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Lessons from the 2021 European Gas Crisis

by Joseph Calnan

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POLICY PERSPECTIVE

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Energy crises happen when decision-makers fail to fully understand and prepare for the limitations of their energy systems. These limitations are often found when an unexpected event throws the system off balance.

The current European natural gas crisis is an example of this. Some commentators have tried to frame this crisis as a simple renewables vs. fossil fuels fight. One side points to the shortcomings of natural gas and proposes that more renewables would have prevented this problem. The other side says that the crisis proves that an energy system which relies heavily on intermittent renewables is too fragile. There are good reasons why natural gas plays a major role in Europe's energy systems – it enables renewables by filling in for their daily and weekly intermittency, as well as changes in seasonal demand from home heating. There are also good energy security reasons to reduce Europe's dependence on natural gas, including declining domestic production and over-reliance on Russia. Balancing these competing imperatives involves answering the question: How can energy security be maintained during the energy transition?

The European Union (EU) reduced its annual CO2 emissions from 4.47 billion tonnes in 1990 to 3.29 billion tonnes in 2019.[1] Since the majority of anthropogenic GHG emissions are a byproduct of burning hydrocarbons for energy, European climate policies have focused on changing the way that Europeans produce and consume energy. The most successful example of this is the reduction in Europe's power sector emissions. The emissions intensity of power in the 27 EU countries dropped from 524 gCO2/kWh in 1990 to 230 gCO2/kWh in 2020, primarily due to the EU's Emissions Trading Scheme (ETS).[2] This was accomplished with a massive expansion of intermittent renewables and the replacement of coal-fired generation with natural gas.[3]

This worked well until the summer of 2021, when a shortage of natural gas caused prices in Europe to blow past all historical records in late September and early October. Industrial shutdowns, skyrocketing electricity and carbon prices and collapsing energy retailers followed. Heading into the winter heating season, Europe's natural gas prices are still close to all-time highs, costing households and governments billions.

Natural gas is an excellent energy carrier, a crucial feedstock for many industries and a necessity for home heating in much of Europe. This usefulness has led to over-dependence. Reducing natural gas dependency and improving security of supply is necessary. However, no source of energy is completely secure and the future technologies of the energy transition have their own serious energy security concerns. Decision-makers must understand and prepare for the limitations of tomorrow's energy systems.

[1] Hannah Ritchie and Max Roser, "CO2 and Greenhouse Gas Emissions," Our World in Data, May 2017, https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions.
[2] Staff, "Greenhouse Gas Emission Intensity of Electricity Generation in Europe," European Environment Agency, November 18, 2021, https://www.eea.europa.eu/ims/greenhouse-gas-emission-intensity-of-1.
[3] Staff, "European Union 2020," International Energy Agency, June 2020, https://www.iea.org/reports/european-union-2020.

This is even more important because of chronic global under-investment in oil and gas. Traditional energy companies are investing as if we are on track for the International Energy Agency's (IEA) net zero scenario. Meanwhile, clean energy investment is not expanding enough to even meet the IEA's stated policies scenario.[4] We are potentially facing a global shortage of both traditional and renewable energy in the next decade. Mitigating its impact will require deepening the resiliency of the energy mix, diversifying sources of energy supply and strengthening buffers for all types of energy as the transition unfolds.

What Caused the 2021 European Energy Crisis?

The COVID-19 pandemic has caused serious supply and demand discrepancies, resulting in slower economic growth and inflation.[5] Global investment in oil and gas dropped by 32 per cent in 2020, which turned out to be too hasty with robust energy demand growth in 2021.[6,7] Alongside these general supply chain issues, several other factors combined to cause a shortage in the global liquefied natural gas (LNG) market:

- Extreme weather events lowered supply and raised demand;
- Importing countries waited to refill inventories with the assumption that prices would fall;
- There was a shift from stable, long-term LNG supply contracts in favour of a more volatile spot market.

The root of the crisis can be traced to the 2020 Gulf Coast hurricane season. Hurricane Laura hit the U.S. Gulf Coast in August 2020, taking a huge chunk of LNG export capacity offline.[8] In reaction to these shutdowns, Asian LNG customers dipped into their storage rather than order new cargoes, under the assumption that prices would remain low.

