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Securing Alternative Gas Supplies and Addressing Critical Infrastructure Gaps in Europe

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INTRODUCTION

The Kremlin's weaponization of natural gas exports to Europe as winter approaches has shattered any illusions that Russia could be a reliable supplier. Europe urgently needs to import gas from other suppliers to heat its homes and power its industry. In doing so, Europe can build a more secure and sustainable energy system while cutting off funds for Moscow's war machine.

Painfully high energy prices are already having a serious impact on quality of life and economic development in Europe. New natural gas supplies and expanded interconnections to bring them to market will drive down the costs of energy and reduce the likelihood of social unrest over energy poverty.

The surest means to end Russia's energy leverage over Europe include accelerating the green transformation, curtailing gas demand, and boosting energy efficiency. However, the continent cannot implement these changes overnight. Gas remains instrumental in Europe's transition from dirtier fossil fuels, electrification of power-hungry sectors, and integration of large-scale intermittent renewables. Natural gas will likely remain a critical part of Europe's power baseload for at least the medium term.

Procuring an adequate supply of gas in the short to midterm is not at odds with the energy transition. Europe must cultivate alternative suppliers, build non-Russian-oriented import infrastructure, and accelerate decarbonization in tandem to boost energy security and affordability. Sourcing gas from non-Russian suppliers will sustain longer-term decarbonization efforts and prevent regression back to dirtier fuels amid the energy crunch.

To diversify their energy systems, European states must determine how much Russian gas can be replaced and from where, as well as what new infrastruc-

The Global Energy Center promotes energy security by working alongside government, industry, civil society, and public stakeholders to devise pragmatic solutions to the geopolitical, sustainability, and economic challenges of the changing global energy landscape.

ture will be necessary to enable new imports. The European Union (EU) needs to clearly articulate the anticipated natural gas supply gap to identify investment opportunities for the relevant market players. This issue brief will examine potential sources of alternative gas supplies, the infrastructure required to bring new supplies to European consumers, and the financial and regulatory mechanisms needed to support diversification efforts.

This brief is the first in a series on reducing Europe's reliance on Russian gas. Two subsequent briefs will address how decarbonization and the integration of Ukraine into the European energy system can strengthen European energy security. The final report, *Reducing Europe's Reliance on Russian Gas: Key Strategies under Four Scenarios*, will unify this analysis into separate possible outcomes of the war in Ukraine.

EUROPE'S PIVOT TO ALTERNATIVE GAS SUPPLIERS

In 2021, Russia supplied the European Union with 155 billion cubic meters (bcm) of gas, 40 percent of the bloc's annual consumption.¹ Total Russian gas imports between January and August 2022 fell by 39 bcm year-on-year, and by the fall of 2022, the EU imported only 7.5 percent of its gas from Russia.² This year, the EU has more than compensated for the loss of Russian gas, with overall imports up 12 bcm in the first half of 2022.³ As Moscow's energy warfare grows increasingly brazen, however, Europe must prepare for a winter without Russian gas and guard against kinetic or cyber assaults on its critical infrastructure.

The European Commission and Parliament have done remarkably well in driving efforts to attain alternative sup-



A liquefied natural gas tanker sails along Nakhodka Bay near a Russian port city in June 2022. (REUTERS/Tatiana Meel)

- 1 Dina Kartit, "Factbox: Europe's Alternatives If Russia Shuts Off Gas Supply," Reuters, October 20, 2022, <https://www.reuters.com/business/energy/europes-alternatives-if-russia-shuts-off-gas-supply-2022-10-20/>.
- 2 "New Reports Highlight 2nd Quarter Impact of Gas Supply Cuts," European Commission, October 17, 2022, https://ec.europa.eu/info/news/drop-gas-consumption-and-increase-renewable-energy-generation-q2-2022-2022-oct-14_en; Annabelle Timsit and Emily Rauhala, "The E.U. Is Preparing for Blackouts This Winter, amid an Energy Crisis," *Washington Post*, October 5, 2022, <https://www.washingtonpost.com/world/2022/10/05/europe-blackouts-energy-crisis-ukraine-russia/>.
- 3 Stuart Elliott, "EU Gas Consumption Plunges in Q2 on Mild Weather, High Prices: EC," S&P Global, October 17, 2022, <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/101722-eu-gas-consumption-plunges-in-q2-on-mild-weather-high-prices-ec>.

plies, save energy, and fill gas storage. Subsequent winters, however, could be even more challenging, as Europe will enter the spring filling season with low inventory and as resurgent demand in Asia tightens the global liquified natural gas (LNG) market. Europe must appreciate that the supply crunch will be a multi-year phenomenon. To bring new volumes to market as soon as possible, European buyers will need to secure additional long-term contracts. This would ensure that European economic growth is not stifled by the energy supply crunch over the next several decades and mitigate risks of returning to Russian exports. Transatlantic cooperation and partnerships between governments and the private sector will be critical for meeting European energy security objectives.

The European Union must also ensure gas is affordable for consumers. Unaffordable energy could fan the flames of social unrest and derail Western support for Ukraine. It could also empower populist forces resistant to decarbonization, fatally undermining climate objectives.

Member states are designing various support schemes to lower consumer costs. The European Union is exploring joint purchasing arrangements to maximize leverage in negotiating prices, but such restructuring should seek to preserve market liberalization. Ultimately, policymakers must understand that Europe's gas crunch is a matter of supply. Ensuring that producers are incentivized to invest in bringing new supply to market is a prerequisite for European consumers to be relieved of high prices.

The European Union has explored placing a limit on how much importers can pay for gas. The European Commission's proposal for an emergency ceiling at the high price of €275 per megawatt-hour and additional stipulations for triggering the price cap may do little to distort market forces. Under the proposal, even the skyrocketing prices from August 2022 would have been insufficient for enforcing the pricing mechanism. While this tool will guard the European consumers from catastrophic pricing scenarios, its impact on European energy prices is superficial. This is a positive outcome for European markets, as a lower price cap could have encouraged tankers to reroute toward more lucrative markets. Additionally, below-market retail prices would discourage energy conservation. The feasibility of these unprecedented emergency measures remains

contentious and will require EU member state approval before coming into force. EU policymakers should find more effective ways of lowering energy prices while preserving market signals, such as reconsidering the bloc's power market design, in which the most expensive generating source sets the price—in this case, gas. These efforts are already under way in cooperation with the EU's Agency for the Cooperation of Energy Regulators.

While market restructuring could be months away, sufficient opportunity in the near term exists to cultivate alternative suppliers. What follows is a list of Europe's options to do so.

Major Alternative Suppliers

NORWAY

Norway has surpassed Russia as the European Union's number one gas supplier. Its pipeline exports to the bloc totaled 84 bcm between January and September 2022, up 6 bcm year-on-year.⁴ The recently completed Baltic Pipe, which can deliver 10 bcm per annum (bcm/a) to Poland, adds to Norway's capacity to reliably supply Europe. Norway is forecast to export 90 bcm to the European Union and 36 bcm to the United Kingdom in 2022,⁵ 9 bcm more than in 2021.⁶

Norwegian policymakers have warned that despite the new Baltic Pipe, Norway's pipeline exports are at capacity.⁷ However, the country's LNG export capacity has the potential to grow as Hammerfest LNG recovers from a fire and returns to operation in the new year. Norway has proven natural gas reserves of 1.45 trillion cubic meters (tcm),⁸ and Oslo plans to keep producing at elevated levels through 2030.⁹ Increasing utilization of Norway's 7 bcm/a LNG capacity would increase export flexibility beyond the current European crisis.

