

DGAP POLICY BRIEF

Gas and Energy Security in Germany and Central and Eastern Europe



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Russia's weaponization of gas supplies caused a shock to the energy security of Central and Eastern Europe. Countries responded by increasing alternative gas supplies and LNG import capacity. Gas flows shifted from the east-west axis to west-east and north-south axes. In the short term, the usage of coal is rising; in the longer term, renewable and nuclear energy. Mitigating the effects of this shock requires the EU to prioritize policies that foster the integrity and security of its energy market.

– The industry-heavy and gas-dependent region is hit hardest by the gas cutoff. Thus far, significant energy savings have been achieved in Germany without provoking economic collapse. High regional economic interdependence underlines the importance of ensuring continued cross-border gas flows.

– Germany's role as a transit hub became more important as Norwegian gas and LNG replaced Russian deliveries. In the medium term, both the expansion of LNG capacity in Poland, the Baltics, and Southeastern Europe and increased interconnections will contribute to the security of supply.

– The impetus to expand renewables should be maintained through a strong price signal. Only with continued energy savings and the procurement and distribution of gas from the global LNG market can Russian supplies be replaced.

As part of its war against Ukraine, Russia – which supplied 45 percent of EU natural gas imports – is weaponizing its gas supplies.¹ Over the course of half a year, the country has almost completely cut its deliveries to Germany and Central and Eastern Europe, a region where gas recently made up over 20 percent of energy supply² and whose most important supplier of natural gas was Russia. Financial analysts now predict that gas prices in Europe will remain much higher for the next ten years relative to other regions and the prewar period. This weaponization of energy by Russia was largely met by a firm response and, with few exceptions, the region has not given in to Russian blackmail. Instead, a massive adaptation of the energy system is underway. From a macroeconomic point of view, this energy price shock constitutes a massive deterioration of the EU's and Germany's terms of trade. The current account surplus has become a deficit, a first since 2008, as Europe has had to import energy at much higher prices and its exchange rate weakened.³

Central and Eastern Europe is home to a high number of gas-intensive commodity producers, which are hit hardest by high gas prices. Many industrial processes rely on gas either directly or indirectly as a source of energy. Industry consumption accounts for 27 percent of total EU gas usage and this number is higher for Germany and Central and Eastern Europe.⁴ In Germany, industry consumed 36 percent of the total sales of natural gas in 2021.⁵ Furthermore, German industry is interconnected with thousands of suppliers in neighboring states. Trade with the Visegrád Group totaled €186.8 billion between January and June 2022 (€167 billion the previous year).⁶ This exceeds the €148.9 billion in trade with China, making them collectively Germany's strongest trading partner and signaling high economic interdependence.

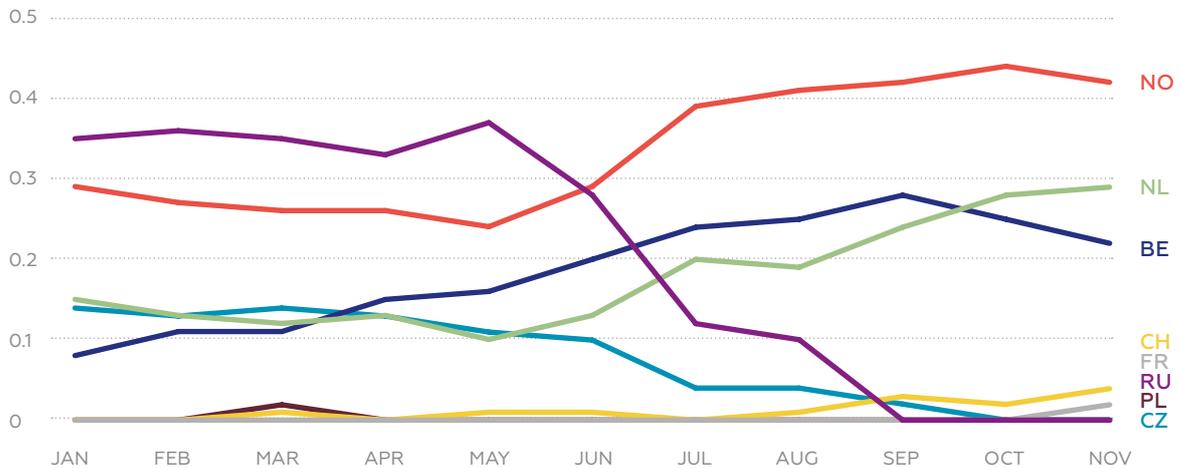
The response to this large shock to energy security and the economic system of Germany and Central and Eastern Europe consisted of two essential elements:

First, a major part of the response has been a reduction in the final demand for gas. Contrary to widely voiced fears, this was achieved without major effects on economic activity. In Germany, temperature-corrected gas consumption of households is estimated to be around 20 to 30 percent lower on average now than from 2018 to 2021.⁷ Industry demand has fallen by similar amounts relative to a period during which demand had already been dampened by the recession induced by the COVID-19 pandemic. Yet this reduction does not appear to correlate with drops in industrial output except for in the chemical, iron, and steel sectors.⁸ A recent survey by the ifo Institute documents that three quarters of companies report to have achieved significant gas savings without cuts to production; the effect on GDP of this shock has been relatively muted and only a mild recession is forecast for 2023.⁹ Nevertheless, a recent article reported that 20 percent of European fertilizer production has shut down, most of which is located in Central and Eastern Europe with 13 percent in Poland alone (although given lower gas prices in the last months, some may have resumed).¹⁰ A similar trend can also be observed in the steel and chemical industries.¹¹

Second, new supply routes were created and, increasingly, existing capacities of alternative supplies are being utilized. Liquefied Natural Gas (LNG) and gas from Norway have been particularly important in replacing Russian gas. Some adaptation has come from a change in the energy mix with oil and coal playing a larger role. Coal consumption in the EU is estimated to have

