

Year VII n°19 - March 2022 Ukraine Invasion: a Structural Break

REF4E OSSERVATORIO
ENERGIA

A review of the premises on which our scenarios are based follows the structural break brought by the invasion of Ukraine. In the *Worst Case Scenario* long term tensions lead to permanently high prices, which would hit the Energy Transition, while in the *Best Case Scenario* tensions fade quickly and low Prices support economic growth, investments and an acceleration of the energy transition. **Most probably, tension will only reduce progressively, leaving temporarily high prices and imposing delays to the Energy Transition.**

Assuming the European demand being on its pre-War growth path, there would be a **high risk of world LNG market becoming significantly tight**. While **Adding 50 Bcm/y to the world LNG demand to compensate a reduction in Russian supplies to Europe** is compatible with the regassification and internal transportation infrastructure capacity, this would also **worsen the market tightness, with supplies being diverted from other importers** (potentially divertible short-term contracts from US, Middle Eastern and Nigeria production near 60 Bcm/y) and **competition on LNG supplies likely to keep prices supported in the short-term**. Moreover, an increase in LNG and pipeline inflows to Europe would only partially replace a halt of Russian supplies and a reduction in gas demand would be needed. For winter 22-23 such a reduction need could be of the order of 75 Bcm, approximately 15% of the European 2021 demand.

In this context, electricity consumption growth would be limited and a recovery trend would only resume over years 2023 and 2024, with power demand nearing 322 TWh and 324 TWh respectively. **High commodities prices would keep the PUN supported**, with the baseload average staying near the 200 €/MWh threshold till year 2023 and **coal-fired generation remaining competitive** despite a partial mitigation by switching-related CO2 swings. Coal-fired generation would in fact be **close to pre-switching levels**. Since rising CO2 prices would worsen inflationary pressure on corporates and families, **the EU Commission could postpone the implementation of the Fit for 55 measures** designed to reinforce the ETS system before Ukraine invasion and planned to be implemented starting from this year, while other forms of regulation could support transition.

GEOPOLITICS AND ECONOMICS SHAPE THE ENERGY MARKET FRAMEWORK

A review of the premises on which our scenarios are based follows the structural break brought by the invasion of Ukraine. The immeasurable humanitarian tragedy combines in fact with economic disruption and a new geopolitical scenario still to take shape, which would likely be the key determinant for the energetic future of the European continent.

Gas and electricity forecasts must now take into account the diverse geopolitical and economic hypothesis deriving from the potential war duration. How the crises may develop and eventually end and how the European Union and each single nation would react to the inevitable disruption generated from the deterioration of both diplomatic and commercial relations with Russia are also seen as key determinants of the future equilibrium of the energy markets.

In this perspective, we defined three scenarios, the main assumptions on which they are based are described below:

Worst Case Scenario

Permanently HIGH Prices and Energy Transition Failure

Should Russia succeed in seizing Kyiv and Ukraine, this could take four to six weeks. However, given the durability of the Ukrainian resistance and its long history of pushing Russia back, according to US and UK intelligence there is a high risk for war lasting over 10 years. This would have highly disruptive economic and commercial consequences, leading to a long lasting Second Cold War, leading to:

- commercial relations and trade flows interruption amid cross sanctions, import-export bans and economic retaliation
- commodities supply sharp reduction and persisting high prices
- gas, oil and coal arrivals from Russia sharp reduction: gas long-term contracts may not be honoured and the Nord Stream 2 would be definitively dismissed
- long lasting (10 years) European negative and zero economic growth
- investments fade
- energy transition fails: coal, oil and gas maintain a predominant weight in the production mix
- the ETS system is suspended

An almost complete interruption of gas supplies from Russia would prevent storages to reaching last year already below average levels, putting the system security at risk and keeping prices under upward pressure. A geographical redistribution of gas flows, with the Russian supplies possibly being redirected to Asia and the US LNG to Europe to which an increase of exports from North Africa may help a rebalancing of the market. However, investments in infrastructure to guarantee the efficiency of a new European distribution profile may take time and a return of coal thermoelectrical production and a quota system limiting consumptions would most likely be needed in the short-term. High gas prices would reflect on electricity prices, with a strong impact on inflation and demand, fuelling a vicious circle of economic contraction, low investments, high prices, low purchasing power and demand. In such extreme conditions, the ETS CO2 system may be suspended in the attempt to limit the prices surge.

Reference Scenario

Temporarily HIGH Prices and Energy Transition Pause and Resumption

A diplomatic agreement, partially backed by the West, is reached, but diplomatic and commercial tensions remain. This would require Ukraine to sign a treaty of neutrality and may allow an economic move towards the West, supported by reconstruction aids, while most of the sanctions on Russia should be lifted. This would lead to:

- commercial relations and trade flows resume, despite import-export bans and sanctions remaining partially in place
- commodities supplies resume and price trends normalise progressively starting from year 2023
- gas, oil and coal arrivals from Russia resume, long-term gas contracts related flows are guaranteed
- gas supplies from alternative routs increase limiting prices upward potential

- the economy suffers a 1.5% to 2.0% contraction over the next two years, followed by recovery and investments resume coherently
- energy transition pauses over the next two years since the economic decline hits investments, but then resumes and accelerates favoured by the willingness not to depend on supplies from Russia
- the ETS system reforms are delayed to avoid additional pressure on energy prices

A reduction of gas supplies from Russia (in this scenario assumed to stabilize at current levels) would not prevent the European storages to reach last year (still below average) levels or event higher ones, should special measures be implemented by the EU Commission. A geographical redistribution of gas flows, with the Russian supplies possibly being redirected to Asia and the US LNG to Europe to which an increase of exports from North Africa would be key to rebalance the market. Investments in infrastructures to guarantee the efficiency of a new European distribution profile would be incentivized and may temporarily distract resources from the RES development. The energy transition would remain in focus though and once gas supplies are guaranteed the regulatory framework should lead to an acceleration. The ETS system reforms which were supposed to reinforce the system are delayed to avoid additional pressure on energy prices during the economic contraction period, with its key scope limited to the coal to gas switching going forward since other more effective measures are taken to support the transition process. Gas prices could remain under pressure till the end of the next winter season, but special measures limiting the upside may be implemented. This would reflect on electricity prices and initially weigh on demand.

Best Case Scenario

LOW Prices and Energy Transition Acceleration

A diplomatic agreement fully backed by the West and China is reached or Putin falls and a new pro-West Government is installed. Ukraine signs a treaty of neutrality and firmly moves towards the West economy, possibly being included into the EU. Reconstruction aids would be massive and all the sanctions on Russia would be lifted. This would lead to:

- commercial relations and trade flows resuming quickly, following import-export bans and sanctions immediate and total lifting
- commodities supplies resume and price trends revert downwards sharply
- gas, oil and coal arrivals from Russia fully resume, long-term gas contracts related flows are guaranteed and the Nord Stream is approved before the year end
- gas supplies from alternative routes increase adding to the overall prices downward pressure
- the economy suffers a less than 1.5% contraction over the next two years, followed by a firm rebound led by investments quick resumption
- energy transition accelerates supported by coordinated reforms, administrative resolutions and significant private investments
- the ETS system key scope remains limited to the coal to gas switching since other more effective measures are taken to support the transition process

A full resumption of gas supplies from Russia (in this scenario assumed to recover back to pre-crisis levels) would allow the European storages to reaching above last year levels, with special measures implemented by the EU Commission also supporting. This would let gas prices move quickly lower and free resources to incentivize both a geographical redistribution of gas flows and the energy transition process. The ETS system reforms which were supposed to reinforce the system may still be put on hold in favour of an administrated transition mechanisms, which would guarantee a faster transition attracting private investments into a certain regulatory framework. Its key scope would therefore be limited to the coal to gas switching going forward. A steady downtrend in gas prices would reflect on electricity prices incentivising demand and an economic recovery.