Maintaining Norwegian production will depend on price signals. Recent EU invective over Norwegian "price gouging," if coupled with a price cap lower than the Commission's proposed limit, could weaken Norwegian producers' incentives to invest in LNG to keep gas flowing to its neighbors. The two sides will likely find a compromise over pricing, but it is important for Norway and the European

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- 4 Stuart Elliott, "Norwegian Gas Supplies to Europe, UK Drop in September on Heavy Maintenance," S&P Global, October 4, 2022, <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/100422-norwegian-gas-supplies-to-europe-uk-drop-in-september-on-heavy-maintenance>.
 - 5 Lisa Jucca, "Norway Gas Lifeline for Europe Is the Smart Move," Reuters, September 9, 2022, <https://www.reuters.com/breakingviews/norway-gas-lifeline-europe-is-smart-move-2022-09-09/>.
 - 6 Carole Nakhle, "Will Norway Turn the Energy Crisis into Opportunity?" Geopolitical Intelligence Services AG, August 2, 2022, <https://www.gisreportsonline.com/r/norway-energy-crisis/>.
 - 7 Stine Jacobsen, "Baltic Pipe Won't Increase Norway's Gas Exports in Maxed Out System, PM Says," Reuters, March 9, 2022, <https://www.reuters.com/business/energy/baltic-pipe-wont-increase-norways-gas-exports-maxed-out-system-pm-says-2022-03-09/>.
 - 8 "Norway: Executive Summary," US Energy Information Administration, last updated June 30, 2022, <https://www.eia.gov/international/analysis/country/NOR>.
 - 9 Nora Buli and Nerijus Adomaitis, "Exclusive: Norway Eyes High Gas Output until 2030, Says Energy Minister," Reuters, August 23, 2022, <https://www.reuters.com/business/energy/exclusive-norway-eyes-high-gas-output-until-2030-says-energy-minister-2022-08-23/>.

Union to deconflict pricing issues with the United Kingdom, which imports gas from Norway via pipeline, some of which is exported beyond Britain to nearby EU member states.

Norway has stepped in to provide record volumes of gas, and will be the European Union's number one supplier of piped gas for the foreseeable future. Norway's ability to expand production and exports even further, however, is limited. While Norway can provide a reliable base of EU gas supply along ready-made infrastructure, Europe needs LNG to secure adequate gas supplies.

THE UNITED STATES

The United States, the world's largest natural gas producer, is now Europe's second-largest supplier after Norway.¹⁰ In March 2022, the United States signed a memorandum of understanding (MoU) with the European Commission pledging to increase LNG exports to Europe in 2022 by at least 15 bcma.¹¹ Market forces have brought the transatlantic LNG trade far past that initial target. Through the first half of 2022, US volumes to Europe increased to 39 bcm, representing 68 percent of total US LNG exports, up from 35 percent in 2021.¹²

Three major factors made it possible for the United States to boost exports to Europe. High gas prices, lower demand in East Asia, and US suppliers' flexible destination provisions enabled US cargo originally destined for South Korea, China, and Japan to be redirected to Europe.¹³ Future winters, however, will see a much tighter market. Beijing has begun restricting Chinese LNG traders from reselling cargoes to ensure domestic supply,¹⁴ signaling China may put strict COVID lockdowns behind it and resume economic growth.

To further increase LNG flows to Europe, Washington must address regulatory and supply chain bottlenecks constraining export capacity.¹⁵ US export capacity stands at nearly

145 bcma and is on track to increase to over 200 bcma by 2025.¹⁶ The Gulf Coast accounts for 92 percent of that, but increased East Coast capacity can limit the impact of hurricane-related disruptions and bring gas from the country's cheapest and highest-volume producing Utica and Marcellus shale patches more easily to the Atlantic.

Washington also needs to streamline permitting for LNG projects to ease investment uncertainty and accelerate project completion. Since February 2022, binding long-term agreements and preliminary deals have been tied to 45.5 bcma and 17.9 bcma in new LNG export capacity, respectively. However, construction alone for LNG terminals takes three to five years on average.¹⁷ Permitting reform could hasten Europe's import diversification. While Senator Joe Manchin's efforts to overhaul the process initially failed, there could be bipartisan support around common ground solutions to streamline environmental reviews and public engagement while prioritizing environmental integrity and citizens' feedback. Technical solutions can also be deployed to expedite project completion. Some developers are utilizing innovative approaches such as building sections of plants offsite to accelerate the timeline.¹⁸ Permitting reform and technical innovations could cut the time it takes to approve and build projects by half, from around ten years to five.

Washington must consider additional complications from increased LNG exports to Europe. It could also present a wrinkle to decarbonization objectives. US suppliers and EU importers must ensure that long-term contracts—necessary to incentivize gas investments—can be reconciled with long-term climate ambitions, including through provisions on destination flexibility, escalating emissions standards, and future hydrogen and biomethane integration. Policymakers on both sides of the Atlantic must make clear the role of gas in the green transformation as a critical transition fuel for coal-, oil-, and peat-dependent regions in Europe, North America, and the developing world.

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- 10 Anna Shiryayevskaya, "For the First Time, US Is Sending More Gas to Europe than Russia," *Bloomberg*, July 1, 2022, <https://www.bloomberg.com/news/articles/2022-07-01/us-lng-supplies-to-europe-overtake-russian-gas-iaea-says?sref=a9fBmPFG>.
- 11 "Joint Statement between the European Commission and the United States on European Energy Security," European Commission, press release, March 25, 2022, https://ec.europa.eu/commission/presscorner/detail/en/statement_22_2041.
- 12 Jarrett Renshaw and Scott Disavino, "Analysis: U.S. LNG Exports to Europe on Track to Surpass Biden Promise," Reuters, July 26, 2022, <https://www.reuters.com/business/energy/us-lng-exports-europe-track-surpass-biden-promise-2022-07-26/>.
- 13 "U.S. Natural Gas Exports and Re-exports by Country," US Energy Information Administration, last updated October 31, 2022, https://www.eia.gov/dnav/ng/ng_move_expc_s1_a.htm; Yonhap, "S. Korea to Divert Gas Supplies to Europe over Ukraine Crisis," *Korea Herald*, April 28, 2022, <https://www.koreaherald.com/view.php?ud=20220428000342>; Chen Aizhu, Emily Chow, and Marwa Rashad, "China to Slash Winter Gas Purchases Easing Europe's Supply Pressures," Reuters, October 12, 2022, <https://www.reuters.com/business/energy/china-slash-winter-gas-purchases-easing-europes-supply-pressures-2022-10-12/>; "Italy's Draghi Thanks Japan for Redirecting Gas Cargoes to Europe," Reuters, May 4, 2022, <https://www.reuters.com/business/energy/italys-draghi-thanks-japan-redirecting-gas-cargoes-europe-2022-05-04/>.
- 14 "China Halts LNG Sales to Foreign Buyers to Ensure Own Supply – Bloomberg News," Reuters, October 17, 2022, <https://www.reuters.com/article/china-lng/china-halts-lng-sales-to-foreign-buyers-to-ensure-own-supply-bloomberg-news-idINL4N311UUM>.
- 15 Andy Uhler, "Europe Would Love to Stockpile U.S. Natural Gas. Shipping Bottlenecks Stand in the Way," *Marketplace*, October 3, 2022, <https://www.marketplace.org/2022/10/03/europe-would-love-to-stockpile-u-s-natural-gas-shipping-bottlenecks-stand-in-the-way/>.
- 16 Victoria Zaretskaya and James Easton, "U.S. LNG Export Capacity to Grow as Three Additional Projects Begin Construction," US Energy Information Administration, September 6, 2022, <https://www.eia.gov/todayinenergy/detail.php?id=53719>.
- 17 Robert Rozansky, *How Long Does It Take to Build an LNG Export Terminal in the United States?* Global Energy Monitor, April 2022, <https://globalenergymonitor.org/wp-content/uploads/2022/04/GEM-Briefing-LNG-Terminal-Development-Timelines.pdf>.
- 18 Sergio Chapa, "Race Is On to Be the Next Big US Supplier of LNG to Fuel-Starved Europe," *Bloomberg*, November 15, 2022, <https://www.bloomberg.com/news/articles/2022-11-15/new-lng-supplies-from-us-to-europe-will-take-two-more-years>.