- 1 International Energy Agency, "How Europe can cut natural gas imports from Russia significantly within a year," March 3, 2022: <https://www.iea.org/news/how-europe-can-cut-natural-gas-imports-from-russia-significantly-within-a-year> (accessed December 6, 2022).
- 2 Figure resulting from our own calculations based on data from the International Energy Agency's *World Energy Balances*: <https://www.iea.org/data-and-statistics/data-product/world-energy-balances-highlights> (accessed December 3, 2022).
- 3 OECD, Current account balance (indicator): <https://doi.org/10.1787/b2f74f3a-en> (accessed December 3, 2022).
- 4 Peggy Hollinger et al., "Will the energy crisis crush European industry?," *Financial Times*, October 19, 2022: <https://www.ft.com/content/75ed449d-e9fd-41de-96bd-c92d316651da> (accessed December 5, 2022).
- 5 Zukunft Gas, "Erdgas in Deutschland Zahlen und Fakten für das Jahr 2021" [Natural gas in Germany Facts and figures for 2021], p. 7: <https://gas.info/fileadmin/Public/PDF-Download/Faktenblatt-Erdgas.pdf>; German Council of Economic Experts, "Energiekrise solidarisch bewältigen, neue Realität gestalten, Jahresgutachten" [Overcoming the energy crisis in solidarity, shaping new reality, annual report], October 28, 2022, p. 217: https://www.sachverstaendigenrat-wirtschaft.de/fileadmin/dateiablage/gutachten/jg202223/JG202223_Gesamtausgabe.pdf (both accessed December 3, 2022).
- 6 Ost-Ausschuss der Deutschen Wirtschaft, *OA-Update Mittelosteuropa* [OA Update Central Eastern Europe], September 8, 2022: https://www.ost-ausschuss.de/sites/default/files/paragraphs/pdf/2022-09/OA-UpdateMOE_02_2022.pdf (accessed December 5, 2022).
- 7 Christian Endt, "So viel Gas spart Deutschland wirklich" [This is how much gas Germany really saves], *Zeit Online*, October 14, 2022: <https://www.zeit.de/wirtschaft/2022-10/gasverbrauch-haushalte-datenanalyse-temperatur-energiekrise> (accessed December 3, 2022).
- 8 See, for example, Ben McWilliams: <https://twitter.com/McWilliamsBen/status/1587763102514290690/photo/1> (accessed December 4, 2022).
- 9 ifo Institute, "Many Industrial Companies in Germany Cut Gas Consumption without Curbing Production," November 22, 2022: <https://www.ifo.de/en/press-release/2022-11-22/many-industrial-companies-germany-cut-gas-consumption-without-curbing> (accessed December 3, 2022); German Council of Economic Experts, "Energiekrise solidarisch bewältigen," p. 3 (see note 5).
- 10 Hollinger et al., "Will the energy crisis crush European industry?" (see note 4).
- 11 According to OECD estimates, Poland, the Czech Republic, Slovakia, Austria, and Slovenia are among the countries with the highest shares of employment in vulnerable gas-intensive sectors. OECD, "How vulnerable is European manufacturing to gas supply conditions?: A regional approach," *OECD Policy Responses on the Impacts of the War in Ukraine*: <https://doi.org/10.1787/01278ba3-en> (accessed December 6, 2022).

PERCENTAGE OF TOTAL NATURAL GAS IMPORTS TO GERMANY IN 2022



Source: Own calculations based on data from the Federal Network Agency for Electricity, Gas, Telecommunications, Post, and Railway, *Aktuelle Lage Gasversorgung: Gasimporte in GWh/Tag* [Current situation gas supply: Gas imports in GWh/day], December 5, 2022: https://www.bundesnetzagentur.de/DE/Gasversorgung/aktuelle_gasversorgung/_svg/Gasimporte/Gasimporte.html (accessed December 5, 2022)

increased 10 percent in the first half of the year.¹² Finally, the build-up of renewable energy has accelerated in response to the price shock to fossil fuels.

In this paper, we will map out the changing energy situation in Germany and Central and Eastern Europe in more detail. We will then provide policy recommendations based on those findings.

SHIFT OF NATURAL GAS FLOWS IN EUROPE FROM WEST TO EAST

In 2021, Russia exported roughly 1,550 terawatt hours (TWh) or 155 billion cubic meters (bcm)¹³ of natural gas to Europe, of which 550 TWh were transported via the Nord Stream pipeline and approximately 300

TWh via the Yamal–Europe pipeline.¹⁴ Now, east to west flows through both have ceased.¹⁵ Only 19 TWh still reached Europe via Ukraine and the TurkStream pipeline this October – a fraction of total capacity.¹⁶ While from January to October 2022 gas deliveries were half of those for the same period in 2021, the EU now receives only 20 percent of what it used to.¹⁷ The estimated decrease in Russian deliveries compared to last year is 800 TWh.¹⁸ In response to the reduction and near total discontinuation of Russian gas deliveries, gas flows from west to east have increased substantially.

Norway has become Europe’s – and Germany’s – primary gas supplier.¹⁹ Germany relies on imports of natural gas from Norway as well as on imports of LNG via Belgium and the Netherlands while simul-

12 International Energy Agency, *Coal Market Update – July 2022*: <https://www.iea.org/reports/coal-market-update-july-2022/demand> (accessed December 3, 2022).

13 For better comparability of the energy supply potentials of various sources, gas supplies are given in giga- or terawatt hours. We convert billion cubic meters of natural gas to TWh through a multiplication by ten throughout this paper.

14 Ben McWilliams et al., *European natural gas imports*, Bruegel Dataset: <https://www.bruegel.org/dataset/european-natural-gas-imports>; Ben McWilliams et al., “Can Europe survive painlessly without Russian gas?,” January 27, 2022: <https://www.bruegel.org/blog-post/can-europe-survive-painlessly-without-russian-gas> (both accessed December 5, 2022).

15 Tagesschau, “Gaslieferungen bleiben ausgesetzt” [Gas supplies remain suspended], September 2, 2022: <https://www.tagesschau.de/wirtschaft/gazprom-nord-stream-gaslieferstopp-103.html>; Euronews, “Gazprom liefert kein Gas mehr über Jamal-Europa” [Gazprom no longer supplies gas via Yamal Europe], May 13, 2022: <https://de.euronews.com/2022/05/13/gazprom-liefert-kein-gas-mehr-uber-jamal-europa> (both accessed December 3, 2022).

16 Stuart Elliott, “Russian gas flows to Europe slide further in October, fall below 2 Bcm,” S&P Global Commodity Insights, November 2, 2022: <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/110222-russian-gas-flows-to-europe-slide-further-in-october-fall-below-2-bcm> (accessed December 5, 2022).

17 International Energy Agency, “Never Too Early to Prepare for Next Winter: Europe’s gas balance for 2023–2024, p. 3”: <https://www.iea.org/reports/never-too-early-to-prepare-for-next-winter> (accessed December 5, 2022).

18 Ibid.

19 Stuart Elliott, “Norway is now Europe’s single biggest gas supplier,” S&P Global Commodity Insights, November 30, 2022: <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/113022-high-volatile-prices-in-europe-not-in-norways-interest-pm> (accessed December 3, 2022).

taneously reducing its gas consumption, which was down by 33 percent in October 2022.²⁰ Of the total gas imports in October 2022, 44 percent came from Norway, 28 percent from the Netherlands, and 25 percent from Belgium.²¹ LNG imports from the United States more than doubled in the first nine months of 2022, keeping it the main supplier of LNG to Europe ahead of Qatar and Russia.²²

Imports through Norway's pipeline infrastructure will exceed 1,170 TWh in 2022, second only to LNG imports of 1,500 TWh.²³ The volume delivered via Norwegian pipelines in 2022 is four times larger than the volume delivered through the Nord Stream pipeline, which delivered approximately 300 TWh.²⁴ Ninety-five percent of Norwegian gas is exported via pipelines; therefore, the risk resulting from acts of sabotage would be large.²⁵ Norway's petroleum safety authority recently increased the threat level to gas infrastructure after unidentified drones were seen flying near offshore gas facilities.²⁶ In the past month, more than ten Russian citizens, including a former Russian intelligence officer, were detained in Norway for drone photography of strategic targets.²⁷

