ENERGY OUTLOOK

Year VI n°17 - June 2021

LNG and Natural Gas Market Outlook

Osservatorio energia

REF4E

Last year **subdued investments in new liquefaction capacity** weight on supply growth and lead to a more severe that normal number of outages, which will keep the market tight in the short-term should demand stay strong. **The LNG price is expected to maintain a strong correlation with the Oil indexed prices over the next cold seasons**, with the Southwest Europe reference averaging above 20 €/MWh in year 2021.

The LNG market dynamics drive both the European and the Italian gas prices, the PSV also averaging above 20 €/MWh in year 2021. However, A reduction of the LNG arrivals in Europe amid strong Asian demand competition, leaves room for an increase of **gas flows arriving from the south areas, leading to a PSV-TTF spread structurally tighter than its historical average.**

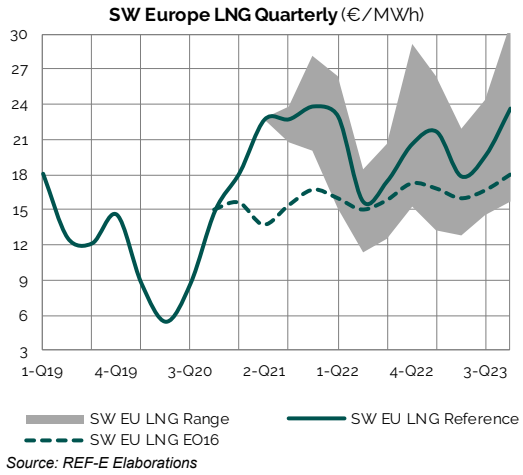
FRAME OF REFERENCE AND METHODOLOGY

The REF-E energy outlook and the special focuses are elaborated by REF-E experts on the base of proprietary suites and market knowledge. Econometric and structural models, as well as our expert sensitiveness and detailed knowledge of regulation, accurate monitoring of market outcomes underlie our elaborations.

A Reference scenario is built to represent the highest probability market equilibrium given the BAU conditions and most likely evolutions of the underlying assumptions (such as known market developments or approved regulatory improvements). A Thermal Renaissance framework refers instead to a scenario where the decarbonisation process slows down significantly or fails in respect to BAU targets while a Green Revolution scenario assumes a very favourable decarbonization framework. Thermal and Green scenarios divergences become more and more evident into the mid to long-term. In a short-term perspective, our High and Low scenarios are respectively characterized by tightening and loosening market conditions (temperatures and climate, market congestions, etc), expected to drive the commodity prices higher or lower.

World LNG Market Dynamics: Chinese Recovery and Supply Shortages

LNG SW Europe Expected Trend



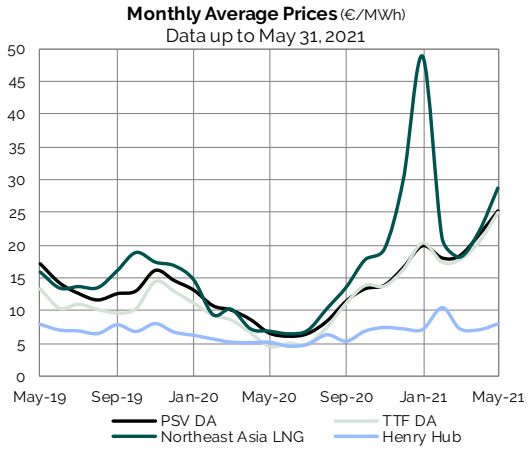
Source: REF-E Elaborations

The 2021 South West Europe LNG average price forecast lies above 20 €/MWh. A 5 €/MWh upward revision compared to our previous update (Global LNG Outlook Feb 2021) follows faster than expect recovery of Asian demand combined with supply side issues.

Year 2022 forecast was revised higher too, with the LNG price now expected to maintain a strong correlation with the Oil indexed prices over the next cold seasons. The *Reference* 2022 yearly average ends up almost 2 €/MWh below year 2021 though, should a gradual demand normalization and under construction projects proceed according to producer's plans.

