

Sources for the ETC energy security explainer series

The drivers of the winter 2021-2022 gas crisis

Page 1

What happened to gas prices in 2021?

Comments

- Dutch TTF gas prices are used to represent European gas markets.

Sources

- BNEF (2022) *E.U. Power and Fuel Prices*
- BNEF (2022) *APAC Power Market Monthly*
- EIA (2022) *Henry Hub Natural Gas Spot Price*

What happened to electricity prices in 2021?

Comments

- Average power prices of France, Germany, Italy, Netherlands and Nordpool are used to represent European power markets.
- ERCOT Houston prices are used to represent the US power markets.
- Japan and Korea prices are an average of the two markets.

Sources

- BNEF (2022) *E.U. Power and Fuel Prices*
- BNEF (2022) *APAC Power Market Monthly*
- BNEF (2022) *U.S. Power and Fuel Prices: Monthly*

Page 2

LNG is more expensive than piped gas

Sources

- BP (2021) *Statistical Review of World Energy*

EU and Asia reliant on LNG

Sources

- BP (2021) *Statistical Review of World Energy*

Fierce competition for LNG between EU and Asia

Comments

- Map based on 'Net LNG Exports and Imports to 2035' data. Numbers illustrative only.

Sources

- BP (2017) *BP Energy Outlook*

Percentage of 2021 EU gas storage filled

Comments

- Derived from IEA chart - 'Inventory levels in EU underground storage sites, 2016-2022'.

Sources

- IEA (2022) *Gas Market and Russian Supply*

The energy security implications of Russia's invasion of Ukraine

Page 1

Russian percentage of European primary energy supply

Sources

- Eurostat (2022) *The EU imported 58% of its energy in 2020*
- BP (2021) *Statistical Review of World Energy*

Russian percentage of German gas imports

Sources

- Eurostat (2022) *Imports of natural gas by partner country*

Which countries are most dependent on Russian gas?

Comments

- Reproduced from *Bruegel Attribution of Gas Imports to Individual Sources in 2021*. Please see <https://www.bruegel.org/2022/02/preparing-for-the-first-winter-without-russian-gas/> for detailed methodology.

Sources

- Bruegel (February 2022) *Preparing for the first winter without Russian gas*

What is gas used for in Europe?

Sources

- Eurostat (2022) *Supply, transformation and consumption of gas*

Page 2

How important is European energy demand to Russia?

Sources

- BNEF (October 2021) *Russia Insight: Why Putin Can Afford to Squeeze Gas Supplies*.
- IEA (April 2022) *Frequently Asked Questions on Energy Security*.
- BBC (November 2021) *Will Russia ever leave fossil fuels behind?*

What has Russia's gas revenue been since the beginning of the war?

Comments

- First quarter 2022 revenue estimates have been calculated by assuming constant imports at 2021 levels (1515 TWh), with 2022 q1 imports calculated by dividing 2021 imports by 4.

Sources

- BNEF (2022) *E.U. Power and Fuel Prices*

How long will high gas prices last?

Sources

- BNEF (2022) *E.U. Power and Fuel Prices*
- Powernext (data extracted 30 March 2022 and 26 April 2022) *Futures market data*



Sources for the ETC energy security explainer series

How far can Europe reduce use of Russian gas this year? [↗](#)

| How much gas does Russia supply to Europe and where is it used? | |
|---|--|
| Comments | <ul style="list-style-type: none"> Other EU gas use includes storage injections (200 TWh), chemical feedstock (200 TWh), and smaller sectors including transport, agriculture forestry and fishing, and energy sector energy use (250 TWh). |
| Sources | <ul style="list-style-type: none"> Eurostat (2022) <i>Imports of natural gas by partner country</i> Eurostat (2022) <i>Supply, transformation and consumption of gas</i> |
| What are the options to replace Russian gas in the next year? | |
| Sources | <ul style="list-style-type: none"> European Commission (March 2022) <i>REPowerEU</i> |
| How far can Europe reduce the use of Russian gas this year? | |
| Sources | <ul style="list-style-type: none"> Aurora (March 2022) <i>Impact of Russia-Ukraine war on European gas markets: can Europe cope without Russian gas?</i> European Commission (March 2022) <i>REPowerEU</i> IEA (March 2022) <i>A 10-Point Plan to Reduce the European Union's reliance on Russian Natural Gas</i> |

