## The Spanish Gas System





Report 20**21** 



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Some published data are subject to change, as they are provisional data at the close of this report. In the event of any discrepancy, the SL-ATR information prevails.



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## A benchmark system with 100% availability

In 2021, the Spanish Gas System operated normally and with 100% availability 24 hours a day, every day of the year.

Total natural gas consumption reached 378.4 TWh, 5% higher than in 2020, driven mainly by a recovery in economic activity.

Conventional demand, for household, commercial and industrial consumption, which represents around 76% of the total demand, grew by 6% compared to the previous year, reaching 288 TWh. This increase has been motivated by the recovery of the economic activity, which has led to greater industrial demand, as well as due to colder temperatures at the beginning of the year with Storm Filomena.

## 378.4 TWh

Total natural gas consumption (**+5%** vs. 2020), driven primarily by a recovery of economic activity

Demand for electricity generation has also experienced growth. Compared to 2020, it has increased by 2% to 90 TWh, mainly due to a lower contribution from hydro and nuclear production.

The recovery of economic activity in 2021 has also been framed in a context of high energy prices, with an impact on industries and households. This volatile situation in the energy markets has reinforced the importance of energy supply security.

In this regard, it should be noted that the infrastructure network of the Spanish Gas System has, for decades, been a European benchmark for the diversification of its supply sources. The System has six operational regasification plants, which in 2021 received liquefied natural gas (LNG) from 14 different sources. LNG supply accounted for 54% of Spain's gas supply.

The system also has international gas connections with Portugal, France and Algeria. On 31 October, the latter country terminated the contract under which it supplied natural gas to Spain via Morocco. The Spanish Gas System, a European benchmark in terms of **supply diversification**, has six regasification plants that received LNG from 14 **different sources** in 2021



The situation has led to additional exceptional measures that, in coordination with the Spanish Ministry for the Ecological Transition and the Demographic Challenge, were taken to reinforce the security of the system. One of them is the awarding of additional slots at Spanish regasification plants. Thus, in October an additional auction of 23 slots was held to add to the 22 slots allocated in September. In total, 45 slots have been awarded in addition to those initially planned for the following twelve months, a measure supported by market players.

The Spanish

Gas System Report 2021

Thanks to the anticipation measures adopted, the Spanish Gas System began its winter campaign with higher levels of contracted natural gas capacity than in previous winters.

Enagás, as the Technical Manager of the System, is in permanent coordination with the Operator of the Electricity System, Red Eléctrica. Lastly, a reference to the regulatory advances that have been made in the field of renewable gases with the aim of promoting their development. In Spain, the Climate Change and Energy Transition Law, approved in May 2021, promotes renewable gases, biogas, biomethane and hydrogen and other alternative fuels.

Also noteworthy are the Hydrogen Roadmap, approved in October 2020; the Biogas Roadmap, which went out for public information in September 2021; and at European level, the 'Fit for 55' package, presented by the European Commission in July 2021.

In order to achieve climate neutrality objectives, both at national and European level, the role of existing infrastructures and the integration of renewable gases in the gas system will be fundamental. These infrastructures are also essential to guarantee the correct operation of the system and the security of the energy supply. In 2021, there have been regulatory advances in the field of renewable gases, such as the approval of the **Climate Change and Energy Transition Law** and the publication of the **Biogas Roadmap** 

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Slots allocated in September and October in addition to those initially planned for the following twelve months to reinforce the security of the system



**840** Long-term capacity auctions **54%** LNG supply

**95** PVB balancing actions (and 50 TVB/AVB imbalance management actions)

**100%** LNG storage contracting at TV (last quarter) **16** Countries supplying natural gas to the Spanish Gas System





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## 1 / Demand

National gas demand reached **378.4 TWh, 5.1% more** than in 2020 and 9.2% higher than the average of the last ten years.





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## Key figures

In 2021, the national gas demand reached 378.4 TWh, which is 5.1% more than the figure recorded in 2020. This growth has been driven primarily by the recovery in economic activity.

Gas demand in 2021 was 9.2% higher than the average for the last ten years. For its part, the compound annual rate for the 2016-2021 period has been above 3.1%, consolidating the growing relevance of natural gas in the national energy context over the last few years.

## 378.4 TWh

National gas demand in 2021, up 5.1% compared to 2020 and 9.2% higher than the average of the last ten years

#### Annual natural gas demand

TWh	2021	2020		2021 vs. 2020
	Y-E forecast	Actual	TWh	(%)
Conventional	288.1	271.2	16.8	+6.2%
DC/SMEs	60.4	56.4	3.9	+6.9%
Industrial	213.2	201.4	11.8	+5.9%
LNG trucks	14.5	13.4	1.1	+8.5%
Electricity service	90.4	88.9	1.5	+1.6%
Total national demand	378.4	360.1	18.3	+5.1%

#### Natural gas demand in 2021





TWh/year

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## Annual evolution of natural gas demand

Conventional market
 Electricity market

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The Autonomous Communities that reported the highest consumption of natural gas in 2021 were Catalonia, Valencia, Andalusia and Madrid. Between them they account for almost half of the total consumption of natural gas in Spain.