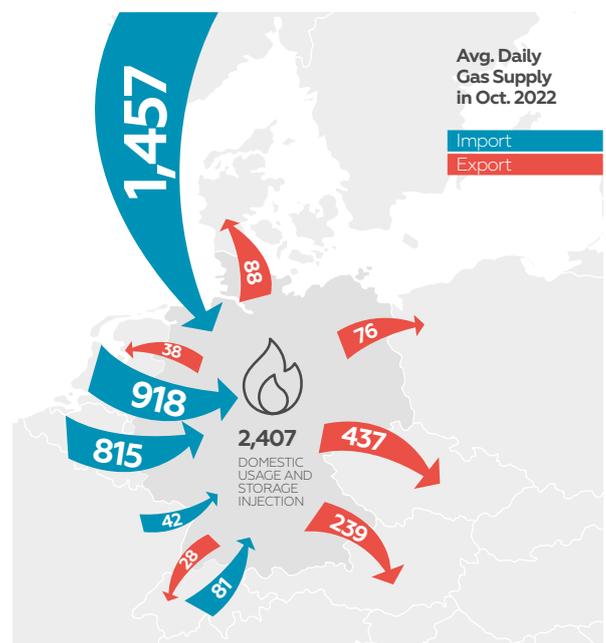
PLAYERS IN THE EU'S INTERNAL GAS MARKET

Germany

As a major gas transit hub, Germany is central to ensuring that the EU's internal gas market functions. In 2021, 46.1 percent of gross German gas imports were exported to neighboring countries.²⁸

In 2022, 59 percent of German gas exports were destined for the Czech Republic. While the share of those exports remained constant, less gas was delivered there than in previous years (888 GWh/day on average in 2022 so far versus 1,271 GWh/day in 2020).

GERMAN NATURAL GAS IMPORTS AND EXPORTS IN OCTOBER 2022 IN GWH/DAY



Own image based on data from the Federal Network Agency for Electricity, Gas, Telecommunications, Post, and Railway (see notes 20 and 29).

- 20 Federal Network Agency for Electricity, Gas, Telecommunications, Post, and Railway, *Gasverbrauch in Deutschland 2022 in GWh/Tag, monatlicher Mittelwert* [Gas consumption in Germany 2022 in GWh/day, monthly average], November 28, 2022: https://www.bundesnetzagentur.de/DE/Gasversorgung/aktuelle_gasversorgung/svg/Gasverbrauch_Gesamt_monatlich/Gasverbrauch_Gesamt_M.html (accessed December 3, 2022).
- 21 Federal Network Agency for Electricity, Gas, Telecommunications, Post, and Railway, *Current status of gas supply in Germany*, December 5, 2022: <https://www.bundesnetzagentur.de/EN/Areas/Energy/Companies/SecurityOfSupply/GasSupply/start.html> (accessed December 5, 2022).
- 22 Ciaran Roe, "Europe to the fore, elsewhere through the floor: How LNG flows were turned on their head in 2022," S&P Global Commodity Insights, October 26, 2022: <https://www.spglobal.com/commodityinsights/en/market-insights/blogs/lng/102622-europe-lng-russian-gas-ukraine-war> (accessed December 6, 2022).
- 23 Nora Buli, "Norway on track for record gas export, will be ready for winter -Gassco CEO," Reuters, September 5, 2022: <https://www.reuters.com/business/energy/norway-track-record-gas-export-will-be-ready-winter-gassco-ceo-2022-09-05/>; Gavin Maguire, "Europe's mammoth LNG import bill may drain energy transition coffers," Reuters, October 7, 2022: <https://www.reuters.com/business/energy/europes-mammoth-lng-import-bill-may-drain-energy-transition-coffers-maguire-2022-10-06/> (both accessed December 5, 2022).
- 24 McWilliams et al. (see note 14).
- 25 Norwegian Petroleum, *Exports of Oil and Gas*, October 29, 2022: <https://www.norskpetroleum.no/en/production-and-exports/exports-of-oil-and-gas/#:~:text=Gas%20markets%20have%20become%20more,the%20Melk%C3%B8ya%20facility%20in%20Hammerfest> (accessed December 3, 2022).
- 26 Euronews with Reuters, "Nord Stream: Norway and Denmark tighten energy infrastructure security after gas pipeline 'attack,'" September 28, 2022: <https://www.euronews.com/2022/09/28/norway-and-denmark-tighten-security-around-energy-infrastructure-after-pipeline-attack> (accessed December 3, 2022).
- 27 Robert Lansing Institute, "Risk of attack on Norway's energy facilities reached a high point," October 26, 2022: <https://lansinginstitute.org/2022/10/26/risk-of-attack-on-norways-energy-facilities-reached-high-point/> (accessed December 3, 2022).
- 28 Federal Ministry for Economic Affairs and Climate Action, *Energy Data: Complete Edition*: <https://www.bmwi.de/Redaktion/EN/Artikel/Energy/energy-data.html> (accessed December 6, 2022); Federal Office for Economic Affairs and Export Control, *Erdgasstatistik* [natural gas statistic]: https://www.bafa.de/DE/Energie/Rohstoffe/Erdgasstatistik/erdgas_node.html (accessed December 14, 2022).

German exports to Austria and Poland increased compared to previous years, helping to fill the shortfall of Russian gas deliveries from the east.²⁹ The replacement of Russian gas with gas from Norway and LNG has increased the importance of Germany to the short-term security of supply of its neighbors. This is set to change as new gas infrastructure connections take up operations across the region in the short and medium term.

Visegrád Countries

While many countries in Central and Eastern Europe are highly dependent on Russian gas imports, their political positions regarding Russian gas are heterogeneous. Poland's proactive efforts to reduce dependence on Russian gas imports and Hungary's increase of Russian gas supplies represent two ends of the spectrum.³⁰

Poland recently began operating the Baltic Pipe, through which it can import the equivalent of up to 100 TWh of natural gas from Norway.³¹ Poland is also expanding its LNG capacity at the Świnoujście Polskie LNG Terminal and a Floating Storage Regasification Unit (FSRU) in the Gulf of Gdansk.³² Interconnectors between Lithuania and Poland³³ and between Poland and Slovakia³⁴ have already become operational this year, thereby linking the Baltic Sea Region with Central Eastern Europe. Poland has not received Russian gas since April 2022, when it refused requests for payment in rubles.³⁵ Poland in-

tends to cease gas imports from Russia at the end of 2022 and is relatively well prepared. Reverse flow gas deliveries to Poland from Germany have increased.³⁶

The remaining landlocked countries of the Visegrád Group – the Czech Republic, Slovakia, and Hungary – previously imported over 85 percent of their natural gas from Russia.³⁷ As in Germany, deliveries to the Czech Republic and Slovakia began to decrease starkly in summer 2022 and then ceased entirely. Both countries have relied on Norwegian and LNG supplies (transiting Germany) to fill their gas storage ahead of winter. Hungary is similarly reliant on Russian gas and continues to receive deliveries via the TurkStream and Transgas pipelines.³⁸ Additionally, Hungary plans to increase its domestic gas production.³⁹ Hungary, Poland, the Czech Republic, and Slovakia are all relying more heavily on coal and/or nuclear energy to avert shortages in the short term. The new Polish-Slovak interconnector may help relieve the situation in Slovakia and could be used to provide gas to Hungary and Ukraine in the future via the Slovak transmission system.⁴⁰

