so their storage and transportation requires much more physical space and capacity. Moreover, a significant part of energy storage will no longer be in liquid or gas form. While it remains unclear which specific energy storage technology is the most effective, large-scale batteries and high-voltage cables will be necessary to support intermittent renewable electricity consumption. Pipelines, trains, barges and tankers will have to be adapted to transport the new fuels. Expertise to store and transport hazardous products such as certain hydrogen carriers will be essential to build European hydrogen hubs.

In a competitive world that is more inclined to impose sanctions and use strategic products to pursue geopolitical goals, strategic reserves will remain central to security of supply. As oil declines in importance, products like synthetic fuels, low carbon ammonia, critical minerals and advanced chips are becoming the most sought-after commodities. Strategic stockholding will continue being a key measure of supply security. Given that the energy carriers used across sectors and industries will vary, more types of fuels and carriers will likely need to be stored in strategic reserves. Stockholding obligations may extend to synthetic aviation fuels for the aviation sector, green ammonia or methanol for shipping or critical minerals.

61 Irina Patrahau, Lucia van Geuns, and Michel Rademaker, 'Energy Trade in the Netherlands: Past, Present and Future' (The Hague Centre For Strategic Studies, 2023), <https://hcass.nl/wp-content/uploads/2023/01/Energy-trade-in-the-Netherlands-HCSS-2023.pdf>.

62 'REPowerEU: Affordable, Secure and Sustainable Energy for Europe', European Commission, 18 May 2022, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repower-eu-affordable-secure-and-sustainable-energy-europe_en.

63 Patrahau, van Geuns, and Rademaker, 'Energy Trade in the Netherlands: Past, Present and Future'.

Extensive infrastructure offering efficient processes and optionality across storage facilities, transport modalities and types of customers makes it attractive for suppliers to choose Europe for the development of hydrogen hubs.

6. Moving forward: recommendations

The coming decades bring complex multi-faceted challenges to Europe – securing affordable supplies of oil and gas, decarbonizing industries, and establishing a green competitive economy whilst undergoing a changing geopolitical system. Recent years have seen an increase in governmental involvement in energy markets, which are now main areas of strategic competition. Protectionism can have detrimental effects on the speed and success of the energy transition. Below is a set of recommendations that can support European governments and companies in achieving a green competitive system.

European climate goals and industrial strategy should be integral components of the same objective: a low-carbon competitive Europe. Harmonizing efforts can bring significant gains and accelerate action.

- European climate goals and industrial policies should be designed based on different needs and timelines. Existing (energy intensive) industries should be guided by a strong industrial policy in their decarbonization in the short-to-mid-term, in order to remain competitive globally. At the same time, new industrial capabilities should be developed into new strategic sectors like green energy, critical minerals or digital technologies.
- In accordance with the Critical Raw Materials Act and Net Zero Industry Act, European governments should ensure rapid and efficient permitting processes, make funding more easily accessible to innovative companies and foster a secure and attractive investment environment. Coherence across national jurisdictions should be ensured as well.
- A skilled workforce with expertise in the new energy sectors is essential to the green transition. Know-how on efficiently and safely producing, handling, storing, transporting and consuming new energy carriers must be fostered and developed across European countries.
- Concrete requirements for the consumption of new products can encourage the creation of a supply base. Large energy users can be first movers and attract supply and investments to Europe.
- Strategic stockholding obligations will have to be revised to match the new realities of the energy transition. As the world is divided into geopolitical blocs and characterised by volatile supply chains, strategic stocks of various new products will be important to ensure supply in case of disruption. To maximise efficiency, this effort should be coordinated at the European level.
- Europe must invest more in domestic industries and move toward strategic autonomy, but the fundamental importance of international trade and cooperation in the energy sector should not be overlooked.

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