EU imports of US LNG will provide a flexible, reliable, and growing bulwark for European energy security as the continent's energy diversification gathers pace. While the enduring transatlantic alliance lends to the United States' reliability as a supplier, Europeans must note it will take some time before US exports mature to their full potential. Moreover, market forces will determine where US private companies ultimately ship gas. In any case, new LNG infrastructure on either side of the Atlantic will be required to maximize US-EU gas commerce.

QATAR

Qatar, one of the world's top producers of natural gas, is another important partner for European energy import diversification. Qatar produces 177 bcm of natural gas per year, and its current export capacity is more than 106 bcma. In 2021, Qatar exported more LNG than the United States,¹⁹ and is increasing production and export volumes, including by expanding its North Field, the world's largest LNG project.²⁰

Qatari exports are overwhelmingly eastward-oriented; nearly 90 percent of Qatar's LNG supplied Indo-Pacific countries in 2020.²¹ But the country is quickly growing its LNG exports to Europe and accounted for a quarter of EU LNG imports in 2021, only marginally behind the United States.²²

Qatar's export volume to Europe could grow even further. Since February 2022, multiple European states have entered talks with Doha to secure supply, notably Germany and landlocked Slovakia and Czechia.²³ Qatar is an attractive partner due to its centralized, state-controlled industry, which can be directed toward Doha's geostrategic aims.

A limiting factor for this partnership is Qatar's LNG commitments to more-established customers; Doha insists it can redirect only 10 to 15 percent of current production.²⁴ The country has pledged to provide Europe a larger share of new production, but insists on doing so under fixed-destination, long-term contracts, which Europeans worry could lead to carbon lock-in.²⁵

Ultimately, Qatar's enormous capacity and state-directed industry will make it a crucial supplier to Europe. However, Europeans must be aware of the financial risk posed by inflexible long-term contracts and from strong competition in the Indo-Pacific for Qatari gas.

Additional Key Suppliers

ALGERIA

Algeria is typically the European Union's third-largest source of external gas supply, after Russia and Norway. It delivered 55.2 bcm of gas to the continent in 2021, mostly via pipeline.²⁶ Algeria can transport 30.2 bcma to Italy, and 10 bcma to Spain.²⁷ A second, 13.5-bcma Spanish-bound pipeline transited Morocco, but was suspended amid deteriorating relations in the Maghreb. Algeria then committed to increasing supply to Italy by 4 bcma, becoming Italy's number one gas supplier.²⁸ Given Iberia's gas transit bottleneck and vast LNG import capacity, the reorientation puts more gas onto the greater European market while having a negated effect on Spain and Portugal.

With 35 bcma available, Algeria has the fifth-largest LNG capacity in the world.²⁹ Whether Algeria will increase LNG exports to Europe remains to be seen. Overall production in Algeria has expanded, but the country must balance exports with growing domestic consumption. Between

19 Martin Armstrong, "The Biggest Liquefied Natural Gas Exporters," Statista, July 26, 2022, <https://www.statista.com/chart/27839/biggest-liquefied-natural-gas-exporters/>.

20 Ron Bousso, Sabrina Valle, and Marwa Rashad, "Eni to Join Exxon, Total, Shell, Conoco in Qatar's Mega-LNG Expansion – Sources," Reuters, June 8, 2022, <https://www.reuters.com/business/energy/eni-join-exxon-total-shell-conoco-qatars-mega-ling-expansion-sources-2022-06-08/>.

21 "Natural Gas, Liquefied, in Qatar," Observatory of Economic Complexity, n.d., [https://oec.world/en/profile/bilateral-product/natural-gas-liquefied/reporter/qat?redirect=true#:~:text=At%20the%20same%20year%2C%20Natural,and%20Pakistan%20\(%241.21B\)](https://oec.world/en/profile/bilateral-product/natural-gas-liquefied/reporter/qat?redirect=true#:~:text=At%20the%20same%20year%2C%20Natural,and%20Pakistan%20(%241.21B),), accessed November 16, 2022.

22 Pier Paolo Raimondi, *A Scramble for Gas: Qatari LNG and EU Diversification Plans*, Istituto Affari Internazionali, April 22, 2022, <https://www.iai.it/en/pubblicazioni/scramble-gas-qatari-ling-and-eu-diversification-plans>.

23 Annmarie Horden, "Qatar Says Talks with Germany on LNG Contracts Ongoing," *Bloomberg*, September 21, 2022, <https://www.bloomberg.com/news/articles/2022-09-21/qatar-says-talks-with-germany-on-ling-contracts-ongoing?sref=a9fBmPFG>.

24 Andrew England and Tom Wilson, "Europe at Risk of 'Much Worse' Energy Crisis Next Year, Says Qatar," *Financial Times*, October 18, 2022, <https://www.ft.com/content/9661190-3c09-48b7-8ded-7b2651590f94>.

25 Stephen Stapczynski and Verity Ratcliffe, "Qatar to Demand EU Sign Long-Term LNG Deals if It Wants More Gas," *Bloomberg*, June 23, 2022, <https://www.bloomberg.com/news/articles/2022-06-23/qatar-to-demand-eu-sign-long-term-ling-deals-if-it-wants-more-gas?sref=a9fBmPFG>.

26 Intissar Fakir, "Given Capacity Constraints, Algeria Is No Quick Fix for Europe's Russian Gas Concerns," Middle East Institute, March 8, 2022, <https://www.mei.edu/publications/given-capacity-constraints-algeria-no-quick-fix-europes-russian-gas-concerns#>.

27 Stuart Elliott, "Algeria's Medgaz Gas Link to Spain to Operate at Expanded Capacity from Q4," S&P Global, July 13, 2021, <https://www.spglobal.com/commodityinsights/ko/market-insights/latest-news/natural-gas/071321-algerias-medgaz-gas-link-to-spain-to-operate-at-expanded-capacity-from-q4>.

28 Marwa Rashad, Hamid Ould Ahmed, and Lamine Chikhi, "Algeria to End Gas Supplied to Morocco; Supply Spain Directly – Sources," Reuters, October 25, 2021, <https://www.reuters.com/world/africa/algeria-end-gas-supplies-morocco-supply-spain-directly-sources-2021-10-25/>; "Algeria Becomes Italy's Biggest Gas Supplier in New €4Bn Deal to Reduce Russian Dependency," Euronews, July 18, 2022, <https://www.euronews.com/2022/07/18/italys-draghi-visits-algeria-for-gas-talks-while-political-crisis-continues-at-home>.

29 "Algeria to Modernise Skikda LNG Facilities to Allow Larger Vessels and Exports to Asia and South America," *LNG Journal*, February 21, 2022, <https://lngjournal.com/index.php/latest-news-mainmenu-47/item/105085-algeria-to-modernise-skikda-ling-facilities-to-allow-larger-vessels-and-exports-to-asia-and-south-america>.