Southeastern Europe

In the short and medium term, Southeastern Europe looks to play a crucial role in gas provisioning. New gas infrastructure in the region, which is supported by the EU, could provide more natural gas from the Black Sea and Caspian Basin (Azerbaijan) to Central

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- 29 Federal Network Agency for Electricity, Gas, Telecommunications, Post, and Railway, *Aktuelle Lage Gasversorgung: Gasexporte in GWh/Tag* [Current situation gas supply: Gas exports in GWh/day], December 5, 2022: https://www.bundesnetzagentur.de/DE/Fachthemen/ElektrizitaetundGas/Versorgungssicherheit/aktuelle_gasversorgung/_svg/Gasexporte/Gasexporte.html?nn=1059464 (accessed December 5, 2022).
- 30 S&P Global Commodity Insights, "Russia begins extra gas flows to Hungary on top of contracted volume: official," August 15, 2022: <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/081522-russia-begins-extra-gas-flows-to-hungary-on-top-of-contracted-volume-official> (accessed December 3, 2022).
- 31 European Commission, "Launch of the Baltic Pipe," September 27, 2022: https://ec.europa.eu/info/news/launch-baltic-pipe-2022-sep-27_en (accessed December 3, 2022).
- 32 Global Energy Monitor Wiki, Swinoujście Polskie LNG Terminal: https://www.gem.wiki/%C5%9Awinouj%C5%9Bcie_Polskie_LNG_Terminal; Grzegorz Landowski, "Poland's FSRU floating LNG terminal capacity will be doubled," *Poland at Sea*, June 7, 2022: <https://www.polandatsea.com/polands-fsru-floating-lng-terminal-capacity-will-be-doubled/> (both accessed December 3, 2022).
- 33 European Commission, "Inauguration of gas interconnection between Poland and Lithuania," May 5, 2022: https://ec.europa.eu/info/news/inauguration-gas-interconnection-between-poland-and-lithuania-2022-may-05_en (accessed December 3, 2022).
- 34 European Commission, "Inauguration of the gas interconnector between Poland and Slovakia," August 26, 2022: https://ec.europa.eu/info/news/inauguration-gas-interconnector-between-poland-and-slovakia-2022-aug-26_en (accessed December 3, 2022).
- 35 Martin Adam, "Polen eröffnet 'Baltic Pipe'" [Poland opens "Baltic Pipe"], *Tagesschau*, September 27, 2022: <https://www.tagesschau.de/ausland/europa/energie-polen-baltic-pipeline-103.html> (accessed December 3, 2022).
- 36 Interfax, "Poland taps European market to replace gas from Gazprom," April 27, 2022: <https://interfax.com/newsroom/top-stories/78672/> (accessed December 3, 2022).
- 37 Jiří Koželouh and Karel Polanecký, "How to break Czechia's dependence on Russian gas," Heinrich Böll Foundation, April 21, 2022: <https://eu.boell.org/en/2022/04/21/how-break-czechias-dependence-russian-gas>; Sergio Velasco, "The pipeline that could help Slovakia become less dependent on Russian gas with Polish help," Warsaw Institute, July 26, 2022: <https://warsawinstitute.org/pipeline-help-slovakia-become-less-dependent-russian-gas-polish-help/>; Reuters, "Hungary's Orban expects gas deal with Russia this summer," July 29, 2022: <https://www.reuters.com/business/energy/hungary-pm-sees-deal-with-russia-by-end-summer-more-gas-supplies-2022-07-29/> (all accessed December 3, 2022).
- 38 Wilhelmine Preussen, "Hungary signs new deal with Gazprom," *Politico*, August 31, 2022: <https://www.politico.eu/article/hungary-signs-deal-with-gazprom-over-additional-gas/> (accessed December 3, 2022).
- 39 Sylvia Beyer and Gergely Molnar, "Accelerating energy diversification in Central and Eastern Europe," International Energy Agency, September 14, 2022: <https://www.iea.org/commentaries/accelerating-energy-diversification-in-central-and-eastern-europe> (accessed December 3, 2022).
- 40 Sergio Velasco, "The pipeline that could help Slovakia become less dependent..." (see note 37).

and Eastern Europe.⁴¹ The Trans-Adriatic Pipeline, the first phase of the BRUA Pipeline (Bulgaria-Romania-Hungary-Austria), and the Krk LNG terminal all took up operations in 2020 and 2021. Interconnectors from Bulgaria to Greece, Romania, and Serbia enable higher gas volumes to reach the region.⁴² These developments indicate that the north-south axis of gas infrastructure will play a more extensive role in supplying gas to Central, Eastern, and South-eastern European countries in the medium term, thereby decreasing the importance of west to east flows that became vital in the immediate aftermath of the gas supply shock.

TIGHT GAS MARKET DEMANDS ALTERNATE ENERGY SOURCES

In 2022, the EU rapidly expanded its LNG import capacity in a move to diversify gas supplies. Five floating storage and regasification terminals, each providing a capacity to import approximately 50 TWh per year, are to become operational in 2022 and 2023 in Germany alone.⁴³ Looking ahead, the combined LNG capacity of Germany, Croatia, Greece, Poland, and Lithuania is set to rise from 200 TWh/year to 500 TWh/year by the end of 2023 and to 1,000 TWh/year by 2026. This is equal to the region's total imports of Russian gas in 2021.⁴⁴ The new LNG infrastructure and interconnections have increased the capacity for gas deliveries along the north-south axis to supply Central and Eastern Europe.⁴⁵ These additional import capacities do not necessarily mean more gas imports for the EU but better availability in the region studied.

The gas supply situation will remain tight in 2023. It should be noted that the EU's efforts to secure gas

supplies in 2022 benefitted greatly from decreased LNG demand by China. Should the economy recover in the coming year, LNG imports to China are estimated to capture most of the additional global LNG supply in 2023 and buy the 190 TWh it did not demand this year.⁴⁶ The International Energy Agency (IEA) estimates that Europe would face a supply-demand gap of 300 TWh during the refilling period next year, which would lead to gas storage at only 65 percent of capacity ahead of the 2023/24 heating period.⁴⁷ In this context, ideas to cap the price of gas would increase the difficulties related to procuring sufficient supplies. While the IEA forecast assumes a complete cessation of Russian gas deliveries in 2023,⁴⁸ it is not unlikely that gas supplies to select countries, such as Hungary, will continue via the TurkStream and Transgas pipeline systems.

Reducing the demand for natural gas further in 2023 depends on alternative forms of electricity generation. France, Europe's largest electricity exporter, became an importer for much of 2022 due to the interruption of nuclear and hydropower generation. The resumption of operations in 2023 could reduce the estimated EU gas demand by 80 TWh.⁴⁹ The EU Commission has announced an ambitious emergency regulation to accelerate renewable energy projects with the aim of replacing 140 TWh of natural gas through wind and solar capacity in 2023.⁵⁰ Withdrawing less gas than average from storage, which Europe appears on track to achieve this winter, would significantly alleviate demand in the coming refilling period.⁵¹ Limited Russian gas deliveries via TurkStream and Transgas – as well as a partial replacement of gas in electricity generation through reinstated hydropower, nuclear, and new wind and solar power generation – would be sufficient to eliminate the IEA's estimated supply-demand gap of 300 TWh in 2023.