Importing Liquefied Natural Gas (LNG) [↗](#)

| Where is LNG produced? | |
|---|--|
| Comments | <ul style="list-style-type: none"> Asia Pacific = Malaysia, Indonesia, Papua New Guinea, Peru, Brunei Darussalam. Other MENA = Oman, UAE, Egypt, Algeria. Other = Nigeria, Angola, Cameroon, Equatorial Guinea, Norway, Argentina, Trinidad & Tobago. |
| Sources | <ul style="list-style-type: none"> BNEF (Jan 2022) <i>Global LNG Trade Flows: 2021 Review</i> |
| How much LNG does Europe use today and how much can LNG help this year? | |
| Sources | <ul style="list-style-type: none"> European Commission (March 2022) <i>REPowerEU</i> IEA (March 2022) <i>A 10-Point Plan to Reduce the European Union's reliance on Russian Natural Gas</i> |

| Methane emissions per unit of gas produced | |
|--|---|
| Comments | <ul style="list-style-type: none"> Methane leakage rate measurements include high degree of uncertainty. Minimum supply chain LNG estimates are around 6 ktCH₄/bcm, whereas maximum estimates are upwards of 75 ktCH₄/bcm. |
| Sources | <ul style="list-style-type: none"> Sustainable Gas institute (2015) <i>White Paper – Methane and CO₂ emissions</i> |
| Natural gas consumption | |
| Sources | <ul style="list-style-type: none"> ETC (2020) <i>Making Mission Possible</i> |
| Global LNG imports | |
| Comments | <ul style="list-style-type: none"> Other Asia includes South Korea (5.1 bcm), Turkey (2.8 bcm), and India (2.1 bcm) and 'Other Asia' (5.1 bcm). |
| Sources | <ul style="list-style-type: none"> BNEF (April 2022) <i>Global LNG Monthly: No Price Relief This Shoulder Season</i> |

How increased renewable deployment can deliver energy security [↗](#)

| What is the role of renewables in power generation? | |
|---|---|
| Comments | <ul style="list-style-type: none"> Other renewables include hydro, tidal, wave, solar thermal and geothermal and bioenergy. 2030 value is the projected power generation mix under the Fit for 55 package. 2050 value is taken as the projected power generation mix in the IEA's Sustainable Development Scenario in Europe. A more ambitious Net Zero scenario would likely see higher levels of power generation in Europe. |
| Sources | <ul style="list-style-type: none"> European Commission (2021) <i>'Fit for 55' mix scenario energy model</i> IEA (2021) <i>Sustainable Development Scenario dataset</i> |
| Is the deployment of renewables on track? | |
| Comments | <ul style="list-style-type: none"> Values for average capacity additions between 2022-2030 are computed based on the difference between current installed capacity and capacity (or equivalent production-derived capacities) targets for 2030 in reference net-zero consistent scenarios for selected geographies. |
| Sources | <ul style="list-style-type: none"> European Commission (2021) <i>'Fit for 55' mix scenario energy model</i> European Commission (March 2022) <i>REPowerEU</i> TERI (2020) <i>Renewable Power Pathways: Modelling The Integration Of Wind And Solar By 2030</i> RMI (2021) <i>China Zero-Carbon Electricity</i> Princeton University (2020) <i>Net-Zero America Report – E+ high electrification scenario</i> |

Sources for the ETC energy security explainer series

Page 2

| Lowest-cost bulk generation cost | |
|--|--|
| Comments | <ul style="list-style-type: none"> Levelised costs (LCOEs) for gas CCGTs in Italy and Spain are taken as the average LCOE for France and Germany. Presented LCOEs are unsubsidized and include carbon pricing. |
| Sources | <ul style="list-style-type: none"> BNEF (2022) <i>LCOE data for selected countries</i> ETC (2021) <i>Making Clean Electrification Possible Report</i> |
| All-in generation cost | |
| Sources | <ul style="list-style-type: none"> ETC (2021) <i>Making Clean Electrification Possible Report</i> |
| Offshore wind potential | |
| Sources | <ul style="list-style-type: none"> ETC (2021) <i>Making Clean Electrification Possible Report</i> |
| Cumulative resources needed for transition by 2050 | |
| Sources | <ul style="list-style-type: none"> ETC (2021) <i>Making Clean Electrification Possible Report</i> |

Page 3

| What are the bottlenecks for rapid scale up of renewables in Europe? | |
|--|--|
| Sources | <ul style="list-style-type: none"> Italy – Wind Europe (2022) <i>Messy permitting leads to yet another undersubscribed wind auction in Italy</i> Sweden – F.Jalkenas (KTH) (2019) <i>Evaluation tool for large scale onshore wind power projects</i> |