2018 and 2028, domestic demand is projected to increase 50 percent, potentially reducing exports by 20 bcm. Algerian state producer Sonatrach has signaled it will prioritize domestic consumers, which could make it more difficult to attract foreign investment.³⁰ While Algeria will be the primary baseload supplier for southwest Europe, to maintain the country's exports, investments must be made in its abundant solar and wind resources to temper domestic gas demand, as well as in Algerian shale production—the country's reserves may total 20,000 bcm.³¹

AZERI AND CASPIAN GAS

In July 2022, the European Commission signed a historic MoU with Azerbaijan to double the volume of natural gas exported along the Southern Gas Corridor. After delivering 8 bcm to the European Union in 2021, Azeri exports are expected to total 12 bcm in 2022 before targeting 20 bcm by 2027 under the parameters of the MoU.³²

The complex route between Azerbaijan and Europe presents logistical challenges to realizing this objective. While the 10 bcma Southern Gas Corridor was designed to be expandable, the route consists of three separate-but-interlinked pipelines with different capacity potentials. While the Anatolian and Adriatic branches can be expanded by 10 and 16 bcma, respectively, there are doubts the South Caucasus branch can be expanded by more than 8 bcma.³³ Moreover, 20 bcma of exports from Azerbaijan alone may not be realistic; estimates suggest that by 2027, Azerbaijan will be able to export only 15-16 bcma.³⁴

This deficit can be bridged in two ways. First, developing renewables in Azerbaijan—an EU commitment under the MoU—could reduce domestic consumption. Second, Azerbaijan can receive gas from Central Asia, namely Turkmenistan. A reclusive republic with the world's fourth-largest gas

reserves, Turkmenistan has shown increasing receptiveness for supplying Europe.³⁵ The Caspian gas field Dostlug, whose 100 bcm reserves are split 70:30 between Turkmenistan and Azerbaijan, can add to Southern Gas Corridor supply. Baku and Ashgabat have agreed to deepen cooperation in developing the field.³⁶

While overall volumes will be relatively small, Azerbaijan can be a significant supplier and transit state. To do so, pipeline and clean energy investments are needed to bring new gas to Europe.

EUROPEAN COUNTRIES

Europe will continue to rely on natural gas imports for heating and industry in the short to midterm, but its minor reserves can alleviate Europe's gas deficit at the margins.

The Netherlands' Groningen field, which supplied 27 bcma as recently as 2016,³⁷ is now limited to 2.8 bcma.³⁸ The field is 80 percent depleted, and production-induced earthquakes have compelled the Dutch government to proceed with its phase-out by 2024.³⁹ However, with 450 bcm in remaining reserves, Groningen can still provide an emergency lifeline.

Denmark, previously committed to peak gas production at 3.2 bcm by 2027, signaled in April 2022 that it would raise output 25 percent.⁴⁰ Denmark's consumption is decreasing rapidly, down 56 percent since 2010, making a larger share of production available for export.⁴¹

Britain can also be a consequential gas node for Europe. In the first half of 2022, UK production was up 26 percent year-on-year, as new projects brought an additional 3.5 bcm to market.⁴² British and Norwegian North Sea gas flows through the island to the European Union through

30 Mostefo Ouki, *Algerian Gas in Transition: Domestic Transformation and Changing Gas Export Potential*, The Oxford Institute for Energy Studies, October 2019, <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2019/10/Algerian-Gas-in-Transition-NG-151.pdf>.

31 *Technically Recoverable Shale Oil and Shale Gas Resources: Algeria*, US Energy Information Administration, September 2015, https://www.eia.gov/analysis/studies/worldshalegas/pdf/Algeria_2013.pdf.

32 "EU and Azerbaijan Enhance Bilateral Relations, Including Energy Cooperation," European Commission, press release, July 18, 2022, https://ec.europa.eu/commission/presscorner/detail/en/IP_22_4550.

33 Daniel D. Stein, "TAP and the Southern Gas Corridor: Challenges to Expansion," *EnergySource*, July 26, 2021, <https://www.atlanticcouncil.org/blogs/energysource/tap-and-the-southern-gas-corridor-challenges-to-expansion/>.

34 Murad Muradov, "Europe Turns to Azerbaijan for Gas: How Big Could This Be?" *Rusi*, October 5, 2022, <https://www.rusi.org/explore-our-research/publications/commentary/europe-turns-azerbaijan-gas-how-big-could-be>.

35 "Turkmenistan: Form an Orderly Pipeline," *Eurasianet*, November 1, 2022, <https://eurasianet.org/turkmenistan-form-an-orderly-pipeline>.

36 Orkhan Jalilov, "Azerbaijan, Turkmenistan Agree to Deepen Dostlug Offshore Field," *Caspian News*, July 30, 2021, <https://caspiannews.com/news-detail/azerbaijan-turkmenistan-agree-to-deepen-cooperation-on-dostlug-offshore-field-2021-7-30-0/>.

37 "Dutch Limit Groningen Gas Production despite Energy Crisis," *Reuters*, September 26, 2022, <https://www.reuters.com/business/energy/dutch-limit-groningen-gas-production-28-bcm-2022-09-26/>.

38 "Dutch Government Sets 2015/2016 Groningen Gas Production at 27 Bcm," *Reuters*, December 18, 2015, <https://www.reuters.com/article/netherlands-gas-groningen/dutch-government-sets-2015-2016-groningen-gas-production-at-27-bcm-idUSA5N13F00E20151218>.

39 Therese Robinson, "Netherlands May Double Groningen Natural Gas Output to Meet Increasing Demand," *Natural Gas Intel*, January 11, 2022, <https://www.naturalgasintel.com/netherlands-may-double-groningen-natural-gas-output-to-meet-increasing-demand/>.

40 "North Sea Gas Production Could Increase by 25%, Denmark Says," *Reuters*, April 19, 2022, <https://www.reuters.com/article/denmark-gas-russia-idAFC7N2R0020>.

41 N. Sonnichsen, "Natural Gas Consumption in Denmark from 2005 to 2021," *Statista*, July 22, 2022, <https://www.statista.com/statistics/703645/natural-gas-consumption-denmark/>.

42 "UK Producers Ramping Up North Sea Gas Production," *Offshore Magazine*, August 24, 2022, <https://www.offshore-mag.com/regional-reports/north-sea-europe/article/14281768/uk-producers-ramping-up-north-sea-gas-production>.

bidirectional interconnectors with Belgium and the Netherlands and a one-way pipeline to Ireland. With 25.5 bcma of capacity between Britain and continental Europe, the United Kingdom is an important partner for ensuring energy security and economic opportunity.

Cyprus's 200 bcm of offshore gas discoveries could also boost European gas supplies.⁴³ These reserves can be developed in cooperation with neighbors Israel and Egypt, whose gas potential will be further elaborated below. Given Cyprus consumes no gas, the newly discovered reserves would be slated entirely for export.

Romania launched a 1 bcma offshore project, but war-related risks preclude insurers from underwriting investment in the Black Sea.⁴⁴ Additionally, Romania faces the tough task of balancing its tax environment with national fiscal priorities to attract investors. Romania rolled back some of the prohibitive tax on additional gas income in May; further legislative changes may be needed to spur future developments.

Further gas developments to tap EU and UK shale reserves of 14 trillion cubic meters are unlikely due to high costs and public opposition to hydraulic fracturing.⁴⁵ Britain's attempt to legalize fracking contributed to the fall of its government in October 2022, serving as a stark warning to EU neighbors that social license and engagement with the public are critical for successful project development.

Ultimately, Europe's indigenous reserves can provide relief at the margins. However, policymakers must be realistic as to the political, economic, and technical feasibility of European gas development.

EGYPT AND ISRAEL

Egypt exported 8.9 bcm of LNG in 2021—mostly to Asia—only half of the country's 16.5 bcma export capacity.⁴⁶ An MoU among the European Commission, Egypt, and Israel proposes expanding Egyptian LNG output with Israeli gas. Israel currently produces 20 bcma, and is expected to double output by 2024.⁴⁷ Exports to Egypt account for 27 percent of Israel's gas production, supported by the Arab Gas Pipeline, which can supply 10.3 bcma to Egypt via Jordan.⁴⁸ In addition to a 5 bcma subsea pipeline and a proposed project to add another 3 to 5 bcma between the two countries, Israeli-Egyptian cooperation can ensure maximal utilization of Egypt's Mediterranean LNG facilities as the country contends with rising gas demand, providing southeast Europe with a reliable LNG supply.⁴⁹

OTHER GULF STATES

While small compared with neighboring Qatar, Oman and the United Arab Emirates (UAE) are significant LNG producers. Oman is the Gulf's second-largest gas exporter, producing 15.2 bcm in 2022.⁵⁰ However, Oman's future LNG expansion includes a project to pipe Iranian gas to Omani export facilities, which could create sanction compliance issues.⁵¹

The United Arab Emirates could provide less politically risky supply. The country currently has an export capacity of 8 bcma, slated to nearly triple when the 13.24 bcma Fujairah project comes online in 2027.⁵² In addition, a US\$20 billion push to become self-sufficient in gas through the Dalma gas field, operational by 2025, will free more Emirati gas for export, as will the completion of the Barakah Nuclear Energy Plant by reducing domestic gas needs.⁵³

43 Juliette Portala and Tassilo Hummel, "TotalEnergies, Eni Announce Major Cyprus Gas Find," Reuters, August 22, 2022, <https://www.reuters.com/business/energy/totalenergies-eni-announce-major-cyprus-gas-find-2022-08-22/#:~:text=MIJ%20on%20Monday%20announced%20a,N>.