41 European Commission, REPowerEU Plan, COM(2022) 230, May 18, 2022, p. 9: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN&qid=1653033742483> (accessed December 3, 2022).

42 European Commission: Annexes to the REPowerEU Plan, May 18, 2022: https://energy.ec.europa.eu/system/files/2022-05/COM_2022_230_1_EN_annexe_autre_acte_part1_v4.pdf (accessed December 3, 2022).

43 Federal Ministry for Economic Affairs and Climate Action, "Habeck: Standortentscheidung für zwei weitere schwimmende Flüssigerdgasterminals ist gefallen" [Habeck: Location decision for two more floating liquefied natural gas terminals has been made], July 19, 2022: <https://www.bmwk.de/Redaktion/DE/Pressemitteilungen/2022/07/20220719-habeck-standortentscheidung-fur-zwei-weitere-schwimmende-fluessigerdgasterminals-ist-gefallen.html> (accessed December 3, 2022).

44 Sylvia Beyer and Gergely Molnar, "Accelerating energy diversification in Central and Eastern Europe" (see note 39).

45 Ibid.

46 International Energy Agency, "Never Too Early to Prepare for Next Winter," p. 5 (see note 17).

47 Nora Buli, "IEA says Europe must act now to avoid winter 2023 gas shortages," Reuters, November 3, 2022: <https://www.reuters.com/business/energy/iea-calls-urgent-action-european-gas-supply-gap-2022-11-03/> (accessed December 6, 2022).

48 International Energy Agency, "Never Too Early to Prepare for Next Winter" (see note 17).

49 Ibid., p. 10.

50 European Commission, "REPowerEU: Commission steps up green transition away from Russian gas by accelerating renewables permitting," September 1, 2022: https://ec.europa.eu/commission/presscorner/detail/en/ip_22_6657 (accessed December 6, 2022).

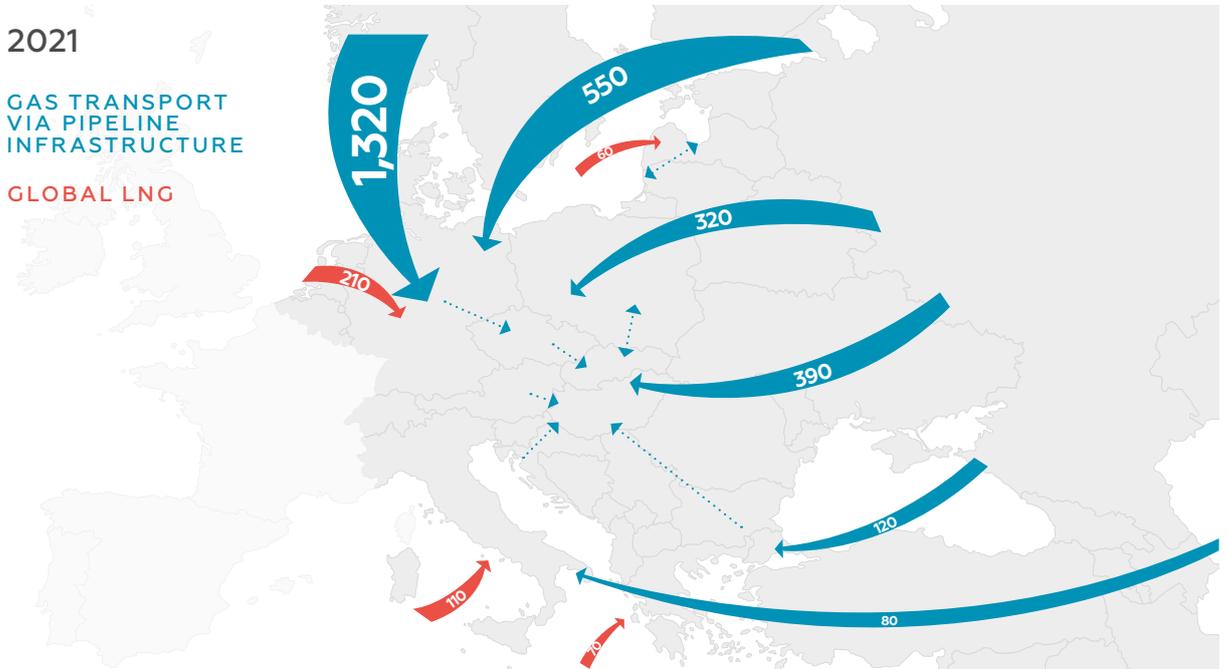
51 John Kemp, "Europe on course to end winter with plenty of gas," Reuters, November 29, 2022: <https://www.reuters.com/business/energy/europe-course-end-winter-with-plenty-gas-kemp-2022-11-28/> (accessed December 5, 2022).

PREWAR VS POSTWAR GAS FLOWS IN TWH

2021

GAS TRANSPORT VIA PIPELINE INFRASTRUCTURE

GLOBAL LNG



2024

GAS TRANSPORT VIA PIPELINE INFRASTRUCTURE

GLOBAL LNG



Schematic illustration of gas infrastructure supplying Central and Eastern Europe with natural gas in 2021 (image 1) and in 2024 (image 2). Note: Forecast gas infrastructure for 2024 is based on announced plans for infrastructural expansion and authors' estimates. Only LNG capacity greater than 50 TWh/year is listed. The capacity of the Baltic States as well as the LNG capacity of Belgium and the Netherlands is aggregated. Figures for Norway reflect the total exports to Europe (pipeline and LNG). Arrows indicate the primary direction of gas transmission.

Source: McWilliams et al. based on EntsoG data (see note 14); Giovanni Sgaravatti et al., "National energy policy responses to the energy crisis," Bruegel Datasets, November 11, 2022: <https://www.bruegel.org/dataset/national-energy-policy-responses-energy-crisis>; European Commission, "Diversification of gas supply sources and routes": https://energy.ec.europa.eu/topics/energy-security/diversification-gas-supply-sources-and-routes_en; International Energy Agency, *Gas Market Report Q4-2021*, p. 83: <https://iea.blob.core.windows.net/assets/261043cc-0cb6-498b-98fa-a1f48715b91f/GasMarketReportQ42021.pdf> (all accessed December 3, 2022).

Renewables

In the medium and long term, expanding renewable energy capacity is key to shifting away from gas. In the past two years, just over half of Europe's new renewable capacity (44 TWh annually) has replaced gas power.⁵² In 2021, wind and solar generated more electricity than gas in the EU for the first time.⁵³

The extent of renewable expansion in the EU is mixed, however. Together, Spain, the Netherlands, and Greece account for over half of all growth in wind and solar output in the EU since 2019 while Bulgaria, the Czech Republic, and Romania have failed to deploy almost any wind and solar. Hungary and Poland started low but have since recorded impressive growth in renewable energy.⁵⁴

Member states have responded to a push by the EU to accelerate the rollout of renewable energy and decarbonization of industries in line with its REPowerEU objectives.⁵⁵ The Czech Republic, Poland, and Slovakia, among others, have eased regulation or announced new projects to accelerate the deployment of renewable energy sources. Many Central and Eastern European countries have also announced their coal phase-out dates.⁵⁶ Germany has set ambitious plans to nearly triple wind and solar capacity by 2030.⁵⁷ This would yield approximately 1,200 GWh/day in contrast to the average 440 GWh/day

produced from wind and solar in 2021 (of 616 GWh/day from renewables in total).⁵⁸ The European Commission plans to bring renewable energy capacity to 1,236 GW by 2030.⁵⁹ The expansion of solar and wind alone would save 210 TWh/year in natural gas by 2030 in addition to the 1,160 TWh/year already estimated to be saved under the Fit for 55 measures.⁶⁰ By achieving the Fit for 55 and REPowerEU objectives, the EU could reduce gas consumption by 1,550 TWh – the equivalent of the EU import of Russian gas in 2021 – by 2027 and a total of 3,100 TWh by 2030.⁶¹ Whether these ambitious EU and national targets can be met is a separate matter.