Last summer Covid-19 related lockdowns and a sharp decline in demand led the Northeast Asian LNG spot price towards an all-time low at 6.5 €/MWh in May 2020. This triggered an unprecedented number of US cargo cancellations throughout the summer season as the European TTF fell towards the U.S. Henry Hub, hitting the U.S. export economics. Twelve months later **the same Asian price is close to 30 €/MWh mainly amid a stronger than expected recovery in Chinese demand, with US LNG exports on track to remain high across the rest of the year.**

Severe demand-supply tensions affected Q1 2021 with a combination of colder than expected temperatures and tight LNG supply which led to record spot price spikes, initially in Asia in early January and then in the US in late February. Over the January cool spell LNG cargoes were diverted from Europe to Asia accelerating withdrawals from European storage sites, while the second cold snap forced the Gulf Coast to stop production and Texas to ban exports. In April, unseasonal lower temperatures boosted gas demand across Europe too, supporting gas prices consequently. This, combined with LNG scarcity attracted pipeline imports from Russia and North Africa. Asian demand for storage injection is expected to remain strong, following last winter market tightness, in tandem with the European one, which may keep prices unseasonably high in both continents.



Source: REF-E Elaborations

Short-Term LNG Supply Dynamics

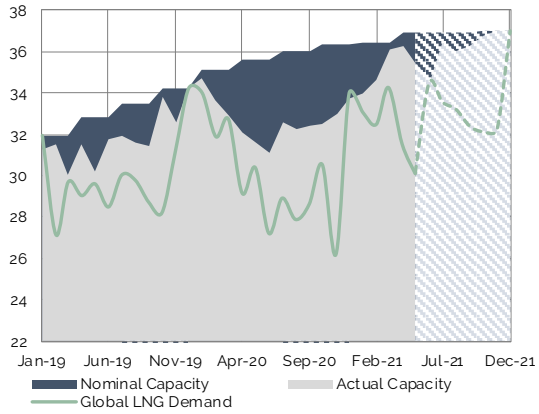
Last year Covid related price drop weighed on investments in new liquefaction capacity, which lead to a slower growth of supply. Moreover, slower than normal maintenance processes in year 2020 is causing a more severe than normal number of outages, due both to disruptions and delayed planned maintenance unfolding till the end of this year.

The actual liquefaction capacity worldwide is in fact going to be 10% lower than the nominal (installed) one on a yearly basis in 2021. The consequent tightness of the market supported the LNG spot prices in the beginning of year 2021 and may keep quotations under pressure in the short-term, should demand remain strong. Should more unplanned disruptions arise over the next summer months, this could reduce the margin between cooling and restocking demand and available supply, putting prices under further pressure:

Most of planned interruptions will affect Australian facilities, with an overall loss in capacity of almost 50 Mt of LNG over the next six months, while more than 15 unavailable Mt of LNG are already scheduled in the US by the end of 2021. Plants mainly involved in Australia are the *Northwest Shelf*, the *Queensland Curtis*, the *Gorgon,* and the *Australia Pacific*, along with the *Corpus Christi LNG* in Texas.

Soaring Asian LNG demand and consequently high spot prices attracted US exports at the expenses of the European continent. LNG imports in Europe fell to 30% of the US destination mix since the beginning of the year, from 45% of the same period in 2020.

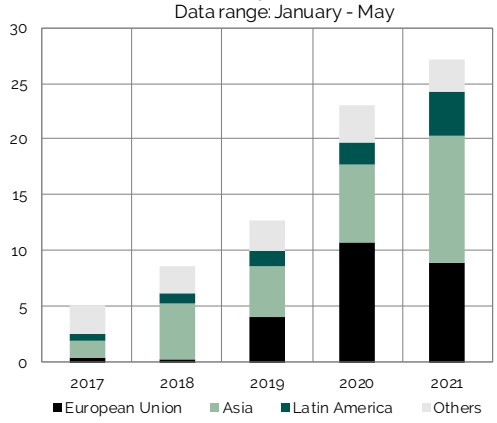
Nominal *vs* Actual Global LNG Capacity
(MT of LNG/Quarter)



Source: REF-E Elaborations

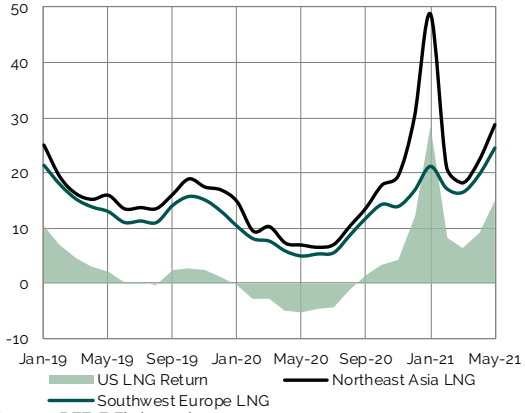
Overall, US LNG exports speeded up, reaching almost 30 Mt of LNG in the first five months of 2021 (+32% compared to the same period last year), with the US LNG producers[1] having more than compensated for the losses they have incurred in between January and Sep-20.