44 Luiza Ilie, "Black Sea Gas Platform Launched off Romania despite War Risks," Reuters, June 28, 2022, <https://www.reuters.com/business/energy/black-sea-gas-platform-launched-off-romania-despite-war-risks-2022-06-28/>.

45 Gregor Erbach, "Shale Gas and EU Energy Security," European Parliamentary Research Service, December 2014, [https://www.europarl.europa.eu/RegData/etudes/BRIE/2014/542167/EPRS_BRI\(2014\)542167_REV1_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2014/542167/EPRS_BRI(2014)542167_REV1_EN.pdf) (pre-Brexit numbers).

46 Sarah El Safty and Ari Rabinovitch, "EU, Israel and Egypt Sign Deal to Boost East Med Gas Exports to Europe," Reuters, June 15, 2022, <https://www.reuters.com/business/energy/eu-israel-egypt-sign-deal-boost-east-med-gas-exports-europe-2022-06-15/>; Sherik Tarek, "Egypt Dims Light to Maximize LNG Revenue," *The Africa Report*, September 23, 2022, <https://www.theafricareport.com/243754/egypt-dims-lights-to-maximise-Ing-revenue/>.

47 Ari Rabinovitch, "Israel Ramping Up Gas Output, Looks to Help Supply Europe," Reuters, May 17, 2022, <https://www.reuters.com/business/energy/israel-ramping-up-gas-output-looks-help-supply-europe-2022-05-16/>.

48 "Arab Gas Pipeline (AGP), Jordan Syria, Lebanon," Hydrocarbons Technology, n.d., <https://www.hydrocarbons-technology.com/projects/arab-gas-pipeline-agp/>, accessed November 16, 2022.

49 Ron Bousso and Ari Rabinovitch, "Exclusive: Israel Considering New Pipeline to Boost Gas Exports to Egypt," Reuters, October 21, 2021, <https://www.reuters.com/business/energy/exclusive-israel-considering-new-pipeline-boost-gas-exports-egypt-2021-10-21/>.

50 Fareed Rahman, "Oman's LNG Output Surges to a Record 10.6 Million Tonnes in 2021," *The National News*, June 12, 2022, <https://www.thenationalnews.com/business/energy/2022/06/12/omans-Ing-output-surges-to-a-record-106-million-tonnes-in-2021/>.

51 Therese Robinson, "Oman Aiming to Boost LNG Output as Asian Sales Grow," *Natural Gas Intelligence*, August 16, 2022, <https://www.naturalgasintel.com/oman-aiming-to-boost-Ing-output-as-asian-sales-grow/>.

52 Anthony Di Paola and Verity Ratcliffe, "UAE to More than Double LNG Export Capacity with Fujairah Plant," *Bloomberg*, May 17, 2022, <https://www.bloomberg.com/news/articles/2022-05-17/uae-to-more-than-double-Ing-export-capacity-with-fujairah-plant?sref=a9fBmPFG>.

53 Anthony Di Paola, "UAE Pushes ahead with \$20 Billion Gas Projects to Boost Exports," *Bloomberg*, November 17, 2022, <https://www.bloomberg.com/news/articles/2021-11-17/uae-pushes-ahead-with-20-billion-gas-project-to-boost-exports?sref=a9fBmPFG>.

Both the UAE and Oman can provide small but growing volumes of LNG to international markets, lowering global spot prices. Whether that supply goes to Europe is another question.

SUB-SAHARAN AFRICA

Sub-Saharan Africa can be another important supplier for Europe. The International Energy Agency notes that 5 tcm of undeveloped reserves exist in Africa, and the continent could provide 30 bcma to Europe by 2030.⁵⁴

Angola, Cameroon, Nigeria, and Equatorial Guinea have LNG capacity totaling 46.6 bcma; an additional 35.9 bcma is expected to come online in Nigeria, Mozambique, Senegal, and Mauritania by 2025.⁵⁵ Moreover, Nigeria and Niger signed an MoU with Algeria for a trans-Saharan pipeline that could transit 30 bcma to Europe.⁵⁶ Additionally, Italy has agreed with Angola to explore joint ventures,⁵⁷ and in November 2022, Mozambique became Africa's newest LNG exporter as the first shipment from its floating terminal set sail for Europe.⁵⁸

Developing Africa's gas potential requires overcoming formidable challenges. Infrastructure is underdeveloped, and natural disaster preparedness is low, as exemplified by Nigeria LNG's flooding-induced force majeure in October 2022.⁵⁹ Security also requires attention. EU officials believe that Nigeria, which provided 14 percent of EU LNG in 2021, could quickly double exports to the bloc by better securing its facilities, which are operating at only half capacity.⁶⁰ Likewise, the original Mozambique LNG project has long been halted by an Islamic State of Iraq and al-Sham-linked insurgency.⁶¹

Africa will be an important and growing supplier for Europe as new projects quickly come online. Ensuring support for African states to secure export infrastructure and reconcile growing energy demand is crucial for cementing an EU-Africa gas partnership.

MARGINAL AND INDIRECT CONTRIBUTORS AFFECTING THE GLOBAL LNG MARKET

MARGINAL SUPPLIERS

Some noteworthy smaller suppliers that could export to Europe include Iraqi Kurdistan, Libya, and Trinidad and Tobago. Iraqi Kurdistan has 425 bcm of reserves, but internal political infighting has forestalled extending pipelines into the Turkish gas infrastructure.⁶² Improved stability could help plug the region into trans-Anatolian transit networks.

Libya can export 11 bcma via Greenstream, and, in response to militia threats, the Italian Navy has increased patrols of the pipeline.⁶³ Despite rampant political instability, Libyan natural gas fields are largely offshore and reliable, although attracting investments into the country will be difficult. In October 2022, Libya agreed to develop a new corridor to transport Nigerian gas to Europe, but securing a trans-Libyan route will be challenging.⁶⁴

Trinidad and Tobago's Atlantic LNG has doubled volumes to Europe, which now comprise 40 percent of Trinidadian gas exports. Production has declined as old wells deplete, but new projects are coming online, which could allow the country to maximize its 20.4 bcma capacity, of which it currently utilizes half.⁶⁵ Trinidad and Tobago could provide significant new supply to Europe as it reestablishes production paired with existing excess capacity.

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

55 Stuart Elliott, "Sub-Saharan Africa Could Green-Light 74 Mil Mt/Year LNG Capacity by 2030: Acting," S&P Global, February 9, 2021, <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/natural-gas/020921-sub-saharan-africa-could-green-light-74-mil-mt-year-lng-capacity-by-2030-acting>.

56 Lamine Chikhi, "Algeria, Niger and Nigeria Sign MoU for Saharan Gas Pipeline," Reuters, July 29, 2022, <https://www.reuters.com/business/energy/algeria-niger-nigeria-sign-mou-saharan-gas-pipeline-2022-07-28/>.