Nuclear Energy

Numerous countries in Central and Eastern Europe have announced plans to expand nuclear energy capacity:

- In Slovakia, a new nuclear unit capable of generating almost a quarter of the country's electricity consumption came online in 2022. Starting in 2024, an additional unit will make Slovakia a net electricity exporter.⁶²
- Russian energy giant Rosatom is set to construct two new reactors at the Hungarian Paks nuclear plant by 2030.⁶³ This would double the capacity of the plant, which currently generates 40 percent of Hungary's electricity.

52 Charles Moore, *European Electricity Review 2022*, Ember, February 1, 2022: <https://ember-climate.org/insights/research/european-electricity-review-2022/#supporting-material-downloads>, p. 10 (accessed December 3, 2022).

53 Ibid., p. 12.

54 Ibid., p. 24.

55 European Commission, "REPowerEU: A plan to rapidly reduce dependence on Russian fossil fuels and fast forward the green transition," May 18, 2022: https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131 (accessed December 3, 2022).

56 Giovanni Sgaravatti et al., "National energy policy responses to the energy crisis," Bruegel Datasets, November 11, 2022: <https://www.bruegel.org/dataset/national-energy-policy-responses-energy-crisis>; Pawel Czyzak et al., "Shocked into Action," Ember, June 2, 2022: <https://ember-climate.org/app/uploads/2022/06/Ember-EU-national-plans-slash-fossil-fuels.pdf> (both accessed December 3, 2022).

57 German Council of Economic Experts, p. 261 (see note 5).

58 Bruno Burger, "Nettostromerzeugung in Deutschland im Jahr 2021" [Net electricity generation in Germany in 2021], Energy-Charts, January 9, 2022: <https://www.energy-charts.info/index.html?l=de&c=DE#:-:text=3%2C5%20TWh,15%20TWh%20weniger%20als%202020>; Fraunhofer Institute for Solar Energy Systems ISE, "Nettostromerzeugung in Deutschland 2021: Erneuerbare Energien witterungsbedingt schwächer" [Net electricity generation in Germany in 2021: Renewables weaker due to weather conditions], January 3, 2022: <https://www.ise.fraunhofer.de/de/presse-und-medien/news/2022/nettostromerzeugung-in-deutschland-2021-erneuerbare-energien-witterungsbedingt-schwaecher.html> (both accessed December 6, 2022).

59 European Commission, "Renewable energy targets": https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en (accessed December 3, 2022).

60 European Economic and Social Committee, "Fit for 55: delivering the EU's 2030 Climate Target on the way to climate neutrality," February 23, 2022: <https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/fit-55-delivering-eus-2030-climate-target-way-climate-neutrality> (accessed December 14, 2022).

61 European Commission, "Implementing the REPowerEU EU Action Plan, Commission Staff Working Document," Communication from the Commission, SWD/2022/230 final, May 18, 2022, p. 4 and p. 9: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD%3A2022%3A230%3AFIN> (accessed December 3, 2022).

62 Radovan Stoklasa, "Slovaks fuel up new nuclear plant as Europe grapples with energy crisis," Reuters, September 14, 2022: <https://www.reuters.com/business/energy/slovaks-fuel-up-new-nuclear-plant-europe-grapples-with-energy-crisis-2022-09-13/>; World Nuclear News, "Slovakia's Mochovce 3 permitted to start up," August 26, 2022: <https://www.world-nuclear-news.org/Articles/Slovakia-s-Mochovce-3-permitted-to-start-up#:~:text=%22After%20the%20start%20of%20production,in%20the%20spring%20of%202024.%22> (both accessed December 3, 2022).

63 Alys Davies, "Russia to build two nuclear reactors in Hungary," BBC News, August 27, 2022: <https://www.bbc.com/news/world-europe-62695938> (accessed December 3, 2022).

- The first of four new nuclear units in the Czech Republic is set to be in use in 2036.⁶⁴
- Poland, as of yet without a nuclear power sector, plans to construct six reactors by 2040.⁶⁵

While the expansion of nuclear energy capacity detailed above is substantial, most of it will only come online in the long term. Therefore, it will not substantially help reduce the region's demand for natural gas in the coming years.

Furthermore, existing nuclear reactors in the Czech Republic, Slovakia, Hungary, and Bulgaria were built by Russia. Their further operation depends on fuel from Russian suppliers and maintenance services.⁶⁶ While the civilian nuclear sector is explicitly exempt from EU sanctions against Russia, this dependence constitutes a further potential target for energy weaponization by the Russian government.

Hydrogen

Hydrogen could be an important green substitute to gas in certain industrial sectors. The REPowerEU plan foresees the production of 330 TWh of climate-friendly hydrogen in the EU by 2030 and a further 330 TWh to be imported from third countries.⁶⁷

While total demand for gas energy by EU industries was 970 TWh in 2017, not all of it requires substitution with hydrogen.⁶⁸ Industrial processes that require temperatures too high to be generated by heat pumps, which account for approximately 60 percent

of natural gas used in industrial process heat, could switch to hydrogen or biomethane to decarbonize.⁶⁹ Due to the clusters of chemical installations and steel plants in the trilateral region of Belgium, the Netherlands, and Germany as well as in Eastern Europe, hydrogen demand is assumed to be high there.⁷⁰

The European Hydrogen Backbone Initiative is a proposal for hydrogen pipeline infrastructure by a group of European gas and transmission operators that builds on the repurposing of existing pipeline infrastructure. It ascribes important roles to Hungary, Slovakia, and the Czech Republic as hydrogen hubs and to Ukraine as a potential hydrogen exporter.⁷¹ Despite such ambitious plans, uncertainty over the extent to which gas infrastructure can be repurposed for hydrogen transportation remains.

Recent reports have demonstrated that new LNG terminals have limited potential for being retrofit for future renewable energy carriers.⁷² According to some analyses, Portugal and Spain offer the greatest potential to supply green hydrogen within the EU.⁷³ Outside of the bloc, the EU's "Hydrogen Partnerships" aim to establish long-term relationships with numerous countries in which hydrogen generation is more efficient to reduce the risk of creating dependency patterns.⁷⁴ While Ukraine's energy security is currently under threat, its potential for renewable energy generation is already shaping plans for a green reconstruction of its energy sector (see box on page 10).