All the Autonomous Communities recorded increases in consumption in 2021 compared to the previous year, with the exception of Castilla-La Mancha, which fell by 0.4 TWh in absolute value (-3%).

#### Total emission gas demand by communities (2021 vs. 2020)





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## Evolution of annual demand peaks



#### Winter 2020-2021: Storm Filomena (cold wave)

**Reference temperature** 

# of the Gas System

Daily peaks reached in 2021 were:

→ Total national demand: 1,792 GWh/day (30/11)

- → Conventional demand: 1,298 GWh/day (12/01)
- → Electricity sector demand: 742 GWh/day (30/11)

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The cold wave associated with Storm Filomena caused an extraordinary increase in demand of 3,760 GWh between 1-17 January, compared to the values expected under normal temperature conditions:

- **2,854 GWh** in the domestic-commercial and SME sector (including tanker trucks)
- 906 GWh in the industrial sector

On 12 January 2021, a new conventional demand record was registered, reaching 1,298 GWh/d and surpassing the previous maximum value of 1,249 GWh/d recorded on 3 February 2012.



Extraordinary increase in demand between 1-17 January 2021 (vs. forecast values under normal temperature conditions)

#### Record demand during the cold wave -Storm Filomena





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## Conventional gas demand

Throughout 2021, the conventional sector recorded 288.1 TWh, up 6.2% compared to the previous year. This value represents the highest consumption in the conventional sector in the historical series. Adjusted for labour and temperature effects, the increase would have been 4.8%.

This increase has been widespread in both the domesticcommercial and SME sector and in the industrial segment with figures of +6.9% and +5.9%, respectively, compared to 2020.

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#### DC/SMEs

In 2021, demand for natural gas in the domestic-commercial and SME market grew by 3.9 TWh (+6.9%) compared to the previous year. This decrease was due to the effect of temperatures, which were colder than in 2020.

The variation in the domestic-commercial sector was driven by two factors:

- → 18,000 new customers, an increase of 0.1 TWh.
- → Colder temperatures than in 2020.



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→ Labour

0%

#### **Domestic-commercial and SME sector**



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#### Variation factors in the domestic-commercial sector

1.		New customers ≈ 18,000 new customers 7.55 MWh average unit consumption						nption	≈ +0.1 T						Wh/y				
TWh	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	• Very wa	rm C	old erv.cold
Unit consumption	8.7	9.2	9.3	8.6	9.7	8.7	8.9	8.8	7.6	7.9	8.2	8.0	8.4	7.6	7.1	7.6	<ul> <li>Normal</li> </ul>	• • •	
2.		Tem	perat	ures			Jan, Rest	, <b>Apr, N</b> t <b>,</b> rema	<b>/lay, Ju</b> l iining w	l <b>, Oct, N</b> /armer t	<b>ov</b> cold empera	er temp tures ir	peratur า 2021	es in 20	)21		≈+3	.8 T V	Vh/y
Reference tempera of the Gas System 	ature		30°C 25°C 20°C																
			15°C 10°C 5°C 0°C -															<u> </u>	
Cold/hot rating			J	lan	Feb	Mar	A	pr	May	Jun	Ju	ıl .	Aug	Sept	Oc	t ľ	Nov D	ec	2021
Σ°C for excess			4	1.4	75.7	24.1	8	3.0	21.8	29.4	14.	9	27.3	18.0	18.	6	3.7 50	5.0	338.9
Σ °C by default			-9	1.7	0.0	-23.3	-30	0.0	-29.9	-29.3	-31.	3 -	19.4	-15.1	-24.	6 -4	19.3 -	7.9	-351.6
Change			-50	0.3	15.7	0.8	-22	2.0	-8.1	0.1	-16.4	4	7.9	3.0	-6.	0 -4	5.5 48	8.1	-12.7

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#### Industrial demand

Gas consumption in the industrial sector recorded 213.2 TWh in 2021, up 11.8 TWh compared to 2020. This increase in gas demand for the industrial market has been generalised across all sectors except for refining.

The evolution of industrial demand, as represented in the following figure on the evolution of IGIG<sup>1</sup>, has grown strongly at the end of the first quarter of 2021, compared to the contraction of demand in the previous year due to the containment measures motivated by the COVID-19 pandemic. Immediately after the first quarter, the difference in growth compared to the previous year narrowed, and by the end of the year, the year-on-year rate had reached positive values of 1%.