57 "Europe Turns to Africa for Gas as Alternative to Russia," *Al Jazeera*, October 12, 2022, <https://www.aljazeera.com/features/2022/10/12/europe-turns-to-africa-for-gas-as-alternative-to-russia>; "Italy to Increase Gas Imports from Angola to Reduce Reliance on Russia," *Offshore Technology*, April 21, 2022, <https://www.offshore-technology.com/news/italy-gas-imports-angola-russia/>.

58 Matthew Hill and Borges Nhamirre, "Mozambique Exports First LNG to Help Ease European Crunch," *Bloomberg*, November 13, 2022, <https://www.bloomberg.com/news/articles/2022-11-13/mozambique-first-lng-exports-to-help-ease-european-winter-crunch?sref=a9fBmPFG>.

59 "Nigeria LNG Declares Force Majeure," *Argus Media*, October 17, 2022, <https://www.argusmedia.com/en/news/2381194-nigeria-lng-declares-force-majeure>.

60 Macdonald Dzirutwe, "EU Looks to Replace Gas from Russia with Nigerian Supplies," Reuters, July 23, 2022, <https://www.reuters.com/world/africa/eu-looks-replace-gas-russia-with-nigerian-supplies-2022-07-23/>.

61 Matthew Hill and Borges Nhamirre, "Beheadings Show Peril Persists for Total on Mozambique," *Bloomberg*, June 16, 2022, <https://www.bloomberg.com/news/articles/2022-06-16/beheadings-show-islamist-peril-persists-for-total-in-mozambique?sref=a9fBmPFG>.

62 Amina Ismail and Maha El Dahan, "Analysis: Kurdish Tensions Stymie Iraqi Region's Gas Export Ambitions," Reuters, June 13, 2022, <https://www.reuters.com/business/energy/kurdish-tensions-stymie-iraqi-regions-gas-export-ambitions-2022-06-13/>.

63 "International Transport," Eni, n.d., <https://report.eni.com/factbook-2013/en/business-segments/gas-power/international-transport.html>, accessed November 16, 2022.

64 "Libya Agreed to Transport Nigeria Gas to Europe," *Middle East Monitor*, October 4, 2022, <https://www.middleeastmonitor.com/20221004-libya-agreed-to-transport-nigeria-gas-to-europe/>.

65 Ank Kuipers, "Trinidad Boosts LNG Exports to Europe, Pushes More Gas Output," Reuters, June 28, 2022, <https://www.reuters.com/business/energy/trinidad-boosts-lng-exports-europe-rushes-more-gas-output-2022-06-28/>.

INDIRECT CONTRIBUTORS

Europe will receive few cargos from the Pacific. However, the Asia-Pacific region remains the epicenter of global LNG markets and nearby producers are needed to meet demand and relieve Europe from high prices.⁶⁶

Australia has the largest LNG export capacity in the world, at 120.8 bcma, and was the world's largest exporter in 2021 at 107.6 bcm.⁶⁷ Indonesia and Malaysia are also critical suppliers, exporting 62.3 bcma, virtually all to Asia's Pacific coast.⁶⁸

The Americas' Pacific coast can also help balance the market. In British Columbia, Canada will bring 19.3 bcma of Albertan gas to market by 2025, and in 2023, construction will begin on a second Canadian Pacific terminal.⁶⁹ It will be joined by a 10.5 bcma LNG terminal in Mexico's Baja California, which will be filled by US gas. North American partners should consider Pacific export infrastructure part of the equation for relieving Europe's gas crunch.

It is important that transatlantic policymakers consider LNG supply in a global context. Asia is poised to reclaim its role as the leading destination for LNG cargos as the pandemic recedes, and it is critical that supply exists to meet resurgent demand and mitigate the intensity of competition with Europe.

PRINCIPLES FOR SECURING ALTERNATIVE SUPPLIES

As Europe acclimates to a changing gas supply dynamic, it should proceed according to three principles. First, solidifying relations with top suppliers like Norway, the United States, and Qatar will be crucial for securing as large a base as possible of supply. Second, it should realize that every bcm counts, and should cast as wide a net as possible in cultivating new gas relationships, even with more marginal producers. Finally, it should learn the lesson from years of Russian dominance that diversification in its energy imports can bolster resilience in its energy system.

ADDRESSING CRITICAL INFRASTRUCTURE GAPS FOR ATTRACTING ALTERNATIVE LNG AND PIPED SUPPLIES

Reliance on natural gas and Russian natural gas imports varies across Europe, presenting individual states with unique challenges to diversify their energy imports. Even if the preceding volumes are secured from global producers, the reorientation of European gas imports will require new infrastructure across Europe, particularly for regions highly exposed to Russian energy leverage.

LANDLOCKED CENTRAL AND EASTERN EUROPE

Landlocked states face steep barriers to securing alternative sources. Austria, Serbia, Czechia, Slovakia, Moldova, Hungary, and almost landlocked Slovenia rely heavily on Russian gas. Slovakia and Czechia have been proactive in diversification efforts. The bidirectional Poland-Slovakia interconnector and LNG from Croatia and Italy could provide Slovakia with gas from Norway and overseas. Czechia has invested in a new LNG platform in the Netherlands to book a share of LNG imports transported eastward via pipeline, and with additional EU funding, Prague could expand interconnections with LNG-importing Warsaw through the previously abandoned Stork II pipeline.⁷⁰ Slovenia is importing Algerian gas supplies through Italian and Tunisian pipelines. Austria reduced reliance on Russian gas to 50 percent and is preparing for a full phase out by 2027. While these developments are promising in establishing alternative routes in the region, landlocked Central and Eastern Europe is still largely an infrastructure desert when it comes to the necessary connections to ensure fungible natural gas supplies. Additional public-private investments could strengthen North-South natural gas transmission across Europe and unlock new supply access to the most vulnerable counties.

Other landlocked states have sought to strengthen existing arrangements. Hungary secured additional supplies from

66 "World LNG Imports and Exports by Region, 2015-2025," International Energy Agency, last updated October 26, 2022, <https://www.iea.org/data-and-statistics/charts/world-lng-imports-and-exports-by-region-2015-2025>.

67 Therese Robinson, "Australian LNG Exports under Scrutiny amid Global Supply Crisis," Natural Gas Intelligence, June 16, 2022, <https://www.naturalgasintel.com/australian-lng-exports-under-scrutiny-amid-global-supply-crisis/>; N. Sonnichsen, "Countries with Largest Liquefied Natural Gas (LNG) Export Capacity in Operation Worldwide as of July 2022," Statista, August 20, 2022, <https://www.statista.com/statistics/1262074/global-lng-export-capacity-by-country/>.

68 "Indonesia," US Energy Information Administration, last updated September 24, 2021, <https://www.eia.gov/international/analysis/country/IDN>; "Malaysia," US Energy Information Administration, last updated January 25, 2021, <https://www.eia.gov/international/analysis/country/MYS>.

69 Nia Williams, "Canada Sees West Coast LNG Revival as World Scrambles for Gas," Reuters, August 29, 2022, <https://www.reuters.com/business/energy/canada-sees-west-coast-lng-revival-world-scrambles-gas-2022-08-29/>.

70 "Czechs, Poles Ask for EU Funding for Revived Gas Interconnector Project," Reuters, September 30, 2022, <https://www.reuters.com/markets/europe/czechs-poles-ask-eu-funding-revived-gas-interconnector-project-2022-09-30/>.

Russia in August 2022, augmenting a fifteen-year contract signed in 2021.⁷¹ Similarly, Serbia has done little to reduce its high reliance on Russian gas, although the country is exploring diversification options behind the scenes.

While some inland states may doubt their prospects for diversification, Russia has proven itself an unreliable supplier even to states it deems friendly, and diversification may be forced upon them. Budapest should reduce its exposure by building a natural gas connection with Slovenia and expanding interconnections with Romania and LNG importer Croatia, and implementing plans to increase domestic production by 0.5 bcma.⁷² Interconnections with North Macedonia and Bulgaria, which sources LNG via Greece, could bolster its energy resilience.