The gas and electricity markets price outcomes based on the assumptions just described are summarized in the table below:

	TTF €/MWh			PSV €/MWh			CO2 €/ton			PUN €/MWh			CSS €/MWh		
	REF	Worst	Best	REF	Worst	Best	REF	Worst	Best	REF	Worst	Best	REF	Worst	Best
2021	46	46	46	46	46	46	53	53	53	125	125	125	5	5	5
2022	85	97	59	86	97	60	77	28	51	212	214	152	-1	-3	2
2023	75	99	34	76	100	36	77	10	32	190	214	91	-2	-4	-1
2024	50	78	25	51	80	28	51	10	32	129	172	72	-1	-3	-2

MBS Elaborations

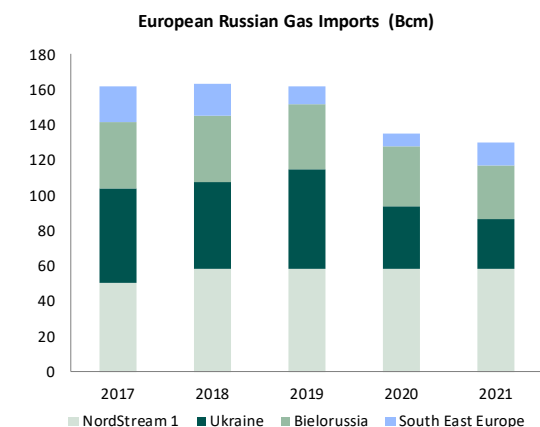
GAS MARKET OUTLOOK

With the European Commission targeting a two-thirds reduction of Russian gas imports within a year, the alternative import sources growth potential combine to world and European demand dynamics in shaping future fundamentals and price scenarios.

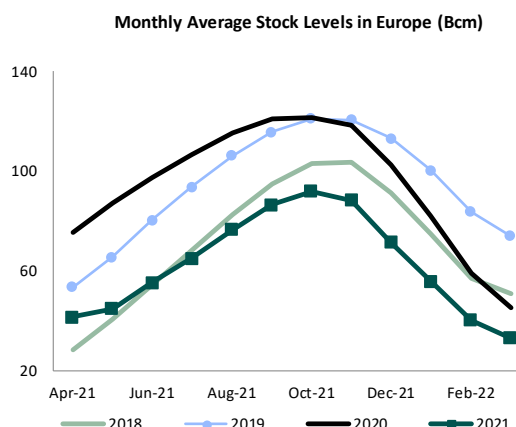
From the geopolitical-economic scenarios described above derive the assumptions on which our price scenarios are based. The key factors taken into account are synthesized below.

	World LNG Dynamics	Pipeline Import & European Production	Natural Gas Savings
Worst case	- the economic downturn weighs on investments and new capacity projects - Europe competes with Asian on LNG supplies - scarcity pushes prices higher	- North African, Azerbaijani and Norwegian flows remain unchanged - investments scarcity and infrastructures bottlenecks weigh on domestic production	- demand depression lasts for a decade due to the economic downturn and quotas - coal production comes back and the coal price remains high - investments scarcity blocks energy efficiency and RES development
Reference	- commodities market tension eases starting from year 2023 2021 and 2022 high prices support investments in new capacity and LNG supplies growth accelerates from year 2023 - Russians gas supplies gain weight in the Asian import mix freeing LNG flows from other origins for Europe	- North African, Azerbaijani and Norwegian flows progressively increase - domestic natural gas and biomethane production short-term growth adds to non-European pipeline flows	- demand decreases temporarily due to the economic growth deceleration and quotas - coal production temporarily comes back, but the coal price progressively normalizes - investments support energy efficiency and RES development progressively leading to a structural gas demand reduction
Best case	- commodities markets tensions ease in the very short-term - commercial deals are signed for US and Middle east supplies to Europe - Russian flows cover a growing share of the Asian demand	- North African, Azerbaijani and Norwegian flows increase - biomethane production ramps up in the short-term adding to domestic production and non-European pipeline flows	- demand decreases temporarily due to quotas - economic growth fast resumption and incentives support investments and energy efficiency and RES spread, leading to a structural gas demand reduction

RUSSIAN GAS: OPPORTUNITIES AND CONSTRAINTS TO DIVERSIFICATION



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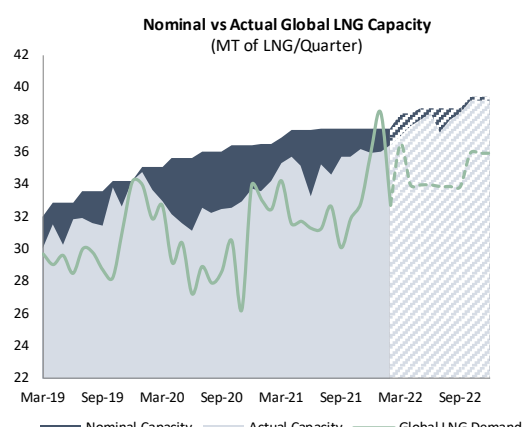
MBS elaborations

The European and Italian future gas and electricity market dynamics depend on the possibility to diversify its import mix now more than ever. In the latest years, Europe (here indicating the European Union less Baltics and Finland plus UK) imported from Russia 130 Bcm (but over 160 Bcm on average between years 2017 and 2019) through four main roots: Nord Stream 1 (NS1), Ukraine, Belarus, and Turkstream.

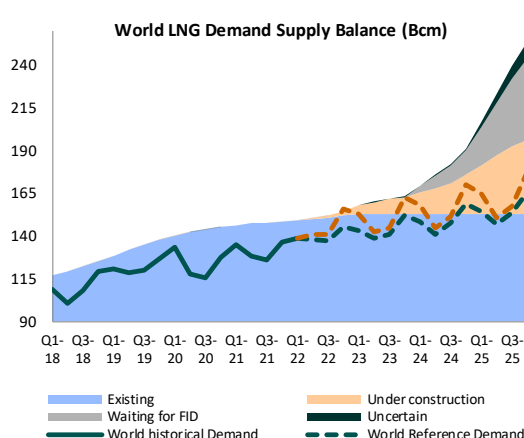
All the three scenarios assume a strong reduction of the European dependence on Russian gas. This strategic need combines with the shorter-term and more contingent one of replenishing the European storages before the next winter season. In this perspective, increased gas supplies from alternative sources must match with an adequate transport infrastructure, in the absence of which, the only alternative would be a reduction in demand.

World LNG Market

The LNG market dynamics are gaining further weight in determining the future demand-supply and prices equilibrium and availability to Europe.



MBS Elaborations



MBS Elaborations

The recent sharp upward acceleration of gas prices amid Ukraine invasion was anticipated by year 2021 steady bullish trend, with supply growth perspectives uncertainty (delays in investment decisions for new liquefaction projects) having combined with short-term outages (the available capacity was on average 6% lower than the nominal one, compared to a 4% average maintenance rate between years

2018 and 2020) and a stronger than expected demand growth acceleration, especially in Asia. In our Reference scenario, **liquefaction capacity growth is expected to resume progressively, following investments growth** encouraged by high prices and the European willingness to diversify its import mix. However, risk for the supply-demand margin moving below the 10% comfort threshold or even becoming negative will remain high over the next winter seasons.