US LNG Export by Destination (MT of LNG)
Data range: January - May



Source: REF-E Elaborations

US LNG Producers Return
(€/MWh)



Source: REF-E Elaborations

[1] US LNG producers' remuneration is here calculated by subtracting shipping costs from the LNG reference prices in Southwest Europe and Northeast Asia.

Liquefaction Capacity Growth

Despite the price's strong recovery, according to the latest available data, **almost 280 Mtpa of liquefaction capacity is still in the pre-FID stage**, with the pandemic effects still visible on the delays across the major exporting countries, mainly in the US.

The biggest exception comes from Qatar which took a Final Investment Decision (FID) on the massive *Phase 1* of its *North Field East LNG* project of 33 Mtpa last February, the world's largest export plant currently under construction which launch is expected in 2026. On the back of the Qatari rush, on 30th March 2021 ***Santos* announced a FID on its second train of the 6.3 Mtpa *Darwin LNG* terminal in Australia**, which will be fueled by the Barossa gas field when the Bayu-Undan one will end production and first output is expected by 2025. Based on recent available information, **the *Plaquemines LNG* export project in Louisiana, US, is the one closer to reach a FID within 2021**. The first 10 Mtpa related to the *Phase-1* of the plant are expected to be operational from 2024, with the possibility to expand the capacity up to 20 Mtpa over the subsequent years. Uncertainty remains as to how many other LNG projects have the concrete possibility of receiving a FID by the end of 2021. The most critical path comes from the US though (and from Texas in particular) where the investment progress in new liquefaction capacity has substantially stopped since the beginning of 2020. Almost 50 Mtpa whose FID was expected for 2021 have already been postponed at least to 2022 mainly in Texas, such as *Texas LNG Brownsville*, *Rio Grande* and *Port Arthur LNG* facilities. A detailed list of liquefaction projects is made in the table below, where new projects and variations of the existing ones are highlighted.

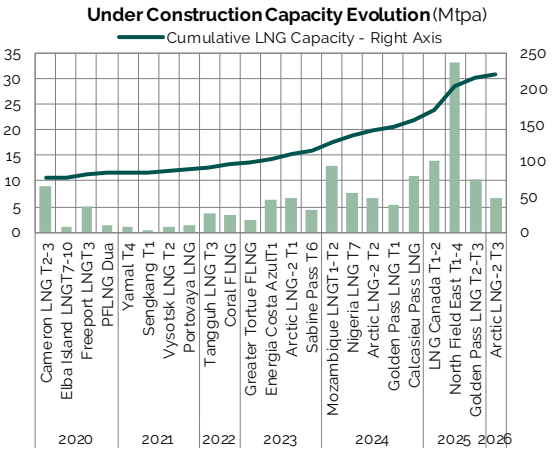
Table 1. Liquefaction Projects in Pre-FID Stage

Country	Plant	Expected FID	Expected Start Year	Capacity (Mtpa)
Australia	**Pluto LNG T2 (Scarborough)**	**2021**	**2026**	**5**
Cameroon	Cameroon FLNG Expansion	Not Defined	2026	1
Canada	Woodfibre LNG	2021	2025	2
Canada	LNG Canada Expansion T3-4	Not Defined	2026	13
Canada	Kitimat LNG	Not Defined	2027	10
Canada	Goldboro LNG T1-2	2021	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 Liberdad T1-2	2021	2024	12
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	Not Defined	2025	10
Russia	Obsky LNG T1	2021	2024	5
USA	**Texas LNG Brownsville T1**	**2022**	**2025**	**2**
USA	**Texas LNG Brownsville T2**	**2022**	**2024**	**2**
USA	**Rio Grande T1-5**	**2022**	**2025**	**27**
USA	**Port Arthur LNG T1-2**	**2022**	**2024**	**11**
USA	Plaquemines LNG Phase-1	2021	2024	10
USA	Magnolia LNG	2021	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	2021	2026	5
USA	Driftwood LNG T1-2	2022	2025	17
USA	Delfin FLNG	2021	2024	13
USA	Cameron LNG T4-5	2021	2026	8
USA	**Annova LNG T1-6**	**Canceled**	**-**	**6**
USA	Alaska LNG T1-3	2021	2025	20
Total				**277**