Moldova, which has experienced cascading blackouts from attacks on Ukraine's infrastructure, faces immense obstacles to diversifying from Russian energy. Russian state firms own most of Moldova's critical energy infrastructure and the country relies on a Russian gas-fired power plant in the Moscow-controlled separatist entity of Transnistria. Moldova should reclaim control of its infrastructure, and following such reform, the country should prioritize making investments in gas storage and expanding interconnections with Romania, Poland, and Ukraine. The United States and European Union must provide increased financial support for new Moldovan energy infrastructure and support significant market restructuring.

COASTAL CENTRAL AND EASTERN EUROPE

Poland, among the first states to be cut off from Russian gas, began its diversification efforts long ago. Warsaw's investments in Baltic Pipe and expansion of the Świnoujście LNG terminal enabled the country's long-standing decision to not renew its supply contract with Gazprom expiring at the end of 2022. Poland can boost its role as a regional gas hub by maximizing use of the new North-South Gas Corridor to the Adriatic Sea, and expanding its LNG import infrastructure, including by leasing floating storage and regasification units (FSRUs). Its landlocked neighbors would especially benefit from these flows.

Despite previously close ties with Russia, Bulgaria was cut off from Russian gas alongside Poland in April 2022 for refusing to make payments in rubles. This year's com-

pletion of the expandable 3 bcma Interconnector Bulgaria-Greece enables Bulgarian access to Greek LNG imports and gas from the Southern Gas Corridor. Modernizing the country's gas transmission network, expanding the interconnector to 5 bcma, and developing the EU-backed Serbia-Bulgaria link could enhance Bulgaria's energy security without Russian gas. Some of the biggest impediments to Bulgaria's future progress on energy reforms and infrastructure developments are the marathon of elections and hung parliament, which have impeded implementation of new regulations and financing mechanisms for the energy sector.

GERMANY AND FRANCE

Germany has made substantial progress building new gas supply routes. Germany's 180-degree pivot from a strategy epitomized by the Nord Stream pipelines is notable and happened quickly. The country fast-tracked up to six FSRUs and has access to the Netherlands' newly leased LNG terminals to replace cheap and plentiful Russian imports, which fueled Germany's thriving industrial sector.⁷³ The first FSRU was integrated in record time into the German transmission system in November. France and Germany agreed to transit gas through France to Germany in exchange for German electricity exports to France, helping to offset France's reduced nuclear power production. Germany is also seizing Russian-owned storage facilities.

SOUTHWESTERN EUROPE

The Iberian Peninsula, boasting 75 bcma of import capacity, is Europe's LNG powerhouse.⁷⁴ Iberia is an energy island, however, with capacity to transport only 7 bcma to the rest of Europe, creating a supply diversification bottleneck.⁷⁵ After scrapping the 7.5 bcma trans-Pyrenees MidCat pipeline project, a newly proposed subsea Barcelona-Marseille (BarMar) route could bring alternative supply to greater Europe while building for future hydrogen and renewable gas compatibility.⁷⁶ While the details of the new project remain to be settled, accelerating implementation and exploring an additional Barcelona-Livorno route can transform Iberia from an energy island to an energy hub.

Italy is also an important gas transit center for Europe. The country is investing in two new 5 bcm FSRUs, adding to its

71 Wilhelmine Preussen, "Hungary Signs New Gas Deal with Gazprom," *Politico*, August 31, 2022, <https://www.politico.eu/article/hungary-signs-new-gas-deal-with-gazprom-over-additional-gas/>.

72 Stuart Elliott, "Russia Begins Extra Gas Flows to Hungary on Top of Contracted Volume – Official," S&P Global, 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>.

73 Stanley Reed and Clifford Krauss, "In the Netherlands, Balancing Energy Security against Climate Concerns," *New York Times*, last updated November 10, 2022, <https://www.nytimes.com/2022/10/18/business/energy-climate-change-netherlands.html>.

74 Iain Esau, "Spanish LNG Terminal to Be Fired Up after Nine Years in Mothballs," *Upstream*, July 12, 2022, <https://www.upstreamonline.com/ing/spanish-ling-terminal-to-be-fired-up-after-nine-years-in-mothballs/2-1-1256140>; Dan Rogers, Richard Nelson, and Nina Howell, *An Overview of LNG Import Terminals in Europe*, King & Spalding, 2018, https://www.kslaw.com/attachments/000/006/010/original/LNG_in_Europe_2018_-_An_Overview_of_LNG_Import_Terminals_in_Europe.pdf?1530031152.

75 "Integration of the Iberian Peninsula into the Internal Energy Market," European Commission, press release, July 27, 2018, https://ec.europa.eu/commission/presscorner/detail/fr/MEMO_18_4622.

76 Jose Miguel Blanco, "Spain, France, Portugal Abandon MidCat, Agree on Green Energy, Gas Corridor," *Euractiv*, October 21, 2022, <https://www.euractiv.com/section/energy/news/spain-france-portugal-abandon-midcat-agree-on-green-energy-gas-corridor/>.

substantial existing gas import capacity from pipelines and LNG terminals.

SOUTHEAST EUROPE

Southeast Europe's new LNG terminals, interconnection with Poland, and gas link with Azerbaijan can play a critical role in creating a liquid market for gas in Central and Eastern Europe writ large. Expanding LNG infrastructure in Greece, Croatia, and Albania could accelerate gas diversification and enable fuel switching from coal. Moreover, the region can be a crucial transit hub for landlocked Central Europe.

Albania and Kosovo are exploring cooperation on the Vlora LNG terminal and interconnecting the FSRU with the Southern Gas Corridor network, which would require new pipelines, technical upgrades, and cooperation with the Azeri government. Proposed projects in Greece could triple the country's LNG capacity within the next year, transforming Greece into a regional hub.⁷⁷

Where interconnection gaps exist, the region holds potential for commercialization of vessel-to-truck LNG transports where such deliveries would be economically feasible. Investments in truck loading infrastructure at LNG terminals would accelerate market penetration.

NORTHERN EUROPE

Lithuania's Klaipėda terminal enabled it to be the first European country to end its Russian gas imports. Latvia, which regained control of natural gas infrastructure previously owned by Russia, is now working on its own Skulte LNG terminal, and Estonia completed its Paldiski LNG terminal dock ahead of schedule. Neighboring Finland signed a deal in record time to secure an FSRU that could begin regasification services as early as December. This agreement serves as an important case study for expediting future critical infrastructure deals in Europe.

Britain can also be a European gas hub. Its 56.1 bcma LNG import capacity is Europe's second largest after Spain, with further capacity under construction or being planned.⁷⁸ Britain is also an important destination for Norwegian exports, with a 25.5 bcma pipeline from Norway that the

British government has explored securing under a long-term contract.⁷⁹

Britain's gas exports totaled £3.4 billion in 2021, half to EU member state Ireland and the rest largely to Belgium and the Netherlands.⁸⁰ By strengthening Britain's interconnections with the EU across the North and Irish Seas, and by reestablishing storage capacity, Britain can engage in close and profitable energy relations with its neighbors and strengthen regional energy diversification. Moreover, revived momentum on Ireland's Shannon LNG, a European Project of Common Interest long mired in legal battles, could enhance Irish energy security and free more gas to flow to the continent from Britain.⁸¹

THE ROLE OF STORAGE IN EUROPEAN GAS MARKET FLEXIBILITY

Expanding gas storage in retired salt caverns, aquifers, and fuel depots is needed to bolster European energy security. Before the winter of 2022-23, the European Union prioritized filling storage, meeting objectives set under REPowerEU a month early. Ahead of future winters, the European Union must expand its 102 bcm of operational storage capacity, which covers only a quarter of its annual consumption. Greater storage volume can improve gas market fungibility, mitigate delivery bottlenecks, and accumulate supply in preparation for more challenging winters than that of 2022-23. Additional storage, along with new LNG import capacity, can also prevent vessels from being turned away from European ports, an occasional occurrence throughout 2022 because tankers were unable to secure offload slots. Finally, increased storage can enable more purchases at bottom market prices, as Europe seeks to tame energy inflation.