Assuming the European demand being on its pre-War growth path, there would be a high risk of world LNG supply-demand balance reaching significant tightness levels. As a matter of fact, colder than average temperatures or delays in putting under construction capacity on line may push demand higher. Outages weighing on available capacity are also a non-negligible risk. **Adding 50 Bcm/y to the world LNG demand by Europe to compensate a reduction in Russian supplies**, as foreseen by the European Commission REPowerEU Plan (the feasibility of which, especially in terms of infrastructures, is more widely discussed in the next chapter), **leads to a strongly unbalanced (tight) market, with the need of supplies being diverted from other importers.**

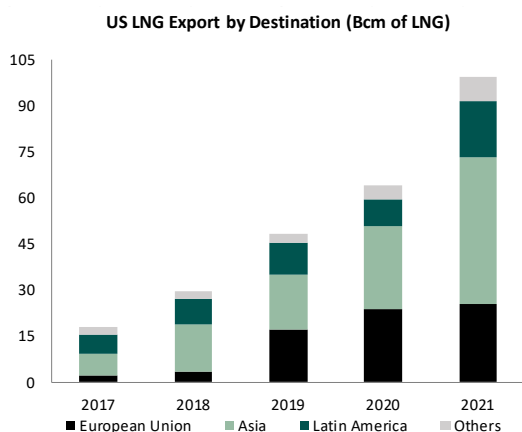
European gas prices, strongly correlated to the LNG ones, will consequently remain supported over the next and, possibly, the 2023-2024 winter seasons.

World LNG Supply-Demand Marging Under Existing Capacity Conditions and Considering Capacity Under Construction

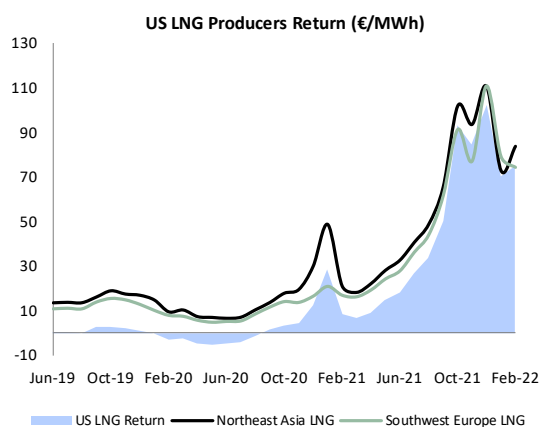
	Q1-22	Q2-22	Q3-22	Q4-22	Q1-23	Q2-23	Q3-23	Q4-23	Q1-24	Q2-24	Q3-24	Q4-24
Existing Capacity	7%	8%	9%	4%	6%	9%	8%	0%	3%	8%	3%	-4%
Under Construction	7%	9%	10%	6%	9%	13%	13%	7%	11%	16%	14%	10%

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Year 2021 global trade of LNG expanded by 6% compared to year 2020, with LNG exports from the US having grown 55% y/y and LNG traded volumes having overcome the natural gas ones. Spot Asian and European prices averaged above 100 €/MWh in Dec 2021, significantly higher than the US reference *Henry Hub*, making exports profitable and the US LNG producers widely in the money.



MBS Elaborations

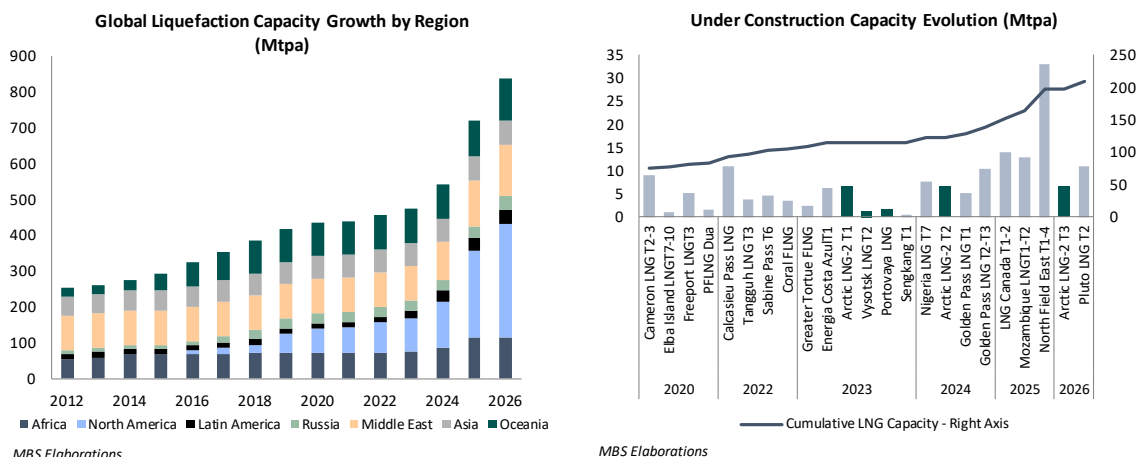


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While European demand growth was almost null in year 2021, with additional export having mainly been directed to Asia, LNG arrivals to the European continent between January and February 2022 were 24 Bcm (13 Bcm higher than the 11 Bcm imported over the same period in year 2021), having so far more than compensated the reduction in natural gas flows from Russia (in Jan-Feb 2022 were 7 Bcm lower than in Jan-Feb 2021), in line with the new path of gas supplies diversification.

Liquefaction Capacity Growth

Last year gas prices firm recovery fostered the acceleration of investment decisions on several new liquefaction facilities around the globe. Operations to complete plants under construction intensified too, with **30 Bcm of new capacity adding to the market in year 2022**.



Among the **new infrastructures**, American *Calcasieu Pass* (14.7 Bcm/year) and *Sabine Pass Train 6* (6 Bcm/year) are set to deliver their first LNG cargo soon, ahead of schedule.

Export capacity growth from Africa is going to increase as Coral FLNG's floating facility (4.5 Bcm/year), operated by Eni, is heading towards Mozambique and would be operational in the second part of the year. African *Mozambique LNG* project has resumed the construction works and is expected to be operating in 2025. In the **Asia Pacific** region, within the end of the year, there will be the addition of Tangguh LNG Train 3, an expansion of the facility already in place, adding 5 Bcm/year to the Indonesian production.

With Golden Pass LNG under construction, coming in 2024, and Canada LNG in 2025, **North America will lead LNG supply growth**, with potentially 162 Bcm/year of capacity available from 2025 and more than 215 Bcm/year in the pre-FID stage, most of them waiting to be approved by 2022. **Outputs from Middle East will remain stable until 2024**, as the Qatari *North Field East* mega project is not expected to ramp up before 2025.

Australia's LNG export volumes are going to increase as Pluto LNG Train 2 reached a final investment decision, with first LNG cargo targeted for 2026 and the *Darwin LNG (Barossa)* facility is expected to be operational in 2025.

High gas prices and an expected enhancement of the European regassification capacity may attract further investments increasing the number of FIDs. Africa has a new project in Tanzania, expecting to start construction in 2023. The project has been under scrutiny since 2014 but gained momentum after the new Tanzania's President took office in March and directed his administration to fast-track delayed investments.

However, the positive momentum in liquefaction growth is partially counterbalanced by the high risk on Russian LNG supplies and projects.