The northern hemisphere experienced an unexpectedly cold winter in early 2021, particularly in northeast Asia.[9] To meet demand, Asian countries bid for LNG cargoes at high prices, diverting them away from Europe. Facing their own cold winter, European buyers also tapped into their storage rather than outbid Asia. Meanwhile, a drought in South America forced Brazil to increase

[4] Staff, "Energy Security and the Risk of Disorderly Change," International Energy Agency, October 2021, https://www.iea.org/reports/world-energy-outlook-2021/energy-security-and-the-risk-of-disorderly-change.
[5] Michelle Bowman, "The View from Here: The Outlook for the U.S. Economy and Implications for Monetary Policy Remarks," Speech, South Dakota State University, Brookings, SD, October 13, 2021, https://www.federalreserve.gov/newsevents/speech/files/bowman20211013a.pdf.
[6] Staff, "Planned 2020 Investments in Upstream Oil and Gas Have Been Slashed Under Pressure from the Collapse in Oil Prices and Demand," International Energy Agency, July 2020, https://ww.iea.org/reports/world-energy-investment-2020/fuel-supply.
[7] Chris van Moessner, "Oil Futures: Crude Edges Higher on Tightened Supply, Demand Outlooks," S&P Global Platts, October 20, 2021, https://www.spglobal.com/platts/en/market-insights/latest-news/oil/102921-oil-futures-crude-edges-higher-on-tightened-supply-demand-outlooks.
[8] David Manowitz and Victoria Zaretskaya, "LNG Exports Resume from Sabine Pass and Cameron Terminals as Another Hurricane Approaches," U.S. Energy Information Administration, October 8, 2021, https://www.eia.gov/todayinenergy/detail.php?id=45397.
[9] Staff, "Gas Market Report Q4-2021," International Energy Agency, https://iea.blob.core.windows.net/assets/261043cc-0cb6-498b-98fa-a1f48715b91f/GasMarketReportQ42021.pdf.

its LNG imports sixfold.[10] Asia and South America continued to outbid Europe for new LNG cargoes throughout 2021.

This happened in the context of a changing global LNG market. Traditionally, LNG cargoes were sold using long-term contracts with prices indexed to oil. Over the past years, however, cargoes have increasingly been bought and sold on the spot market at free-floating prices.[11] While long-term contracts are usually more expensive, they provide better security of supply. For example, Japan's continued reliance on long-term contracts set it up with a tidy surplus of supplies compared to China, which was more exposed to the spot market.[12] Chinese companies have now responded by signing a series of massive LNG supply deals with the United States and Qatar.[13,14]

An array of long-term European energy security issues aggravated the shortage:

- Declining domestic natural gas production and storage capacity in Europe;
- Russia's reluctance to tamp down European natural gas prices;
- High carbon permit prices preventing fuel switching;
- Policy discouraging coal and nuclear power alternatives;
- Slow wind speeds in the North Sea in spring, summer and fall 2021.

The European Union's domestic natural gas production is dwindling due to normal declines and policy interventions. The IEA projected in 2019 that by 2025, annual EU domestic natural gas production will fall to just 65 bcm, well short of the 500 bcm of projected annual consumption.[15] The EU imported 89.5 per cent of its natural gas in 2019; 43 per cent of these imports were from Russia.[16,17] At the same time, some domestic natural gas storage facilities owned by European energy companies, which can act as buffers for periods of short supply, have either been closed or

[10] Staff, "Energy Transition will Fuel Volatility in Gas Market: Panelists," S&P Global Platts, October 6, 2021, https://www.spglobal.com/platts/en/market-insights/latest-news/lng/100621-energy-transition-will-fuel-volatility-in-gas-market-panelists.
[11] Hillary Till and Adila McHich, "Is Oil-Indexation Still Relevant for Pricing Natural Gas?" CME Group, October 1, 2020, https://www.cmegroup.com/education/articles-and-reports/is-oil-indexation-still-relevant-for-pricing-natural-gas.html#.
[12] Ann Koh, "Japan Utilities Help Ease China Fuel Crisis at Tidy Profit," Bloomberg News, October 1, 2021, https://www.bnnbloomberg.ca/japan-utilities-help-ease-china-fuel-crisis-at-tidy-profit-1.1660398.
[13] Stephen Stapczynski, @sstapczynski, Twitter, https://twitter.com/SStapczynski/status/1463533030815846402?s=20.
[14] Staff, "China Suntien Green Energy in 15-year LNG Deal with Qatar Energy," S&P Global Platts, December 8, 2021, https://www.spglobal.com/platts/en/market-insights/latest-news/lng/120821-china-suntien-green-energy-in-15-year-lng-deal-with-qatar-energy.
[15] Peter Zeniewski, "A Long-term View of Natural Gas Security in the European Union," International Energy Agency, March 13, 2019, https://www.iea.org/commentaries/a-long-term-view-of-natural-gas-security-in-the-european-union.
[16] Staff, "Natural Gas Supply Statistics," European Commission, October 2021, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Natural_gas_supply_statistics#Supply_structure.
[17] Staff, "EU Imports of Energy Products – Recent Developments," European Commission, October 2021, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_imports_of_energy_products_-_recent_developments#Main_suppliers_of_natural_gas_and_petroleum_oils_to_the_EU.