Source: REF-E Elaborations

Low production costs allow **Qatar to implement an aggressive pricing strategy**: the emirate lowered its LNG price from 14% to 10% of the Brent price and earned new market shares signing long-term contracts with customers from China, Pakistan, and Bangladesh, in line with its expansion goals in the major importing countries in the Asia-Pacific regions. This move is possibly one of the reasons for the persisting delays in the US FID's approvals, with discouraged greenfield initiatives already lagging compared to rivals and grappling with higher production costs. Qatari strategy will in fact be the final straw for some, as shown by the **cancellation of the *Annova LNG* export project in Texas (6 Mtpa) and the suspension of the *Jordan Cove LNG* project (3.9 Mtpa) in Oregon**, the first located on the West Coast and closer to key demand centers in Asia. Furthermore, the decision of the majority shareholders Woodside to exit the proposed *Kitimat LNG* project of 10 Mtpa in Canada suggests an imminent stop of the project.

The worsening of security conditions is instead a major setback for Mozambique, where *Total* suspended construction works at its *Mozambique LNG* site of 13 Mtpa amid rising violent insurgents' attacks in the region from January. No news is so far available on the site restart, but a negative impact on the economic outlook of Mozambique is possible, causing potential delays on the path for the country to become a major LNG producer to rival Australia, Qatar, Russia, and the United States. The new Mozambique LNG facility was so far expected to go online in 2024.

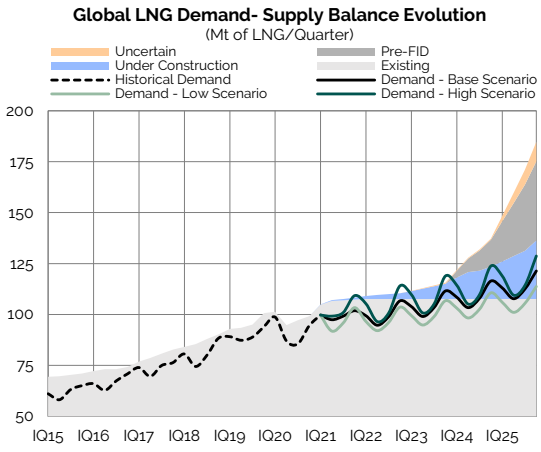


Source: REF-E Elaborations

In Europe, after the fire that hit the Norway's *Hammerfest* facility on September 2020, shipments from the plant will not resume operations until March 2022, a six-month delay compared to the previous expectations of a reopening the next October. The Russian *Novatek* anticipate to 2025 the launch of the third train (6.6 Mtpa) of the *Artic LNG* facility instead.

LNG Demand Perspective

While global LNG supply is destined to remain in the hands of a few big players, global LNG demand is increasingly moving towards greater fragmentation.



The world demand growth is expected to be 9% in 2021 and 1% in 2022, with Asian markets seen as the major driver, in particular China and India, settling around 400 Mt. In addition, emerging LNG importers in Southeast Asia, including Bangladesh, Pakistan and Thailand, which have large population and lower access to energy resources, have a great potential to drive LNG demand growth over the coming years. The gas market liberalization in Brazil could also support an increase in LNG demand in the short to medium-term.

A compression of the potential demand versus available supply margin below 5% is in evidence both in winter 2022 and 2023, which may lead to a significant level of market tightness in the event of colder than average temperatures and/or unexpected supply

outages. Moreover, should new investments be delayed further, then a greater margin squeeze may be seen from year 2023 onwards.

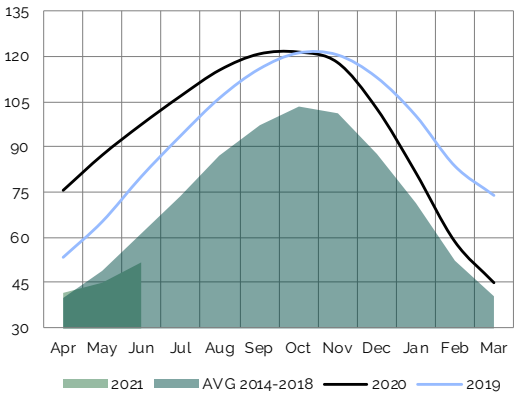
Europe reduced by 20% its LNG intake since the beginning of the year due to strong Chinese demand competition, which was offset by higher pipeline imports (+10%) and strong storage withdrawals. For this summer, we expect to go back towards 2019 levels as injection demand will be strong after a relatively cold winter season. Europe LNG demand is expected around 70 Mt in 2021.