Liquefaction Projects in Pre-FID Stage

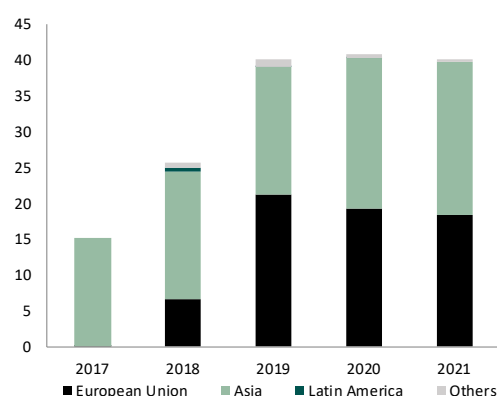
Country	Plant	Expected FID	Expected Start Year	Capacity (Mtpa)
Australia	Pluto LNG T2 (Scarborough)	FID Nov. 2021	2026	5
Cameroon	Cameroon FLNG Expansion	Not Defined	2026	1
Canada	Woodfibre LNG	2022	2025	2
Canada	LNG Canada Expansion T3-4	Not Defined	2026	13
Canada	Kitimat LNG	Shelved	2027	10
Canada	Goldboro LNG T1-2	Shelved	2025	10
Canada	Bear Head LNG T1-2	Not Defined	2023	2
Indonesia	Sengkang Expansion T2-4	Not Defined	2026	2
Indonesia	Abadi LNG	Not Defined	2027	10
Mauritania	Greater Tortue FLNG T2	2023	2026	3
Mexico	MPL Puerto Libertad T1-2	2022	2024	12
Mexico	Vista Pacifico	Not Defined	2025	4
Tanzania	Tanzania LNG	2022	2026	n.d.
Mozambique	Rovuma LNG T1-T2	2023	2026	15
PNG	Papua LNG T1-2	2023	2026	9
Qatar	North Field South Expansion T5-6	2022	2027	16
Russia	Baltic LNG T1-2	Shelved	2024	10
Russia	Obssky LNG T1	Shelved	2024	5
USA	Texas LNG Brownsville T1	2022	2025	2
USA	Texas LNG Brownsville T2	2022	2024	2
USA	Rio Grande T1-2	2022	2025	11
USA	Port Arthur LNG T1-2	2022	2024	11
USA	Plaquemines LNG Phase-1	2021	2024	10
USA	Magnolia LNG	2023	2026	9
USA	Lake Charles	2021	2025	15
USA	Jordan Cove	Not Defined	2025	4
USA	Gulf LNG Pascagoula T1-2	Not Defined	2025	11
USA	Freeport LNG T4	2022	2026	5
USA	Corpus Christi LNG T4-7	2022	2026	10
USA	Driftwood LNG T1-2	2022	2025	17
USA	Delfin FLNG	2022	2025	13
USA	Cameron LNG T4-5	2022	2026	8
USA	Alaska LNG T1-3	Not Defined	2025	20
USA	CP2 LNG	2023	2026	20
Total				255

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Russia LNG Supply Growth at Risk

Russia supplied 40 Bcm worldwide in year 2021, of which more than 18 Bcm to Europe and 21 to the Asian continent, and contributes as key player in LNG export growth, with more than 27 Bcm/year of capacity under construction that should have kicked off by year 2025, plus a series of pre-FID projects. In December 2021, Gazprom announced that its board had approved a memorandum with Linde on the construction of a third liquefaction train at the gas and LNG complex of Baltic LNG, where two terminals are already under construction. The whole project is also assumed to be suspended in our Reference and Worst case scenarios.

Russia LNG Export by Destination (Bcm of LNG)



MBS Elaborations

The conflict-led economic and political isolation may affect Russian LNG target ambitions to become the world's fourth-largest LNG exporter though, with most of the liquefaction technologies belonging to US companies. Moreover, financing problems and the mass exodus of foreign players will likely affect the Kremlin aim of rising its LNG exports to 95 million-115 Bcm per year by 2025 from around 40 Bcm per year today.

Depending on the conflict next developments, we have assessed three scenarios for the Russian LNG supply growth till year 2027:

- **Worst Case.** Russia will be isolated by the Western countries, with most of the foreign companies leaving the country, abandoning their shares and interests in LNG projects. Growth would halt and capacity stall around 40 Bcm/year. Without Russian projects, the global LNG market would lose about 20% of new liquefaction capacity (around 30 Bcm/year) and about 10% of new Pre-FID projects (around 18 Bcm/year)
- **Reference Case.** Russian projects would be postponed for at least three years. The first new LNG Russian production would be completed in 2025 instead of 2022 expected before the war began, leaving LNG global market without 20% of new liquefaction capacity until then. Pre-FID projects may be released after 2025, adding 18 Bcm/year to new under construction capacity
- **Best Case.** An early solution of the conflict may allow Russia to regain some trust among the foreign companies and new LNG projects may restart, contributing to the growth of the global LNG liquefaction capacity.

Before the beginning of the conflict, Vysotsk LNG expansion and Portovaya LNG projects were planned to be operational by the end of this year, while Arctic and Baltic LNG projects would add more than 40 Bcm/y by 2025. Our LNG capacity growth Reference and Worst case scenarios assume the latter projects to be suspended for now.

Exxon Mobil and Shell are pulling out of the Sakhalin-1 and Sakhalin-2 projects (7.3 Bcm per year each) Far East and key importers Japan and South Korea tend to share the West's view of reducing dependence from Russia, with Japanese shareholders under pressure to quit. The country's biggest foreign LNG partner, TotalEnergies, will hang on to its stakes in LNG export champion Novatek, and Novatek's Yamal LNG and Arctic LNG 2 projects unless further sanctions force it out. However, TotalEnergies won't boost spending, despite securing rights to buy 10%-15% of future Novatek projects. Portovaya LNG new project was supposed to start in the second quarter of 2022 as, in November 2021, Gazprom disclosed that construction of the project was in its final stage. However, after the beginning of the conflict in Ukraine, it's hard to believe the plant will be operational in 2022. Vysotsk LNG expansion project starting in 2022 would likely follow the same path.

Moreover, sanctions are hitting Russian LNG deliveries, as cargoes struggle to reach countries that have condemned the invasion. Lithuania has stopped taking cargoes from Novatek's Cryogas Vysotsk (Vysotsk LNG), while the UK closed its ports to Russian vessels on Feb. 28, affecting Yamal LNG shipments. The UK ban covers tankers flagged, registered, owned, controlled, chartered, or operated by any person connected with Russia. Although most Yamal vessels are owned and operated by non-Russian third parties and don't fly the Russian flag, all are under long-term charter to Novatek. However, an EU-wide blockade has not happened yet, as a European ban would likely complicate deliveries to term buyers including Total and Spain's Naturgy.

European Import Infrastructure and Alternatives to Russian Supplies

In terms of infrastructures, Europe would have enough import capacity to replace the Russian gas:

- gas pipelines from **Norway** (arriving in the UK, France, Belgium and Germany) could carry alone up to 150 Bcm per year (more than the 130 Bcm imported from Russia in year 2021) and, from October 2022, the new gas pipeline "Baltic pipe" will be operating, connecting the Norwegian production to Poland, with a capacity of 10 Bcm/year. However, flows from **Norway** are close to **120 Bcm/year on average so far, corresponding to its production capacity net of internal consumption**

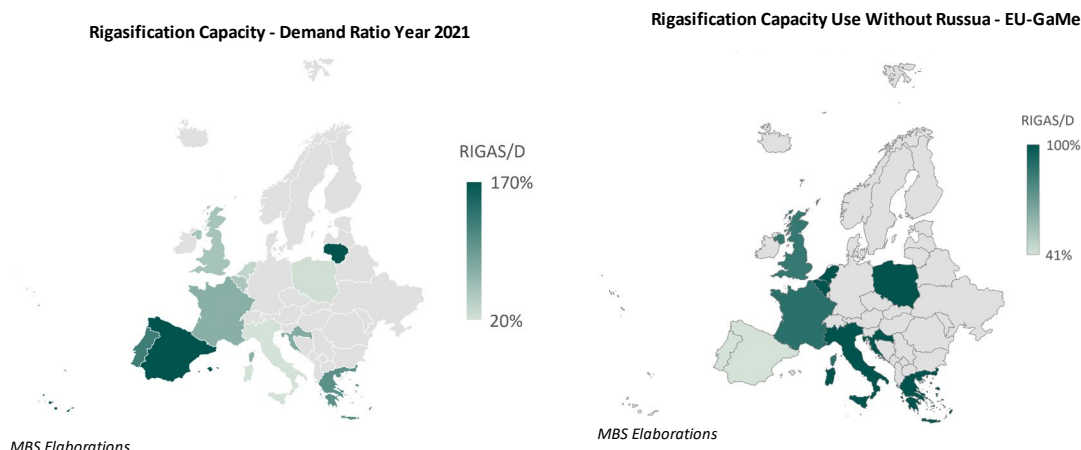
- pipeline import capacity from **Algeria** towards Italy and the Iberian Peninsula is almost 60 Bcm per year, despite the recent halt (since Oct-21) of the gas pipeline *Maghreb-Europe* having a capacity of almost 15 Bcm/year because of tensions with Morocco, which was more than compensated by an increase of flows through the *Medgas* pipeline connecting Algeria directly to Spain. Flows from Algeria are in fact quite variable. Year 2021 flows were close to **maximum net production capacity at 36 Bcm (of which 21 Bcm to Italy and 15 Bcm to Spain)**. With Algeria domestic gas demand growth accelerating, investments in new projects are needed to boost production and exports capacity in the medium-term
- the gas pipeline connecting **Libya** to Italy could also provide flexibility. Its nominal capacity is close to 15 Bcm per year, while the *competing capacity* (defined by Snam for the entry points from the South¹. is 10 Bcm/year. Imports from Libya have gradually decreased from 5.7 Bcm in year 2019 to 3.2 Bcm in year 2021
- finally, the **TAP** is the latest pipeline having started operations, transporting gas from Azerbaijan. Currently it works at its maximum capacity of 10 Bcm per year. Its expansion (for further 10 Bcm per year) will take between 3 and 5 years to be completed
- **regasification capacity** is nearly 200 Bcm, distributed between the Iberian Peninsula, the UK and France; LNG imports to Europe in recent years were stabile around 100-105 Bcm/year