have a bleak future, including the U.K.'s Rough gas storage facility, the Netherlands' Grijpskerk gas storage facility and the Groningen gas field.[18,19,20,21]

Meanwhile, Russia is using its dominant position as Europe's main supply of natural gas to push for quick certification of the Nord Stream 2 pipeline. Russian state-controlled firm Gazprom owns many natural gas storage facilities across Europe, and these facilities are unusually low compared to non-Gazprom owned facilities.[22] Gazprom pipelines in Eastern Europe have also been underused.[23] Russia is using Gazprom to pressure Europe into approving the Nord Stream 2 pipeline that would allow it to bypass Ukraine. Russian Deputy Prime Minister Alexander Novak said in October that the best way to cool Europe's natural gas prices is with quick approval of Nord Stream 2.[24]

Gazprom has, nevertheless, maintained its contractual obligation with Ukraine's Naftogaz and GTSOU to provide 40 bcm/year via Ukraine. However, this forms a relatively small portion of the total natural gas imported by Europe from Russia and a steady curtailment of flows through Ukraine can be easily seen in the sudden declines in booked capacity on January 1, 2020 and 2021.[25,26]

Russia's dominance of European natural gas has only increased with the liberalization of the European gas market and a transition away from long-term contracts. Free-market hubs, like the Dutch Title Transfer facility, provide an opportunity for the most competitive source of natural gas to stifle less competitive sources.[27] In the case of Europe, Russian pipeline supply was able to outbid other sources of natural gas and continue dominating the market despite the EU's stated strategy of using LNG to diversify its energy supplies.[28]

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[18] Adam Vaughan, "Closure of UK's Largest Gas Storage Site 'Could Mean Volatile Prices'," *The Guardian*, June 20, 2017, https://www.theguardian.com/business/2017/jun/20/uk-gas-storage-prices-rough-british-gas-centrica.
[19] Staff, "Rough Gas Storage Undertakings Review," Competition & Markets Authority, December 13, 2017, https://assets.publishing.service.gov.uk/media/5a30ff94ed915d2cf25281ac/rough-final-decision.pdf.
[20] Staff, "Feature: Netherlands on Standby to Decide Future of Grijpskerk Gas Storage Site," S&P Global Platts, January 29, 2021, https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/012921-feature-netherlands-on-standby-to-decide-future-of-grijpskerk-gas-storage-site.
[21] Staff, "Netherlands Rules Out Change to Groningen Gas Field Policy Despite High Prices," S&P Global Platts, September 16, 2021, https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/091621-netherlands-rules-out-change-to-groningen-gas-field-policy-despite-high-prices.
[22] Tom Marzec-Manser, "ICIS Analyst Briefing: Gazprom Signals No Change in Gas Flows to Europe," Independent Commodity Intelligence Services, October 18, 2021, https://www.icis.com/explore/resources/news/2021/10/18/10695845/icis-analyst-briefing-gazprom-signals-no-change-in-gas-flows-to-europe/.
[23] Ibid.
[24] The Editorial Board, "Climate of Strategic Vulnerability," *Wall Street Journal*, October 10, 2021, https://www.wsj.com/articles/climate-strategic-vulnerability-russia-europe-energy-vladimir-putin-nord-stream-2-11633732051.
[25] Staff, "Naftogaz, GTSOU and Gazprom Signed a Set of Agreements to Ensure Russian Gas Transit Over the Next Five Years," Naftogaz, December 31, 2019, https://www.naftogaz.com/www/3/nakweben.nsf/0/24DE3C1B1D52B136C22584E00079DA9E?OpenDocument&year=2019&month=12&nt=News&.
[26] Vitaly Yermakov, "Big Bounce: Russian Gas Amid Market Tightness," The Oxford Institute for Energy Studies, September 2021, https://www.oxfordenergy.org/wpcms/wp-content/uploads/2021/09/Russian-gas-amid-market-tightness.pdf.
[27] Johnathan Stern, "Can Natural Gas Market Liberalization be Compatible with Energy Security and Climate Change Concerns?" *The Institute of Energy Economics Japan Energy Journal*, December 2019, https://eneken.ieej.or.jp/data/8704.pdf.
[28] Staff, "Liquefied Natural Gas and Gas Storage Will Boost EU's Energy Security," European Commission, February 16, 2016, https://ec.europa.eu/commission/presscorner/detail/hu/MEMO_16_310.