Should Asian demand ease in summer, resulting in a surplus of cargoes, European LNG demand may arise to replenish storage and absorb imports from US. This would reduce the risk of summer cancellations and maintain prices supported. However, competition with Asian buyers is expected to remain high.

The European injections season started slowly compared to 2020, with last year excess having been fully withdrawn by a higher-than average demand across Europe amid prolonged cool temperatures. Sustained gas prices added pressure too, with storage operators on edge for more profitable prices to fill inventories.

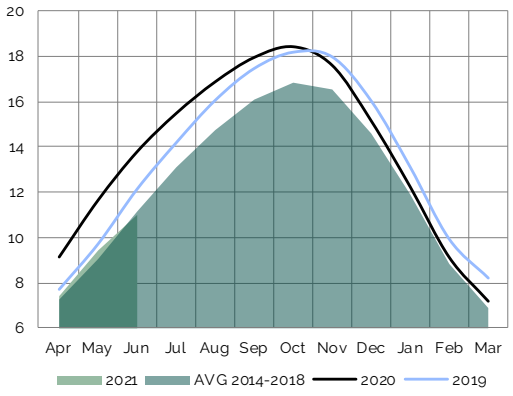
European gas stock's levels are at about 35% of their capacity, nearing 50 Bcm (almost 50% lower than last year now), substantially in line with the 2014-2018 historical average. The Italian regulated ones are now counting about 10 Bcm (22% lower than the same period last year).

European Monthly Average Stock Levels (Bcm)



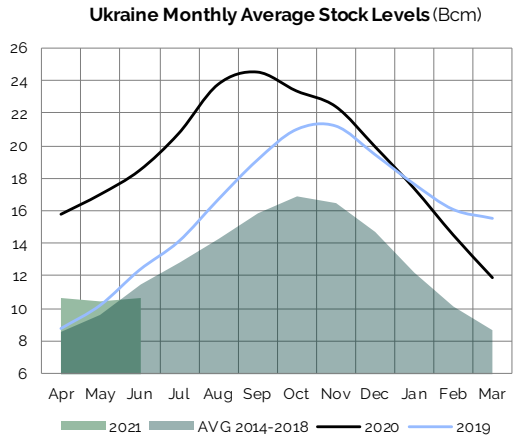
Source: REF-E Elaborations

Italian Monthly Average Stock Levels (Bcm)



Source: REF-E Elaborations

Ukraine Storage and North Stream 2



Source: REF-E Elaborations

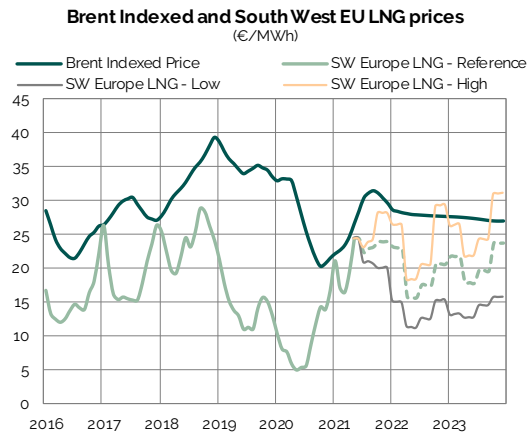
Ukraine gas storage are 40% lower than in 2020 amid low profitable prices, but still in line with the historical average. Unstable relations with Russia could diminish the importance of Ukraine's role for European storage operators, as Russia approaches completion of its *Nord Stream 2* pipeline project.

The *Nord Stream 2* pipeline will double Russia's direct export capacity to Germany as a first entry point in Europe up to 110 Bcm per year. The controversial project is running with an almost two years delate following a series of US sanctions having blocked its funding and construction. The Biden administration removed sanctions on the project completion though, pointing at improving relations with Germany.

Russia completed the first of its double *Nord Stream 2* gas pipelines to Germany, which is now being commissioned to start filling activities on the first leg of the Baltic Sea line. According to available data, less than 80 kilometers remain to be laid, with construction works expected to end within August 2021 and first commercial operations by the end of the year.

The *Nord Stream 2* could divert Russian flows to Europe away from Ukraine, depriving it of lucrative transit revenues and increasing the continent's dependence on Russian gas. Germany will likely play a key role acting as an intermediary between Moscow and Kiev to ensure that Ukraine keeps receiving the transit fees though. The existing transit agreement will be in force until 2024 wit the possibility to extend it to 2034. The Kremlin seems to have accepted it, although Putin having already said that transit fees will be lower than the actual ones after 2024.