The European Union should maximize storage capacity within and near the bloc. Latvia's 50 bcm of cavernous storage can greatly increase EU capacity. Ukraine's half-filled 30 bcm capacity presents additional storage opportunities. Creating financial guarantees for neighboring countries to utilize Ukrainian storage insured against war-related risk can enhance Europe's storage capabilities. Britain is also reopening its Rough facility, which can add to the continent's stock.

77 "Greece, Bulgaria Say New LNG Terminal Will Help Cut Reliance on Russia," Reuters, May 3, 2022, <https://www.reuters.com/business/energy/greece-bulgaria-say-new-lng-terminal-will-help-cut-reliance-russia-2022-05-03/>.

78 Rogers, Nelson, and Howell, *An Overview of LNG Import Terminals*.

79 "Trends in UK Imports and Exports of Fuels," UK Office for National Statistics, June 29, 2022, <https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/articles/trendsinukimportsandexportsoffuels/2022-06-29#>.

80 "UK Looking at Long-Term Energy Contracts with Other Countries – PM Truss," Reuters, October 4, 2022, <https://www.reuters.com/world/uk/uk-looking-long-term-energy-contracts-with-other-countries-pm-truss-2022-10-04/>.

81 "Shannon LNG Terminal and Connecting Pipeline (IE)," European Commission, last updated June 2021, https://ec.europa.eu/energy/maps/pci_fiches/PciFiche_5.3.pdf.

In parallel with capacity growth, the European Union must also address storage access. Many member states lack significant storage capacity, and no legal obligations exist to share gas storage absent bilateral agreements. Most EU gas storage is in Germany, Italy, France, the Netherlands, and Austria.⁸² The European Council proposed that countries lacking storage should secure the equivalent of 15 percent of their yearly consumption in other member states that do have storage capacity.⁸³ Buyers should expand storage arrangements to secure sufficient winter supplies, particularly as enforcing EU solidarity guidelines in private sector transactions could be difficult. Only 10 percent of Europe's storage is publicly controlled through the national strategic reserves.⁸⁴

Several European countries are deploying “use it or lose it” laws against Gazprom to take over unfilled storage space. Gazprom left its European storage facilities empty last year to exacerbate the energy crisis by tightening the winter supply crunch.

CRITICAL ENERGY INFRASTRUCTURE FINANCING IN EUROPE

The EU's previous gas diversification investments are paying dividends, but must be matched with new public and private sector support for critical infrastructure to ensure supply flexibility across Europe.

Multilateral financial institutions like the Three Seas Initiative Investment Fund could bolster support for bankable natural gas projects in the vulnerable Central and Eastern Europe (CEE) region. To catalyze large-scale diversification projects, however, the fund needs a massive increase in investment from member countries, the European Commission, and the United States.

The US International Development Finance Corporation (DFC) is also well-positioned to finance new critical infrastructure in the CEE region and provide technical and risk-management assistance. However, the DFC has had a restrained response to the energy crisis. The corporation

will issue up to \$300 million in financing to the Three Seas Initiative Investment Fund and provide \$400 million in political risk insurance for Moldova.

Although DFC has the authority under the 2019 European Energy Security and Diversification Act to invest in high-income countries if projects advance energy security, the institution is limited by a \$60 billion lending cap, and further congressional action is needed to increase DFC support for projects in frontline European states.⁸⁵ Congress must increase DFC funding, allow the bank to take on more risk, and make it easier to support projects that can contribute the most to European diversification efforts.

Companies and financial institutions look to the EU taxonomy for guidelines on sustainable investment decisions. Natural gas has been included in the taxonomy, but aspirational energy emission limits for gas investments are discouraging new projects even in cases where they displace more highly emitting Russian imports. The taxonomy should factor in the emissions saved by replacing carbon-intensive Russian gas with cleaner LNG imports, which can have two to three times less per-unit emissions.⁸⁶

As buyers assess the financial risks associated with long-term contracts, Europe should explore de-risking mechanisms that reconcile short-term gas needs with long-term climate ambitions. Ultimately, Europe must prioritize destination-flexible suppliers and prepare to reroute future excess cargos to coal-dependent nations in the developing world.

Additional financing should be available for smaller projects that integrate new import infrastructure into the European transmission system, which are often neglected in financing agreements.

82 Jose Miguel Blanco, “Spain, France, Portugal Abandon MidCat, Agree on Green Energy, Gas Corridor,” Euractiv, November 29, 2022, <https://www.euractiv.com/section/energy/news/spain-france-portugal-abandon-midcat-agree-on-green-energy-gas-corridor/>.

83 “Infographic – How Much Gas Have the EU Countries Stored?” European Council, October 17, 2022, <https://www.consilium.europa.eu/en/infographics/gas-storage-capacity/>.

84 Vanessa Dezem, Anna Shiryavskaya, and Elena Mazneva, “Sell or Save: Europe's New Dilemma for Gas Reserves,” *Bloomberg*, October 31, 2022, <https://www.bloomberg.com/news/articles/2022-10-31/sell-or-save-europe-s-new-dilemma-for-gas-reserves>.

85 *U.S. International Development Finance Corporation (DFC)*, US Congressional Research Service, last updated February 22, 2022, <https://crsreports.congress.gov/product/pdf/IF/IF1436>.

86 Sasha Bylsma, et al., “Which Gas Will Europe Import Now? The Choice Matters to the Climate,” Rocky Mountain Institute, March 16, 2022, <https://rmi.org/which-gas-will-europe-import-now-the-choice-matters-to-the-climate/>.

CONCLUSION

As Europe continues to combat the energy crisis and break its addiction to Russian gas, its focus must remain on the core issues: supply shortage and infrastructure gaps. This strategy, through diversifying imports and maximizing storage, has already proved effective with the October drop in gas prices.

Numerous countries have played a role in this approach—and will continue to do so. Notably, Norway, the United States, and Qatar have become the top three suppliers to Europe's remade gas system, but they alone cannot replace Russian supplies. Smaller players, from Algeria and Azerbaijan to Mozambique and Trinidad and Tobago, are needed to enhance European energy diversification.

New infrastructure investments are also needed to deliver non-Russian supply to vulnerable states highly exposed to Russian gas. By accelerating infrastructure integration, especially for landlocked EU member states, Brussels can integrate energy systems and enhance energy competition within the single market. Nimble and innovative solutions such as FSRUs are critical for unlocking access to alternative supplies in the near term; nevertheless, Europe needs a concrete long-term road map for the role of natural gas in fueling heating, electricity, and industrial needs.

Despite the opportunities import diversification will bring, Europe must prepare for a winter of extreme energy volatility in anticipation of a total cutoff of Russian supply, the potential for unseasonably cold weather, demand revival in Asia, and sabotage against critical energy infrastructure. Even if LNG supply rapidly diversifies and infrastructure gaps are filled, Europe may still face a 45 bcm shortage, and must leverage other tools. With low levels of storage expected come spring and resurgent global LNG demand as the pandemic recedes, subsequent winters could provide an even stiffer challenge as Europe grapples with the loss of Russian gas. The severity of the crisis for the next five to ten years will depend on the actions Europe takes within the next twenty-four months.

Energy saving, degasification, and fuel switching are essential for ensuring that Europe can provide residents and businesses with heat and electricity while sustaining its support for Ukraine. Looking beyond the 2022-23 winter, accelerating the European climate agenda will be crucial for securing Europe's energy system, and will be the subject of the second issue brief in this series.

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