EU carbon permit prices also play a role in the current crisis. Ira Joseph has noted that the high natural gas prices in Europe have not reduced demand, indicating very low demand elasticity.[29] With such high gas prices, one would expect more switching from gas to other fuels, like coal. Instead, a feedback loop has developed between natural gas price increases and carbon permit price increases, which limits fuel switching.[30] High gas prices normally make switching to coal more appealing. However, burning coal is more carbon intensive than burning gas, which creates higher demand for carbon permits, raising the price of these permits. The switching price from gas to coal therefore rises, keeping gas economical at higher prices.

Fuel switching opportunities were also reduced by the long-term reduction in alternative energy capacity. Between 2017 and 2020, more than 26 GW of coal-fired power installed capacity in the EU was retired, leaving 122 GW of coal power capacity in 2020.[31] Fit for 55, a set of proposals meant to update EU legislation to meet the EU's climate goals, is forecast to cut coal-fired electricity generation entirely by 2030.[32]

Zero-carbon nuclear power is declining as well. Between 2006 and 2021, EU nuclear power shrunk from an installed capacity of 134 GW to 104 GW.[33] The last 8.5 GW of nuclear energy in Germany is on an irreversible path for shutdown in 2022.[34] In Belgium, nearly 6 GW of nuclear energy will be phased out by 2025, to be replaced by approximately 6.4 GW of natural gas.[35] The decline in coal and nuclear will be managed with continued expansion of renewables and natural gas, though rapidly increasing EU carbon permit prices are expected to make natural gas less attractive in the long run.[36] Nevertheless, in the short run, the declining capacity of coal and nuclear has made natural gas increasingly important for maintaining reliability.

If all this weren't enough, the summer of 2021 was a period of low wind speeds in the North Sea and northern Europe. Energy companies SSE plc, RWE AG and Orsted reported low use for their wind farms between April and November.[37] At times in late August, the United Kingdom's wind turbines produced as little as 1.17 GW out of a capacity of 24 GW.[38,39] After four years of declines,

[29] Ira Joseph, @ira_joseph, Twitter, https://twitter.com/ira_joseph/status/1461480020602413061.
[30] Christopher Rene, "Further Fuel Switching in Europe Likely to be Limited," Independent Commodity Intelligence Services, June 15, 2021, https://www.icis.com/explore/resources/news/2021/06/15/10652255/further-fuel-switching-in-europe-likely-to-be-limited/.
[31] Staff, "Facts Behind the Debate: Recent Trends in EU Coal, Peat and Oil Shale Regions," European Commission, https://ec.europa.eu/jrc/sites/default/files/factsheet_on_eu_trends_coal_peat_oil.pdf.
[32] Robert C. Pietzcker, Sebastian Osorio and Renato Rodrigues, "Tightening EU ETS Targets in Line with the European Green Deal: Impacts on the Decarbonization of the EU Power Sector," Science Direct, July 1, 2021, https://www.sciencedirect.com/science/article/pii/S0306261921003962.
[33] Staff, "Nuclear Power in the European Union," World Nuclear Association, February 2021, https://world-nuclear.org/information-library/country-profiles/others/european-union.aspx.
[34] Edgar Meza, "German Nuclear Power Operators Reject Calls to Keep Running Plant Longer," Clean Energy Wire, November 12, 2021, https://www.cleanenergywire.org/news/german-nuclear-power-operators-reject-calls-keep-running-plants-longer.
[35] Staff, "Country Nuclear Power Profiles: Germany," International Atomic Energy Agency, 2021, https://cnpp.iaea.org/countryprofiles/Germany/Germany.htm.
[36] Yannic Rack, "Europe's Power Giants Send Mixed Messages on Future of Natural Gas," S&P Global Market Intelligence, April 14, 2021, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/europe-s-power-giants-send-mixed-messages-on-future-of-natural-gas-63031018.
[37] Pippa Stevens, "UK Energy Titan SSE Says Low Wind, Driest Conditions in 70 Years Hit Renewable Generation," CNBC, September 29, 2021, https://www.cnbc.com/2021/09/29/sse-says-low-wind-dry-conditions-hit-renewable-energy-generation.html.
[38] "National Grid: Live Status," https://grid.iamkate.com/.
[39] Digest of UK Energy Statistics 2021.