As long as import capacity is concerned, Europe could easily replace Russian imports by adding 100 Bcm of LNG, 40 Bcm from Norway, 10/25 Bcm from Algeria (depending on the Maghreb Europe pipeline) and 5 Bcm from Libya. However, since Norway and Algeria are in fact already sending as much gas as they can, in the short-term (winter 2022/2023) potential increases are seen as hardly significative:

- Norway stated that the launch of the new Baltic pipe does not imply an increase in volumes sent to Europe
- political instability in Libya makes the country an unreliable supplier, with flows having been interrupted for a few weeks over the last months
- Algeria seems committed to increase flows to Italy by 2 Bcm in the short-term instead and may add a total of 10 Bcm in times not too delated, which would lead supplies to reaching between 30 and 32 Bcm/year
- as regards **LNG**, finding additional ships heading to Europe is not a negligible problem, despite spot or short-term deliveries² having a significant weight on the LNG market, but the key issue is represented by transportation bottlenecks within Europe, which would limit the incoming liquefied gas distribution towards regasification plants located in different European countries. A proprietary model (**EU-Game**) **simulation of optimal LNG flows into Europe** excluding supplies from Russia **results in only 150 Bcm of LNG being imported**, since the remaining capacity could not be exploited because of the bottlenecks in the internal infrastructure connecting the European countries. The picture below on the right shows the use of regassification capacity resulting from the simulation when Russian flows are imposed close to zero. The main bottleneck is between the Iberian Peninsula and France: the cross border capacity is in fact only 20 Mmc/g (approximately 7 Bcm /y), while regassification capacity in Spain is 60 Bcm/y compared to a 35 Bcm/y internal gas demand (which would leave 25 Bcm/y spare capacity). The simulation put also in evidence that just 40% of the Iberian Peninsula regasification capacity would be used, while between 85% to 90% of the French and UK capacity would be exploited. The rest of the European countries capacity would be exploited to the maximum instead

¹ 159 Mmc/g is the total capacity, discounted from the competing capacity. Assuming Mazara full capacity being 102 and TAP 27, the residual capacity for Gela is 30 Mmc/g for a total of 10 Bcm/year

² The [GIIGNL report](#) indicates that in 2020 40% of world imports of LNG is made on a spot or short-term basis, for a total of about 196 Bcm.

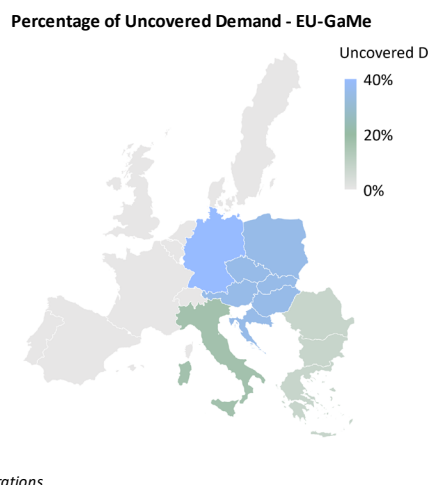


An acceleration of the implementation of regasification projects in Germany and Italy to be connected directly to their network or a link between Spain and Italy may therefore reveal pivotal to reduce Europe dependence on Russian gas.

Gas Savings: Just a Partial Response to Supply Reductions

Overall, while in the medium-term approximately 20/25 Bcm may be added from North Africa and Azerbaijan (1-2 years estimated to increase flows from Algeria, 3-5 years for those from Azerbaijan via TAP), **in the short-term an increase in LNG and pipeline inflows to Europe would only partially replace a halt of Russian supplies and a reduction in gas demand would be needed.** For winter 22-23 such a reduction need could be of the order of 75 Bcm, approximately 15% of the European 2021 demand.

The more countries are dependent on Russian gas imports, the hardest they may be hit by the demand reduction request, with the central-eastern area (Poland, Czech Republic, Slovakia, Hungary), Germany, Italy and the Balkan countries (Romania, Bulgaria and Greece) in focus. The possibility to partially switch from gas to coal in the very short-term and a foreseen acceleration of the energy transition process make the thermoelectric sector the first candidate for gas demand curtailments.



An **increase in European coal-fired generation**, assuming to keep operational the entire coal capacity active in 2021 in Europe (about 143 GW, against 130 GW counted at the beginning of 2022 after the closure of several plants) and assuming an optimistic operation of 4000 equivalent hours of the park, a 135 TWh increase in annual production compared to 2021 (570 TWh) could be achieved. Considering the 50% average efficiency of the European gas production fleet, this **would result in an annual saving of natural gas of about 25 Bcm, which, given the little margin for a production increase from the nuclear plants, leaves nearly 50 Bcm missing.**

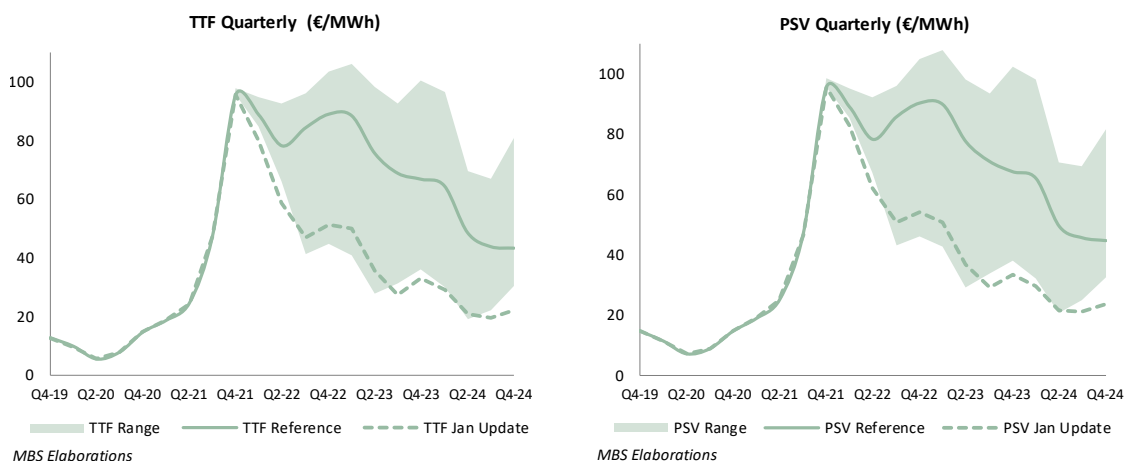
In the short-term, in a purely theoretical optimization framework, if Spain, France and UK would maximise LNG imports, and flows from Algeria and Norway diverted to Italy and Germany, this could allow further 20 Bcm/y being supplied to Europe in addition to the 50 Bcm/y resulting from the Eu-Game model optimisation described above, for a total 70 Bcm/y LNG import increase.