European Gas Prices Reflect the LNG Dynamics



Source: REF-E Elaborations

The recent gas market developments show a very strong correlation between the European LNG price reference (LNG Southwest Europe) with the European hubs gas prices.

In the event of supply shortages, the LNG price tends to gain correlation with the Oil Indexed formulas, as it happened last January, when the LNG demand was slightly higher than the actual available capacity net of the observed outages.

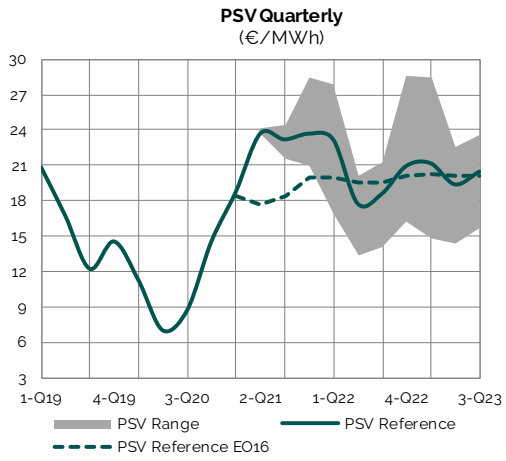
The lower bound of the SW Europe LNG price reflects a wide available margin between demand and supply (Low scenario). The upper bound (High scenario) represents instead a low-capacity scenario that must face the market demand.

The LNG price in the Southwest Europe area is now settling just below 25 €/MWh. Under the base case hypothesis of a gradual demand normalization and projects under construction

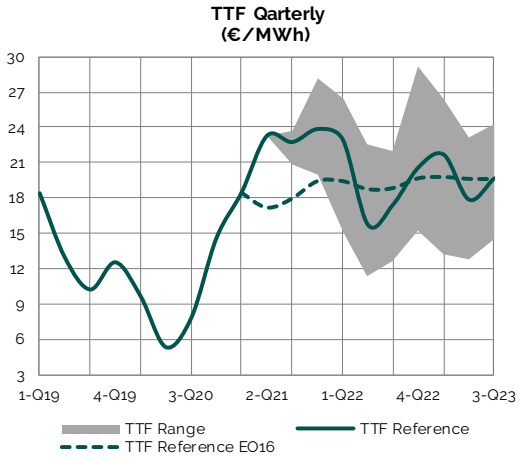
proceeding according to the producers' plans, **our expectations are for the European reference price for year 2021 averaging near 22 €/MWh.** However, in the event of supply shortages and/or higher than normal demand, prices my spike up to average 28 €/MWh in year 2021.

The LNG market path influences the Italian equilibrium too, which reflects on the PSV gas price trend, especially in the short term.

PSV and TTF Expected Trends



Source: REF-E Elaborations



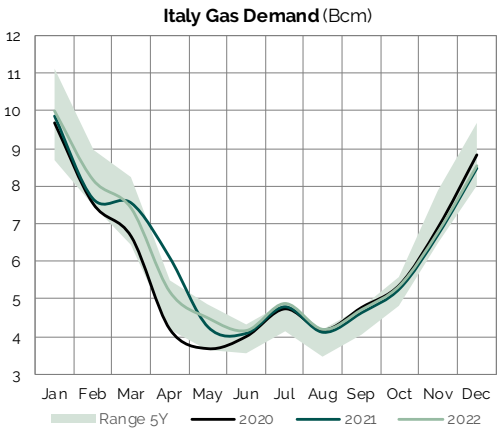
Source: REF-E Elaborations

In our previous update (Natural Gas Market Outlook Mar 2021) we expected the PSV gradual recovery towards historical average values, already a significative gain compared to 2020 record low prices. Soaring LNG prices over Q1 and Q2-21 related to non-structural events pulled our 2021 *Reference* PSV price almost 4 €/MWh higher than the previous forecast, just above 22 €/MWh on average. Year 2022 could settle around 20 €/MWh, based on the assumptions of a gradual normalization of market fundamentals.

Higher gas demand and LNG prices characterize our *High* scenario, pulling the average PSV gas price around 24 €/MWh in 2021 and 2022. Should higher than average temperature ease gas demand over the next winter months, along with low LNG prices, the PSV could settle below 20 €/MWh over the next couple of years though.