natural gas-fired electricity generation increased in the United Kingdom in 2021 to fill in the gap left by wind.[40]

In short, Europe is dependent on imported natural gas to manage renewable intermittency in a global natural gas shortage, and its traditional supplier is using the shortage to their advantage.

The Components of Energy Security

Europe's vulnerability is due to decisions which limited its options for the types of energy available, the source of energy supplies and the adequacy of energy storage. These problems are classic energy security issues and will not go away with the energy transition.

First, consider the energy mix. A resilient energy mix allows energy technologies with different characteristics to step in when other technologies fail. Europe's energy system has become less resilient due to reduced coal and nuclear capacity and high switching prices.

Additionally, the localized intermittency of renewable energy poses its own problems for energy security by co-ordinating outages. By 2030, the United Kingdom, Germany and the Netherlands plan to have a combined 71 GW of offshore wind capacity, largely concentrated in the North Sea. These turbines supply an enormous amount of cheap, clean energy when winds are high. However, their concentration in a relatively small area means that low wind speeds could eliminate dozens of gigawatts of electricity production at once. Low wind speeds in the North Sea in the summer of 2021 likely contributed to higher gas consumption. This is an example of a very concentrated risk to the energy system, especially if these countries intend to use electricity imports from each other to make up for shortfalls.

These trends have reduced the resiliency of Europe's energy mix by contributing to its over-reliance on natural gas to fill in the gaps. Adding novel energy technologies like batteries and hydrogen will improve the resiliency of Europe's energy mix, but these technologies are not ready to step in for the very tough niche that natural gas, coal and nuclear currently fill.

Next, consider the diversity of energy supplies. If there is not enough domestic energy production and energy must be imported, then it is important to have many suppliers to diversify risk. As Europe's domestic production of natural gas continues to decline, there is little reason to expect Europe's heavy dependence on imports to change. Europe continues to be heavily dependent on Russia despite efforts to diversify its natural gas supplies.

Europe planned to use LNG to diversify its sources of natural gas. This didn't pan out as anticipated. Europe's gas market liberalization and the associated growth in the spot market meant that Russia's low-cost natural gas kept a dominant position. While the liberalization of gas markets has saved Europe billions of dollars,[41] spot market growth has also resulted in fewer long-

[40] "National Grid: Live Status," https://grid.iamkate.com/.
[41] Peter Zeniewski, "Despite Short-term Pain, the EU's Liberalised Gas Markets Have Brought Long-term Financial Gains," International Energy Agency, October 22, 2021, https://www.iea.org/commentaries/despite-short-term-pain-the-eu-s-liberalised-gas-markets-have-brought-long-term-financial-gains.

term deals for natural gas from other suppliers. Combined, this caused lower European LNG imports just as the crisis was ramping up.[42]

Diversity of supplies will be crucial for new energy technologies as well. Transitioning into wind power, batteries and hydrogen may replace fuel supply risk with mineral supply risk. The supply chains for these technologies are highly concentrated in a few countries. Of the 44 minerals defined as critical by the European Commission, China dominates the supply chain for 27.[43] China is the world's supplier of the rare earth elements needed for wind power and electric vehicles such as neodymium. China also exerts enormous influence over the supply chains of copper for electricity transmission and cobalt for batteries.[44] Meanwhile, the platinum group metals needed for hydrogen electrolysis are dominated by South Africa and Russia.[45] Unlike fuel interruptions, a disruption to the mineral supply chain will not affect already installed batteries and wind turbines. Nevertheless, rebuilding our energy systems from the ground up requires an understanding of who will control these commodities.