New LNG supplies will come from the US, with Biden having recently committed to 15 Bcm/y additional exports to Europe, matched by the new production capacity on line from the beginning of this year (Calcasieu Pass plant nominal capacity is 10.9 Bcm/y and Sabine Pass T6 6.1). Further 4.6 Bcm/y new

liquefaction capacity potentially available for Europe would only be added from the Mozambique Coral plant at the end of this year. Therefore, **significant additional imports could be mainly achieved by competing with Asia** (mainly India, China, South Korea and Japan) on US, Middle Eastern (Qatar, Oman and UAE) and Nigeria production. Potentially divertible short-term contracts should amount to nearly 60 Bcm/y. However, **increasing competition on LNG supplies is likely to keep prices supported in the short-term.**

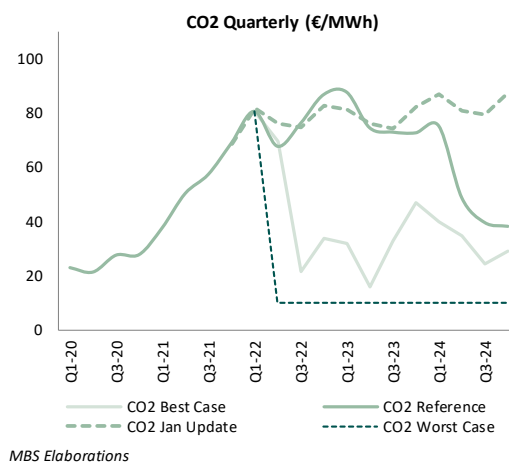
Europe Gas Prices

The European gas prices dynamics would be in line with the fundamental developments assumed above. Year 2022 TTF and PSV would both average near 85 €/MWh in our Reference scenario and just ease towards 75 €/MWh in 2023. Prices would move more decisively lower in year 2024, nearing 50 €/MWh. In the event of the Worst Case scenario, years 2022 and 2023 prices would stabilise in the 90-100 €/MWh area and just ease towards 80 €/MWh in year 2024. In our Reference scenario, The PSV-TTF spread dynamic reflects the assumption of a progressive return of the northern European supplies in the short-term, while in the Worst Case the pipeline flows scarcity from the north limits the possibility of a significant PSV-TTF spread widening. In the Best Case scenario, prices benefit from a faster normalization of market fundamentals than in the Reference case combined with a recovering economy supporting investments and energy transition. This would push the TTF and PSV 2022 averages near 60 €/MWh. The TTF would then move towards just above 25 €/MWh and the PSV to just above 27.5 €/MWh in year 2024, with a widening spread reflecting the northern European flows resumption.



ETS CO2 Outlook

The paradigm shift in Europe's security and energy policy led by the Russian invasion of Ukraine and the ensuing sanctions on Russia is seen as having a strong impact on the ETS system. The commodities prices sharp upward acceleration weighs both on key industrial sectors and consumers purchasing power, while rising inflation may force central banks to unwind loose monetary policies too early to keep the post-Covid economic recovery on track. In such a challenging framework for corporates and families rising CO2 prices would be an additional burden. In the *Worst case* scenario, coal may in fact be just necessary to compensate scarce gas supplies, which would force the CO2 coal to gas switching function out of order. We therefore expect the Fit for 55

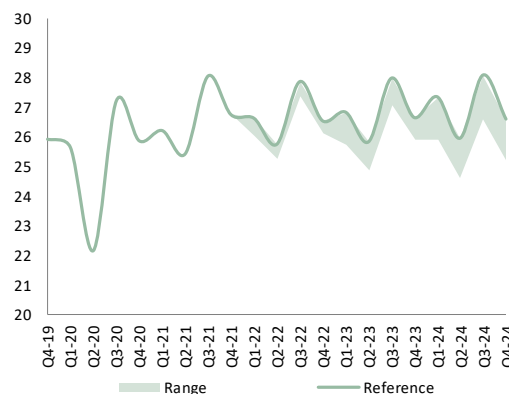


measures, designed to reinforce the ETS system before Ukraine invasion and planned to be implemented starting from this year, to be postponed and other forms of regulation supporting the European energetic transition, such as incentives or, going forward, bans on particularly polluting technologies. In the *Reference* and the *Best case* scenarios the short-term CO₂ price forecast is based on the coal to gas switching modelling, assuming that the Fit for 55 implementation will be delayed till at least year 2025. The *Worst case* scenario contemplates the possibility of the EST system itself being put on hold as a consequence of fuels scarcity and permanently high prices.

ITALIAN POWER MARKET OUTLOOK

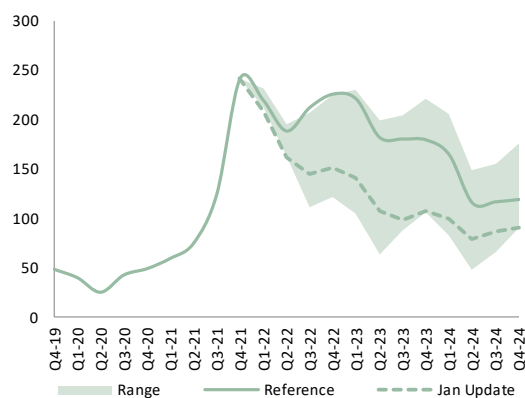
Tensions in the European natural gas markets reflect on power prices, with countries like Italy heavily relying on gas-fired thermoelectric generation significantly exposed to the risk of Russian gas flows interruptions, with Italian power market dynamics expected to follow natural gas prices trends and demand possibly affected by the war and sanctions impact on economic activities and GDP growth

Power Demand Quarterly (TWh)



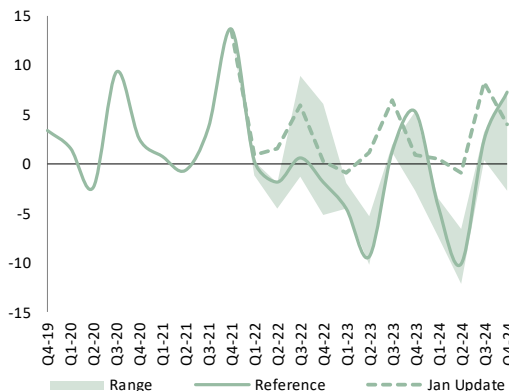
MBS Elaborations

PUN Quarterly (€/MWh)



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CSS Quarterly (€/MWh)

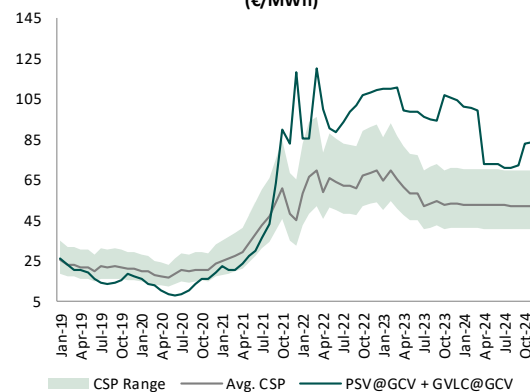


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Worst Case Scenario

A prolonged period of geopolitical tensions, leading to deep commercial relations disruption, logistic chains blocks and high commodities prices would see the **PUN stabilising above the 200 €/MWh threshold in years 2022 and 2023**, with a slow downward movement just beginning in year 2024, despite economic contraction and high inflation weighing on consumptions.

Monthly CSP - Worst Case (€/MWh)



MBS Elaborations

Natural gas scarcity and high prices would translate into coal-fired generation regaining market shares and the baseload Clean Spark Spread (CSS) of 53%-efficiency CCGTs stabilizing in the -3.5/-2.5 range, with very extraordinary market conditions emphasizing the coal-fired generation relative strength.