Italian Gas Demand

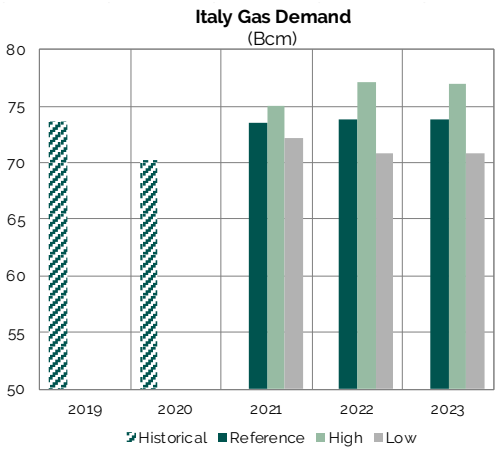
2021 cumulative Italian gas demand is now close to 37 Bcm, higher than both the same period in 2020 (+11%) and the 2015-2019 historical average (+5%), back in line with pre-crisis level over the same period hence. Colder than average temperatures boosted the distribution network consumption and the thermoelectric too. A slow economic recovery drives the industrial gas demand though, which is almost 2% higher than the 2015-2019 average over the same period.



Source: REF-E Elaborations

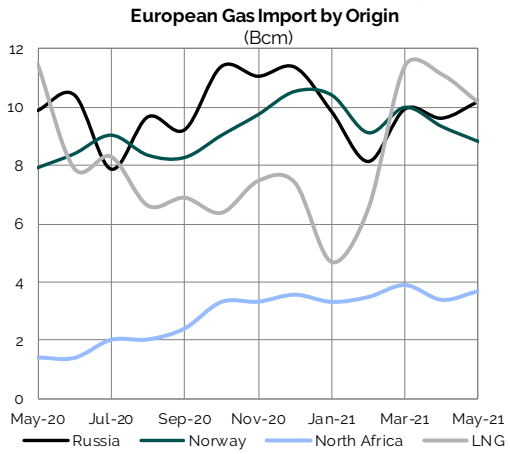
The Italian gas demand is expected to grow by nearly 4% y/y in 2021 (above 73 Bcm) and an additional 0.5% y/y in 2022. An upward revision of almost 1% y/y compared to our previous forecast due to the recovery already recorded in recent months mainly thanks to low temperatures.

In our *Reference* scenario, the industrial gas consumption recovery forecast (+4% y/y compared to 2020) is based on GDP growth expectations along with a normalization of thermoelectric and distribution network gas consumption, under the base case assumptions of temperatures remaining in line with seasonal averages. The *High* scenario materializes in the event of colder than average temperatures and lower contribution of renewables sources (hydroelectric power in particular) and high CO2 prices. The *Low* one is driven by higher temperatures and RES-E, lower electricity demand and a greater use of imports.



Source: REF-E Elaborations

Import Mix and Spread Impact



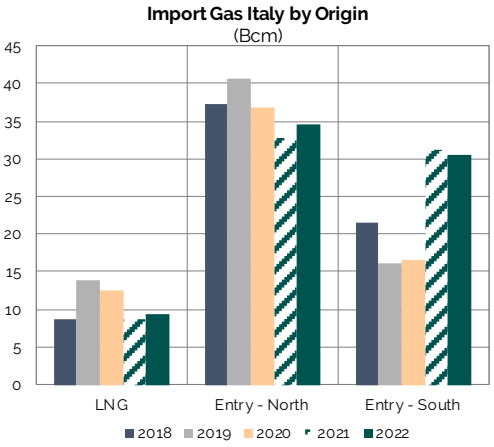
Source: REF-E Elaborations

European pipeline imports since January rose by 10% compared to the same period in 2020, with Russia dominating the import mix.

Southern Europe countries benefit from gas flows arriving from North African exporters instead, such as Algeria and Libya. **Gas flows arriving from the south areas are becoming more and more relevant over the coming years, increasing liquidity at the Italian PSV and closing the PSV-TTF spread further**. However, Russia remains the major supplier for Europe and Italy too.

Since the beginning of the year, **Italian gas imports are 16% higher compared to the same period last year**, with continued cold weather having been supportive. The cumulative 2021 **LNG imports in Italy are 12% lower compared to the same period in 2020 though and could remain around 10 Bcm within 2021.** Algerian gas flows, which price is supposed to be oil-linked, more than offset the LNG scarcity, along with Azerbaijani flows arriving via *Trans Adriatic Pipeline* (TAP) already exceeding 2 Bcm and possibly reaching 4 Bcm in 2021.