A third piece in the energy security puzzle is energy storage. Stored energy can play a key role in balancing energy supplies with energy needs and providing a buffer for price volatility. Europe maintains around 100 billion cubic metres of working natural gas storage to heat homes and businesses in the winter. However, the closure of major sources of storage and cheap domestic natural gas production has weakened this buffer.

Europe has also allowed Russia to play geopolitical games with natural gas storage. Eleven per cent of Europe's storage capacity is owned by Gazprom's subsidiaries in Europe. At the end of September 2021, Gazprom's storage was about 75 per cent below the five-year average on that date, far lower than other gas storage facilities.[46] Foreign ownership of this infrastructure must be reviewed.

This is even more important because the energy transition may increase the need for gaseous energy storage. Hydrogen has a low energy density by volume, meaning that replacing the current volume of natural gas storage with hydrogen will not store as much energy. Since hydrogen may be needed for industrial heat, steel manufacturing, the chemical industry, heavy transport and a variety of other uses, Europe may need to improve its gaseous energy storage.

[42] Neil Hunter, "Physical Imports of LNG in Europe Slashed in July as Global Market Tightens," S&P Global Platts, August 2, 2021, https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/080221-physical-imports-of-lng-in-europe-slashed-in-july-as-global-market-tightens.
[43] Gian Andrea Blengini, Cynthia El Latunussa, Umberto Eynard and Cristina Torres De Matos, "Study on the EU's List of Critical Raw Materials," Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (European Commission), September 3, 2020, https://op.europa.eu/en/publication-detail/-/publication/ff34ea21-ee55-11ea-991b-01aa75ed71a1/language-en.
[44] Staff, "What China's Increasing Control over Cobalt Resources in the DRC Means for the West – Report," Mining.com, January 17, 2021, https://www.mining.com/what-chinas-increasing-control-over-cobalt-resources-in-the-drc-means-for-the-west-report/.
[45] Edgar Meza, "German Nuclear Power Operators Reject Calls to Keep Running Plants Longer," Clean Energy Wire, November 12, 2021, https://www.cleanenergywire.org/news/german-nuclear-power-operators-reject-calls-keep-running-plants-longer.
[46] Staff, "Natural Gas Weekly Update," U.S. Energy Information Administration, September 30, 2021, https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2021/09_30/.

Different issues may arise for other forms of energy storage. For example, droughts in South America, the United States and New Zealand have severely impacted hydro power.[47,48,49] Long-term energy storage in the form of pumped hydro may be vulnerable to droughts as well.

What Lessons Will Be Learned from This?

On October 13, the European Commission released a toolbox of measures for EU member states to address current price increases and to strengthen resilience against future shocks.[50] While these are sensible policies, leaving them to individual member states could result in some countries free-riding on the efforts of others. Since the EU plans to increase energy integration, the European Commission must devote attention and resources to European security of gas supply and storage.

Commodities analysis firm S&P Global Platts has written in support of European Commission-controlled strategic reserves of natural gas.[51] While the idea of a strategic gas reserve was discussed at a European Council meeting on October 22, no definitive conclusions on the matter were made.[52] Alternatively, Europe could imitate China by signing large long-term supply deals with LNG exporters.[53]

However, this problem is deeper than a quick fix for natural gas supply. Europe has put too many eggs in too few baskets. When natural gas is the only source of reliable and dispatchable heat and electricity, then Europe's energy system is going to be very vulnerable to the price of natural gas. Continued closures of coal and nuclear will increase this vulnerability by further reducing Europe's options.