64 Jan Lopatka, "Three companies vie to build new Czech nuclear plant," Reuters, November 30, 2022: <https://www.reuters.com/business/energy/cez-gets-3-initial-bids-build-new-unit-dukovany-nuclear-plant-2022-11-30/> (accessed December 3, 2022).

65 World Nuclear News, "Poland's government confirms Westinghouse for nuclear plant," November 3, 2022: <https://www.world-nuclear-news.org/Articles/Poland-s-government-confirms-Westinghouse-for-nuclear-plant#:~:text=According%20to%20the%20adopted%20schedule,implemented%20every%202%2D3%20years> (accessed December 3, 2022).

66 Tony Wesolowsky, "The Rosatom Exemption: How Russia's State-Run Nuclear Giant Has Escaped Sanctions," Radio Free Europe, June 15, 2022: <https://www.rferl.org/a/rosatom-russia-nuclear-giant-escapes-sanctions/31899192.html> (accessed December 3, 2022).

67 European Commission, "REPowerEU PlanV, COM(2022) 230 final, May 18, 2022, p. 7: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2022:230:FIN> (accessed December 3, 2022).

68 Eurostat, *Final energy consumption by sector and fuel in Europe*: <https://www.eea.europa.eu/ims/primary-and-final-energy-consumption> (accessed December 4, 2022).

69 Agora Energiewende and AFRY Management Consulting, *No-regret hydrogen: Charting early steps for H₂ infrastructure in Europe*, February 2021, p. 12: https://static.agora-energiewende.de/fileadmin/Projekte/2021/2021_02_EU_H2Grid/A-EW_203_No-regret-hydrogen_WEB.pdf (accessed December 3, 2022).

70 Ibid., p. 10.

71 Rik Van Rossum et al., *European Hydrogen Backbone*, The European Hydrogen Backbone Initiative, April 2022: <https://ehb.eu/> (accessed December 3, 2022).

72 Matia Riemer et al., *Conversion of LNG Terminals for Liquid Hydrogen or Ammonia. Analysis of Technical Feasibility and Economic Considerations*, Fraunhofer Institute for Systems and Innovation Research ISI, November 2022: https://www.isi.fraunhofer.de/content/dam/isi/dokumente/cce/2022/Report_Conversion_of_LNG_Terminals_for_Liquid_Hydrogen_or_Ammonia.pdf (accessed December 3, 2022).

73 Alejandro Nuñez-Jimenez and Nicola De Blasio, "Competitive and secure renewable hydrogen markets: Three strategic scenarios for the European Union," *International Journal of Hydrogen Energy*, Volume 47, Issue 84, pp. 35,553–35,570: <https://doi.org/10.1016/j.ijhydene.2022.08.170> (accessed December 3, 2022).

74 European Commission, "In focus: Renewable hydrogen to decarbonise the EU's energy system," November 15, 2022: https://ec.europa.eu/info/news/renewable-hydrogen-decarbonise-eus-energy-system-2022-nov-15_en (accessed December 3, 2022).

ENERGY SUPPLIED BY UKRAINE

Gas and electricity: At this writing, the Transgas pipeline system, which is fed by the Soyuz and Brotherhood pipelines that both transit Ukraine, continues to be operational. On October 10, 2022, flows from Ukraine to Slovakia were at 36 mcm.⁷⁵ Ukraine has halted transit through the southern Soyuz pipeline as it transits Russian-occupied Lkhansk.⁷⁶ Ukraine upgraded its gas transmission system for a reversal of flows.⁷⁷ Additionally, the Ukrainian and European electricity systems were connected shortly after the Russian invasion to facilitate commercial exchanges. Ukraine could receive a total of 80 TWh/year of gas via the Greek-Bulgarian interconnector and the new Polish-Slovak interconnector in addition to 660 TWh/year through the Poland-Ukraine pipelines, with a joint potential to provide half of Ukraine's annual gas consumption.⁷⁸ The International Energy Agency (IEA) estimates that the EU may have to export approximately 50 TWh of natural gas to Ukraine in 2023.⁷⁹

Renewables: Ukraine has a high potential for generating solar, biomass, and wind energy due to its large land mass and Black Sea coastline.

Prewar, renewables accounted for 12 percent of electricity generation.⁸⁰ The majority of all renewable generation is located in the regions Odesa, Zaporizhzhia, Mykolaiv, Kherson, and Dnipro; most halted operations due to the Russian occupation.⁸¹ Ukraine featured prominently in prewar EU hydrogen import plans as well as the European Hydrogen Backbone due to its renewables potential.⁸² According to an estimate made by the German Energy Agency before the war, Ukraine could produce 21 TWh/year of green hydrogen, equivalent to 12 percent of the EU's total hydrogen demand in 2030 as estimated by the EU Hydrogen Roadmap.⁸³ The large-diameter gas pipelines from Ukraine to Slovakia, the Czech Republic, and Germany would provide an inexpensive transport route for hydrogen exports. Ukrainian industry leaders are advocating for a green postwar reconstruction and stronger integration into the European energy system.⁸⁴ Hydrogen featured as an important field of investment in the postwar reconstruction plan presented by the Ukrainian government at the reconstruction conference in July 2022. Of the \$114 billion proposed for energy transition, \$40 billion are allocated to hydrogen infrastructure investment.⁸⁵

- 75 Reuters, "Russia-EU gas flows via Ukraine steady, eastward flows via Yamal at zero," October 10, 2022: <https://www.reuters.com/business/energy/russia-eu-gas-flows-via-ukraine-steady-eastward-flows-via-yamal-zero-2022-10-10/> (accessed December 3, 2022).
- 76 Ivo Mijnsen, "Drohender Transitstopp: Warum Russland so lange Gas durch die Ukraine lieferte" [Impending transit stop: Why Russia supplied gas through Ukraine for so long], *Handelsblatt*, October 1, 2022: <https://www.handelsblatt.com/politik/international/energiekrise-drohender-transitstopp-warum-russland-so-lange-gas-durch-die-ukraine-lieferte/28714378.html> (accessed December 3, 2022).
- 77 Aura Sabadus, "Ukraine and Moldova move to disarm Vladimir Putin's energy weapon," Atlantic Council, October 9, 2022: <https://www.atlanticcouncil.org/blogs/ukrainealert/ukraine-and-moldova-move-to-disarm-vladimir-putins-energy-weapon/> (accessed December 3, 2022).
- 78 Reuters, "Greece-Bulgaria pipeline starts operations to boost non-Russian gas flows," October 1, 2022: <https://www.reuters.com/business/energy/greece-bulgaria-pipeline-starts-operations-boost-non-russian-gas-flows-2022-10-01/>; Energate Messenger, "Romania sends more natural gas to Ukraine and Moldova," July 12, 2022: <https://www.energate-messenger.com/news/223855/romania-sends-more-natural-gas-to-ukraine-and-moldova/>; Ukraine Business News, "Poland and Slovakia have completed a gas pipeline important for Ukraine," August 26, 2022: <https://ubn.news/poland-and-slovakia-have-completed-a-gas-pipeline-important-for-ukraine/>; Enerdata, Ukraine Energy Information: <https://www.enerdata.net/estore/energy-market/ukraine/#:~:text=Starting%20in%202005%2C%20natural%20gas,%25%20over%202005%2D2021> (all accessed December 3, 2022).
- 79 International Energy Agency, "Never Too Early to Prepare for Next Winter" (see note 17).
- 80 US Department of Commerce's International Trade Administration, *Market Intelligence: Ukraine Renewable Energy Market*, April 26, 2021: <https://www.trade.gov/market-intelligence/ukraine-renewable-energy-market#:~:text=Ukraine%20has%20set%20a%20goal,over%2010MW%2C%20is%20comparatively%20small> (accessed December 3, 2022).
- 81 Ibid.; Erin X. Wong, "Russia's Invasion Knocked Out Almost All of Ukraine's Wind Power," Bloomberg, September 14, 2022: <https://www.bloomberg.com/news/articles/2022-09-14/russia-s-invasion-knocked-out-almost-all-of-ukraine-s-wind-power> (accessed December 3, 2022).
- 82 European Commission, "A hydrogen strategy for a climate-neutral Europe," COM(2020) 301, July 8, 2020: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0301&rid=1>; Gas for Climate, "Extending the European Hydrogen Backbone," April 2021: https://gasforclimate2050.eu/wp-content/uploads/2021/04/European-Hydrogen-Backbone_April-2021_V2.pdf (both accessed December 3, 2022).
- 83 Marco Rudolf et al., "Green Hydrogen in Ukraine: Taking Stock and Outlining Pathways," German Energy Agency (dena), June 2021: https://www.energypartnership-ukraine.org/fileadmin/user_upload/ukraine/media_elements/Green_Hydrogen_in_Ukraine.pdf; Fuel Cells and Hydrogen 2 Joint Undertaking, *Hydrogen roadmap Europe: a sustainable pathway for the European energy transition*, Publications Office of the European Union, 2019: <https://data.europa.eu/doi/10.2843/341510> (both accessed December 3, 2022).
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POLICY RECOMMENDATIONS