In the event of a **reactivation of the coal-fired power plants closed at the end of 2021** (La Spezia and Fusina, accounting for about 1 GW of installed capacity), this **would drive coal-fired production above 40 TWh** in years 2022 and 2023 (more than 5000 EOH). Year 2024 coal output may decrease slightly to just above 35 TWh. In this context, **gas-fired output would fall below the 100 TWh threshold** and remain in the 80-95 TWh range in the 2022-2024 period.

Renewables growth would be compromised: between years 2022 and 2024, the sum of solar and wind capacity increase would be just 1.6 GW, while the overall renewable production (hydropower not included) would remain aligned to year 2021 levels at around 70 TWh. Import levels would stabilize above 40 TWh, with switching conditions penalizing gas fired production.

Reference Case Scenario

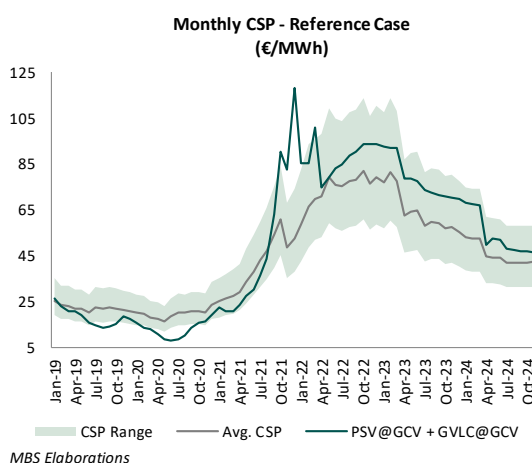
Despite the expected resumption of activities led by the removal of the pandemic-related restrictions, under the assumption of the geopolitical crisis impact on commodities supplies and prices taking at least two years before moving on a normalization path, **electricity consumption growth would be limited** and a recovery trend would only resume over years 2023 and 2024, with power demand nearing 322 TWh and 324 TWh respectively.

High commodities prices would keep the PUN supported though, with the baseload average staying near the 200 €/MWh threshold till year 2023 and **coal-fired generation remaining competitive** despite a partial mitigation by switching-related CO₂ swings. Coal-fired generation would in fact be **close to pre-switching levels** (in the 25-30 TWh range) between years 2022 and 2024. This is equivalent to more than 4000 EOH in terms of plants operation, compared to about 1000 EOH in 2020 and less than 2000 EOH in 2021. **Gas-fired production would be coherently back to pandemic levels**, below the 110 TWh threshold, both in year 2022 and 2023 and **the Clean Spark Spread (CSS) of 53%-efficiency CCGTs** (the marginal technology in the Italian power system) remain in **negative territory**.

Renewables should be supported by **favourable market conditions** fostering both PPAs and merchant investments, but bureaucratic deadlocks and logistic chains damages caused by sanctions, bans and damages to commercial relations deriving from the conflict in Ukraine may limit growth potential in the short-term.

Compared to 2021 levels, in the next three years solar and wind installed capacity are expected to increase by 4.5 GW and 1.3 GW respectively, totalling 26.5 GW and 12.4 GW by the end of 2024. Renewable production (hydropower not included) is expected to overcome the 70 TWh threshold in 2022 and to hit just below 80 TWh in 2024.

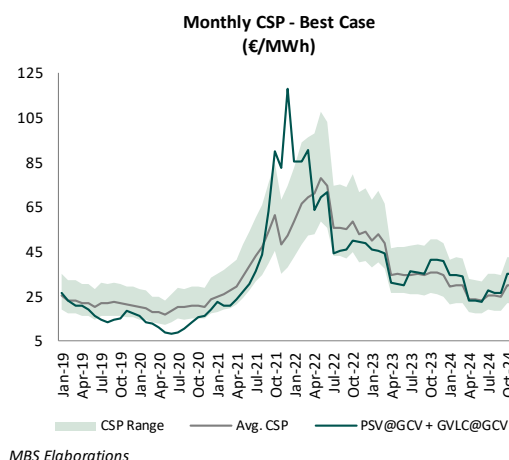
Mutated switching conditions affect also **net import** levels, with energy flows coming from the Northern frontiers expected to remain sustained this year and in the next future as the Italian thermoelectric fleet is challenged by the continental Europe nuclear and coal-fired generation. Thus, net import levels are expected to stabilize around 40 TWh in each of the next three years.



Best Case Scenario

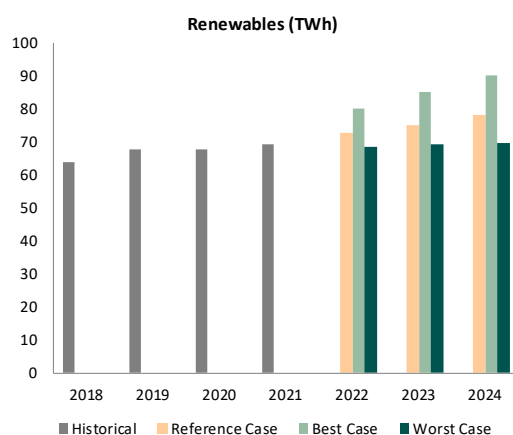
This scenario is characterized by **demand and renewables embracing a steady growth path, with investments in energy efficiency pushing prices lower**, favoured by the combination of a fast normalization of commodities markets with a strengthened consciousness of the energy transition process strategic role.

In this event, a stabilization of the 2022 PUN in the 110-120 €/MWh range would be expected starting from Q3-22, which would lead year 2022 averaging just above 150 €/MWh. The downward trend would accelerate in 2023 and continue in 2024. Coal-to-gas switching conditions would bring gas-fired generation back and the baseload Clean Spark Spread (CSS) of 53%-efficiency CCGTs may move back into the -2.0/+2.5 range.

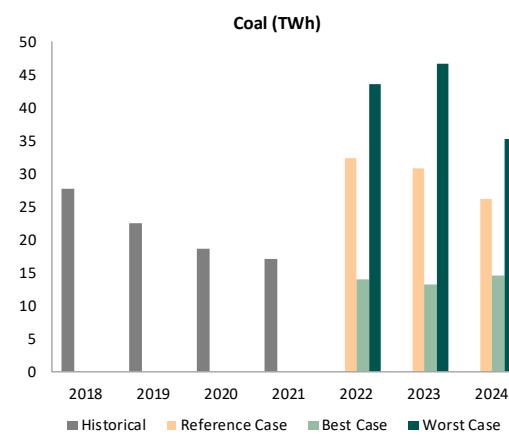


Gas-fired generation would move back to 120 TWh in year 2022 and then diminish to just above 110 TWh as renewable production gains ground, while Coal-fired production phase out would be favoured by highly competitive gas-fired generation and would stall below 14 TWh in the 2022-2024 period.

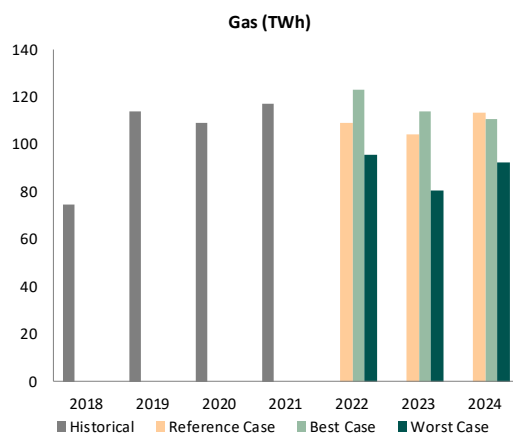
Renewable growth would proceed steadily, supported by regulation, with focus on the need to promptly reduce the level of energy dependence at European level possibly fostering the electrification and decarbonization process, despite an assumedly fast end of the Ukrainian conflict. Solar and wind capacity may increase by 5.7 GW and 3 GW respectively by year 2024 end, while renewable production (hydropower not included) hit 90 TWh.