Increasing investment in batteries, hydrogen and energy efficiency may eventually improve Europe's energy security, but many coal and nuclear plants will close before 2030. European policy-makers must seriously consider whether there will be enough battery and hydrogen capacity by then to avoid another natural gas crisis. Based on current trends, an energy crisis in 2025-2030 will be worse than an energy crisis now. Investment in both traditional energy and clean energy are insufficient for the next decade.[54] New energy technologies will not be adopted

[47] Peter Millard and Mark Chediak, "Global Energy Crisis Comes to Drought-Stricken South America," Bloomberg, October 3, 2021, https://www.bloomberg.com/news/articles/2021-10-03/global-energy-crisis-comes-to-drought-stricken-south-america.
[48] Kevin Adler, "US Hydropower Industry at a Crossroads with Drought, Aging Dams, New Opportunities," IHS Markit, August 3, 2021, https://cleanenergynews.ihsmarkit.com/research-analysis/us-hydropower-industry-at-a-crossroads-with-drought-aging-dams.html.
[49] Charlotte Cook, "Hydro Power: More Dry Weather May Mean Blackouts, Switch to Coal-Generated," RNZ News, April 28, 2021, https://www.rnz.co.nz/news/national/441393/hydro-power-more-dry-weather-may-mean-blackouts-switch-to-coal-generated.
[50] Staff, "Energy Prices: Commission Presents a Toolbox of Measures to Tackle Exceptional Situation and Its Impacts," European Commission, October 13, 2021, https://ec.europa.eu/commission/presscorner/detail/en/IP_21_5204.
[51] Andy Critchlow, "Time for Europe and the IEA to Create a Strategic Gas Reserve," S&P Global Platts, September 27, 2021, https://www.spglobal.com/platts/en/market-insights/blogs/natural-gas/092721-natural-gas-reserve-iea-europe.
[52] "European Council Meeting – Conclusions," European Council, October 22, 2021, https://www.consilium.europa.eu/media/52622/20211022-euco-conclusions-en.pdf.
[53] Jessica Jaganathan and Chen Aizhu, "China Signs Huge LNG Deals with U.S. Supplier Venture Global," Reuters, October 20, 2021, https://www.reuters.com/business/energy/us-venture-global-signs-lng-deals-with-chinas-sinopec-documents-2021-10-20/.
[54] Staff, "Energy Security and the Risk of Disorderly Change," International Energy Agency, 2021, https://www.iea.org/reports/world-energy-outlook-2021/energy-security-and-the-risk-of-disorderly-change.

fast enough to offset the decline in traditional energy supplies, which means we may be entering a period of severe energy scarcity.

There are hopeful signs that policy-makers are embracing a more realistic vision of energy. Ten European Union governments are pushing for the inclusion of nuclear power as a green technology in the European Commission's sustainable finance taxonomy, which would substantially lower the cost of building new nuclear plants.[55] The Biden administration has also changed its tone on energy since the appointment of Amos Hochstein as senior advisor for energy security in August, and now stresses the importance of balancing climate action with ensuring that there is no mismatch of energy supply and demand.

Policy-makers have a difficult road ahead. They will need to thread the needle by increasing investment in clean technology while also supporting the continued availability of traditional energy. Efforts must be made to ensure that traditional energy sources receive enough financing to continue to produce energy until clean energy technologies are fully ready to take their place.

Conclusion

Europe will continue to build more intermittent renewables. This will eventually displace some of the energy provided by natural gas. But until resources that can cover for renewable intermittency and seasonal heating are deployed on a massive scale, the risks for natural gas supply will stubbornly persist.

GHG emissions aside, the steady rise of natural gas into one of the dominant sources of energy globally proves its usefulness as a source of energy. But like any traded commodity, natural gas can experience supply shortages. European governments made a series of decisions which led to high exposure to the price volatility of natural gas. A careless transition could lead to high exposure to the price volatility of electricity, hydrogen and minerals. If they choose to pursue broad policies which consider the source of energy supplies and the adequacy and security of energy storage for all forms of energy used, then Europe will have learned the correct lesson. If they instead choose to focus narrowly on natural gas and pretend that clean energy sources do not come with their own security challenges, then they will likely increase their energy vulnerabilities.

Canada can learn from this as well. As noted above, the world may be entering a period of profound energy scarcity. The way that Canada handles its own energy resiliency in the coming years could determine whether we are caught off guard by this energy shortage, or whether we will be able to master it, and perhaps even thrive, as a secure and trustworthy supplier of desperately needed traditional energy and minerals for the world.

[55] Frederic Simon, "10 EU Countries Back Nuclear Power in EU Green Finance Taxonomy," Euractiv, October 12, 2021, https://www.euractiv.com/section/energy-environment/news/10-eu-countries-back-nuclear-power-in-eu-green-finance-taxonomy/.

About the Author

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