Maintain the integrity of the EU's energy market and cross-border flows

Germany has increasingly served as a transit hub for European gas as global LNG imports via Belgium and the Netherlands and gas from Norway pass through it to replace discontinued gas deliveries from Russia. Maintaining the integrity of the EU's energy market and cross-border flows is essential for the security of supply of Germany's eastern neighbors. A comparison by the International Monetary Fund of the economic impact of a Russian gas shutoff in a fragmented EU gas market scenario versus an integrated one indicates that Hungary, the Czech Republic, and Slovakia would be most affected due to their dependence on Russian gas.⁸⁶ In the fragmented market scenario, all three of these countries experience gas shortages. The integrated market scenario, however, results in sharing that would reduce output losses in Hungary, the Czech Republic, and Slovakia without losses in countries that provide gas – not surprising given how tightly integrated value chains are across countries in the region. Consequently, the security of gas flows is also an essential component in maintaining economic stability.

Protect Norway's pipeline infrastructure

Norway's pipeline infrastructure has become a critical artery for gas supplies to Germany as well as Central and Eastern Europe. Hybrid attacks against it could undermine the energy security of the entire region. Given the evidence of various risks to this pipeline infrastructure as reported in the press, its protection remains necessary.

Invest in north-south interconnections

The emergence of new interconnections and expanded LNG capacity in the Baltics and Poland indicates that north to south flows will play a more important role in supplying landlocked states in Central and Eastern Europe in the short and medium term. Simultaneously, new pipeline and LNG capacity in Southeastern Europe, coupled with improved interconnections, will also contribute to supply security in the region. Investment in gas infrastructure on the north-south axis in Central and Eastern Europe will enable countries to diversify gas supplies by contract-

ing higher volumes of global LNG delivered to various terminals and gas supplies via pipeline infrastructure from Azerbaijan and Algeria, among others.

Expand capacity for renewable energy

The expansion of renewable energy capacity has gained momentum thanks to the strong price signal resulting from the scarcity of fossil fuels. The EU has, for example, roughly doubled its imports of solar panels in the first half of 2022 compared to 2021.⁸⁷ Several governments have reduced administrative hurdles to building up renewables. Nevertheless, under the assumptions of the REPowerEU plan, additional renewable capacity, gas diversification, frontloaded energy savings, and electrification could only replace 1,550 TWh of natural gas exported by Russia by 2027. In comparison, by 2030, 900 GW of additional wind and solar capacity alone could enable the replacement of 1,700 TWh of natural gas.⁸⁸ A further difficulty is that Russian gas currently plays a central role in stabilizing electricity grids as a transition fuel that fills gaps when sun and wind are scarce. Thus, further building up renewable capacity and increasing smart grid capabilities needs to be a policy priority.

Gas-fired power plants could partially be substituted by the new nuclear power plants set to take up operations in Central and Eastern Europe in the second half of the 2030s. However, because little additional capacity can be built in the short term, current policy must focus on powering existing nuclear plants. Critically, many nuclear plants in the region as well as the new plants that are planned depend on Russian technology, making them subject to Russian weaponization.

Developing hydrogen capacity is central to replacing natural gas in industrial processes that require high temperatures. This is particularly relevant for Germany and other Central and Eastern European economies in which heavy industry is dominant and space for renewables is more limited. However, many questions remain regarding the large-scale production of green hydrogen, the establishment of a global hydrogen market, and the practicalities of the shift, including whether major natural gas infrastructure can be repurposed.

86 Gabriel Di Bella et al., "Natural Gas in Europe: The Potential Impact of Disruptions to Supply," *IMF Working Papers*, July 19, 2022: <https://www.imf.org/en/Publications/WP/Issues/2022/07/18/Natural-Gas-in-Europe-The-Potential-Impact-of-Disruptions-to-Supply-520934v> (accessed December 3, 2022).

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88 Kate Abnett, "European Commission analysing higher 45% renewable energy target for 2030," *Reuters*, April 20, 2022: <https://www.reuters.com/world/europe/european-commission-analysing-higher-45-renewable-energy-target-2030-2022-04-20/> (accessed December 3, 2022).

Prioritize security of supply

As Germany, Central and Eastern Europe, and the EU adapt to the massive shocks resulting from decoupling from Russia, energy security is of central importance. The coming two years may prove even more difficult than what we are currently experiencing, and a lot depends on weather conditions. Stiff competition on the global LNG market will render it more difficult and costly to secure supplies despite Europe having more capacity for regasification. Moreover, Russia's remaining gas deliveries could come to a halt, increasing conditions of scarcity. Depending on the conditions this winter, Europe may begin the coming refilling period with depleted gas storages. Together, demand reduction and the roll-out of renewables do constitute two controllable factors. Yet the expansion of traditional renewables such as wind and solar and potential future imports of green hydrogen can give rise to new dependencies and create different security risks. Consequently, the security of LNG supply and alternative pipeline infrastructure needs to remain a high priority for military and intelligence services.

Ensure EU cooperation

Overall, the current energy situation demands a united response from the entire EU. More than ever, maintaining the integrity of the energy market, building additional interconnectors among countries, and ensuring that gas flows where it is most needed are all crucial for minimizing the economic fallout of one of the biggest shocks the EU economy has ever experienced. Distributional questions are high on the agenda. Fiscal policy responses have been largely uncoordinated across the EU and need to take greater account of their overall consequences for the European energy market.

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