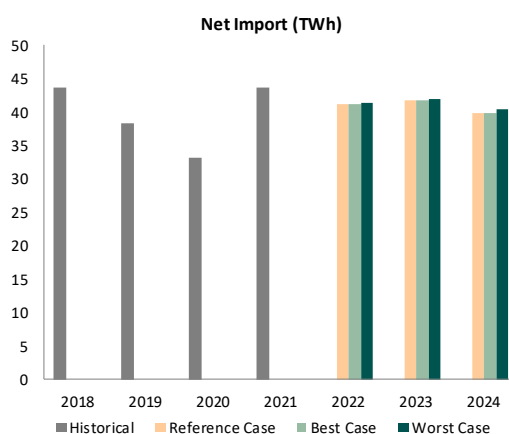
MBS Elaborations



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Hydropower Scarcity Adds to Geopolitical Tensions

Independently from the geopolitical framework, year 2022 thermoelectric generation is favoured by the scarce availability of hydroelectric power plants, with the recent months drought conditions and consequently poor levels of the snowpack expected to reverberated on spring and summer water availability.

Our hydropower output base case scenario just reaches past 40 TWh in 2022, versus a 5-year average close to 45 TWh. Should drought conditions persist over the next months, 2022 hydropower output could total just above 35 TWh³ (low case), while in the event of the rest of the year being particularly rainy, 2022 hydropower production would possibly hit 52 TWh (high case).

A return to normal meteorological conditions would lead to a low-high hydropower production range between 37 and 58 TWh over the next years.

	HYDROPOWER OUTPUT (TWh)			PUN €/MWh			CSS €/MWh		
	Base	High	Low	Base	High	Low	Base	High	Low
2021	46	46	46	125	125	125	5	5	5
2022	41	52	35	212	210	213	-1	-2	0
2023	49	58	37	190	190	192	-2	-3	0
2024	50	59	37	129	128	131	-1	-3	1

MBS Elaborations

Power Generation Contribution to Gas Savings

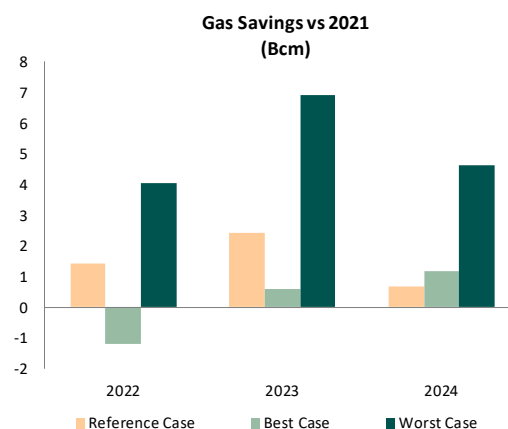
Different combinations of competition levels among fuels in the thermoelectric sector, demand variations, net import and renewable production assumed for our scenarios determine different levels of **gas-fired output and consumption, which were mainly in reduction compared to 2021 levels.**

The table below summarizes the thermoelectrical gas demand expected savings compared to year 2021 (nearly 26 Bcm) consumption in the three geopolitical scenarios described above and depending on the availability of water for hydroelectric production.

	SCENARIOS (Bcm)			HYDRO SENSITIVITY (Bcm)	
	REF	Worst	Best	High	Low
2022	1.4	4.0	-1.2	3.3	0.4
2023	2.4	6.9	0.6	4.0	0.1
2024	0.7	4.6	1.2	2.4	-1.6

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The volume of natural gas saved in the Reference and Worst Case scenarios is driven by extraordinary market conditions pushing coal-fired power plants operation above 4000 EOH. This condition is comparable to pre-switching levels (2015-2017). In our pre-war (Nov-21) scenario, coal-fired production was supposed to be economically phase-out starting from 2023, with year 2021 operation at just 700 EOH.



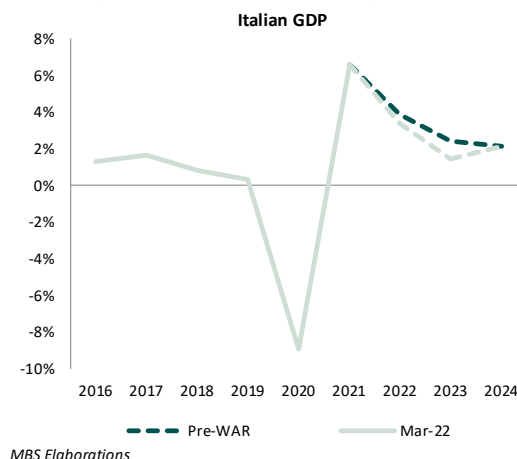
³ High and low hydropower output scenarios are based on monthly output conditions recorded respectively in 2014 and 2017.

ECONOMIC GROWTH AND COMMODITIES OUTLOOK UPDATE

Both the macroeconomic outlook and Brent and coal outlook were revised compared to our latest release ([Macroeconomic and Commodities Outlook Feb 2022](#)) following the recent dramatic events as shown in the charts below. The gas market and the Italian electricity scenarios presented in this report are based on the latter revised economic growth and price forecasts.

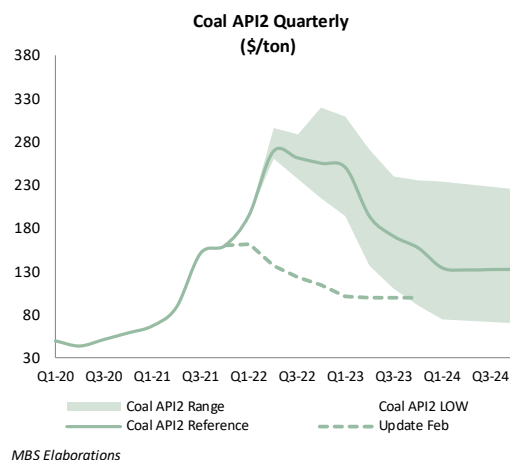
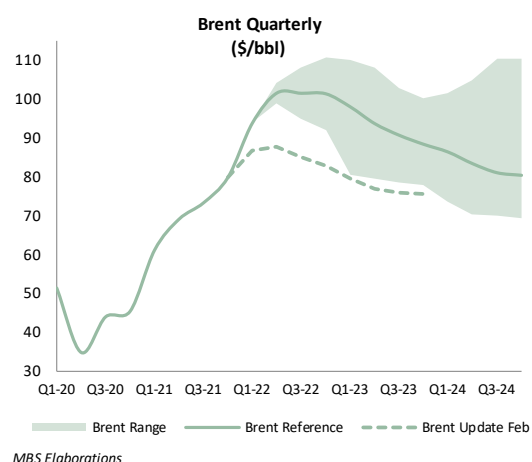
Under the assumption of:

- an agreement between Russia and Ukraine that puts an end to the armed conflict in the coming months
- sanctions being at least partially retrieved, allowing a limited restart of trade
- a gradual recovery of commodities supplies leading prices lower
- despite uncertainty limiting investments and causing a 2-year slowdown, regulation supporting the energy transition



this would have a relatively limited impact on the economic growth, with the **Italian GDP growth revised lower for years 2022 and 2023 to 3.4% and 1.4% respectively** from our pre-War expectations of growth at 3.9% in year 2022 and 2.4% in year 2023. Our revised economic growth Reference forecast is aligned with the BCE most recent outlook. The risk for a further worsening of the geopolitical picture pushing the effective growth rates towards the lower limit of the forecasted range in years 2022 and 2023 is seen as high.

Brent Reference post-war average price for year 2022 is now close to 100 \$/bbl and eases just slightly in year 2023 and 2024 to above 90 \$/bbl and 80 \$/bbl respectively, with a high risk for interruptions of the Russian oil supplies (counting for 30% of the world exports) putting prices under significant upward pressure. The Coal market outlook is also subject to a major revision. The API2 European Reference price for year 2022 is now close to 250 \$/ton and may decline to just below 200 \$/ton in 2023 and to above 130 \$/ton in 2024. The coal market is affected by the geopolitical crisis both directly (Russia is a coal net exporter) and indirectly (coal demand would rise to compensate in the event of Russian gas supplies reductions).



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