In our *Reference* scenario arrivals from the northern areas will be driven by the **predominance of Russian flows, covering almost 40% of the import mix even after 2022,**



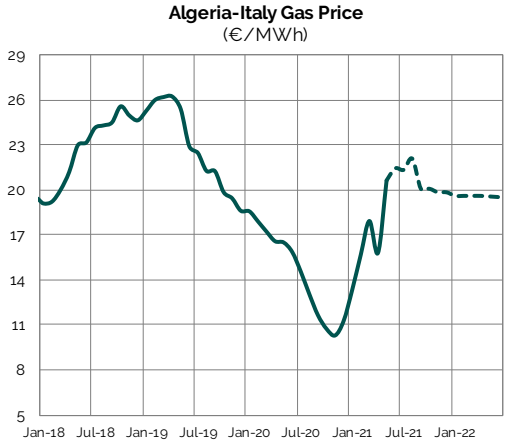
Source: REF-E Elaborations

with natural gas sales around 30 Bcm on average. The gradual closure of the PSV-TTF spread, which could average around 0.5 €/MWh by 2023, with the increasing importance of TAP and Algerian flows being supportive.

In our *High* scenario the PSV-TTF spread can go just above 1 €/MWh since 2022, staying partially capped by the TAP effect though. Contrariwise, in our *Low* scenario, spot LNG imports and flows from Northern entries become more profitable, widening the PSV-TTF spread around 1.5 €/MWh on average.

Algeria

North African gas supply contracts remain dominated by the Brent price indexation. Algeria is the main supplier representing almost 90% of North African exports (with Libya making up the balance) quite fairly split between Italy and Spain.



Source: REF-E Elaborations

Algeria supplies proved to be very flexible and key in determining the Italian gas import mix, representing almost 90% of North African exports (Libya makes up the balance) split between Italy and Spain. With the Algerian prices possibly having a 6-months lagged indexation to oil prices, in 2020 when European gas hub prices dropped at their minimum historical lows, flows from Algeria decreased too, favoring those from Russia and Northern areas instead due to competitive TTF. **In 2021, while gas prices soared, oil-indexed contract prices remained low, given the 6 months lag. This led to a significant increase of the Algerian imports to Italy and Spain since the beginning of the year**, being 2.2 Bcm (+195%) and 1.4 Bcm (+145%) higher than the same period in 2020, respectively.

High flows are likely to continue through 2021, possibly slowing their growth rate by 2022. **The close implementation of the new hydrocarbon law could encourage a new wave of upstream investments and support exports too, by offering improved fiscal regimes for investors.** This reform seeks to re-energize the domestic oil and gas sector affected by decreasing production due to aging fields and potential decrease in oil prices.

DIRETTORE OSSERVATORIO ENERGIA
Claudia Checchi

COORDINAMENTO
Simona Soci

GRUPPO DI LAVORO
Virginia Canazza, Silvia Checola, Giacomo Ciapponi, Paolo Ciliento, Federico Clementi, Elena Ferri, Tommaso Franci, Ana Georgieva,
Valeria Ghirardi, Giuseppe Maggiulli, Paolo Marino, Marco Pellegrino, Giorgio Perico, Greta Sala,
Ralph Sassun, Alejandro Sanchez Ben

EDITORE
REF-E srl u.s.
Via Gioberti 5 - 20123 Milano
www.ref-e.com - info@ref-e.com

PRESIDENTE
Pia Saraceno

SEGRETERIA, EDITING E GRAFICI
Dalia Imperatori
Tel. +39 02 43441022- Fax +39 02 43441027
E-mail: dalia.imperatori@ref-e.com

SOTTOSCRITTORI
A2A SPA, ACEGAS APS AMGA, ACEA ENERGIA SPA, AET AZIENDA ELETTRICA TICINESE, AXPO ITALIA SPA, CSEA CASSA PER I SERVIZI ENERGETICI E AMBIENTALI, CVA TRADING SRL, DOLOMITI ENERGIA SPA, E.ON ITALIA SPA, EDISON SPA, ENGIE ITALIA, ENI GAS E LUCE SPA, EP PRODUZIONE SPA, ERG POWER GENERATION, HERA TRADING SRL, IREN SPA, REPOWER ITALIA SPA, SR INVESTIMENTI, SHELL ITALIA SPA, SORGENIA SPA, TENARIS DALMINE, TERNA SPA, TIRRENO POWER SPA

REF-E SRL u.s.
Via Vincenzo Gioberti 5 – 20123 Milano
info@ref-e.com – www.ref-e.com