#### **213.2 TWh** Gas consumption in the

industrial sector (+11.8 TWh vs. 2020)

#### Annual consumption of natural gas by industrial sector

TWh/year	2021	% vs. 2020
Agri-food	22.1	5.3%
Construction	26.5	17.8%
Electricity	28.0	3.0%
Metallurgy	15.5	9.1%
Paper	15.9	2.5%
Chemistry/Pharmaceuticals	28.3	0.5%
Refining	39.1	0.6%
Other industry	19.5	8.2%
Services	13.1	13.1%
Textile	2.2	6.3%
Other	1.2	3.0%



<sup>&</sup>lt;sup>1</sup> The Large Industrial Gas Consumers Index (IGIG), which began to be published by the Technical Manager of the System in 2015, shows the evolution of gas consumption of the main gas-consuming industries for the ten most intensive industrial sectors in the use of this fuel.

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#### Large Gas Consumers Index evolution





#### Daily industrial demand

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#### Tanker trucks

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Gas consumption by LNG tankers increased in 2021 and amounted to 14.5 TWh/year (50,285 tankers loaded), an increase of 1.1 TWh/year compared to 2020. Barcelona was the busiest loading plant in 2021, followed by Cartagena and Huelva.

By autonomous region, the largest increase was in Andalusia (+0.23 TWh/year), followed by Castilla-La Mancha (+0.18 TWh/year).

#### Annual demand for tankers by community (2021 vs. 2020)



Mugardos
 1.4 TWh/year
 4.7 thousand loads
 36% Fut

→ Huelva 3.1 TWh/year 10.6 thousand loads 49% F<sub>ut</sub>

Cartagena
 3.1 TWh/year
 10.9 thousand loads
 49% F<sub>ut</sub>

3.9 thousand loads 62% Fut → Sagunto

2.2 TWh/year 7.8 thousand loads **58%** F<sub>ut</sub>

 $\rightarrow$  Barcelona

56% Fut

→ Bilbao

3.5 TWh/year

1.1 TWh/year

12.3 thousand loads



## 14.5 TWh/year

Gas consumption by LNG tanker trucks (+1.1 TWh/year vs. 2020)







#### National and international presence of LNG tanker trucks

2021 closed with 1,528 active satellite plant destinations, up 3.7% compared to 2020 (55 more destinations). In addition to the national territory, the Spanish Gas System has supplied tankers to 107 destinations abroad.

**1,528** Total number of destinations (+55 destinations vs. 2020)

**107** Number of foreign destinations (+7 vs. 2020)

#### Tanker destinations by regasification plant



Mugardos
Huelva
Sagunto

• Cartagena • Bilbao





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#### Gas demand for transportation

Demand for natural gas in the transportation sector has managed to maintain the increase in consumption of recent years. During 2021, the figure reached 3.8 TWh/year, with approximately three quarters of the total going to land transport and one quarter to maritime transport.

#### Land transportation

The monitored annual consumption of gas vehicles in Spain has posted an increase of 28% compared to 2020 to reach 2.81 TWh/year (0.919 tankers + 1.89 TWh.) In 2021, the autonomous communities with the highest consumption of natural gas for land transport were the Community of Madrid and Catalonia.

#### Maritime transport

Throughout 2021, 0.98<sup>2</sup> TWh/year were supplied for maritime transport, of which 0.01 TWh corresponded to bunkering supplies carried out in four pipe-to-ship (PTS<sup>3</sup>) operations and 0.33 TWh corresponded to LNG bunkering in 24 ship-to-ship (STS<sup>4</sup>) operations from supply barges. The remaining 0.64 TWh/year were supplied by LNG tankers, with 2,206 tankers in truck-to-ship (TTS<sup>5</sup>) and multi-truck-to-ship (MTTS<sup>6</sup>) operations.

#### LNG tanker supply for maritime transport





<sup>&</sup>lt;sup>2</sup> STS and PTS operations information provided by GASNAM.

<sup>&</sup>lt;sup>3</sup> Pipe-to-ship (PTS) supplies are made directly by connecting flexible hoses from either small or large scale LNG terminals. <sup>4</sup> If the LNG supply is carried out by another vessel, this is a ship-to-ship (STS) operation.

<sup>&</sup>lt;sup>5</sup> The truck-to-ship (TTS) process is based on the supply of LNG to the ship from a tanker truck that is placed on the quay where the ship is berthed.

<sup>&</sup>lt;sup>6</sup> When several tankers are involved in the same LNG refuelling operation simultaneously, the process is called multi-truck-toship (MTTS).



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## Gas demand for the electricity sector

In 2021, gas deliveries to the electricity sector have accumulated 90.4 TWh. This figure is 1.7% higher than the one in 2020, mainly due to a lower production of hydraulic energy and less availability of nuclear generation.

The installed capacity of the electricity generation in Spain remained similar to that of the previous year. Throughout 2021 there has been a further 3.2 GW increase of renewable power, comprising an additional 535 MW of wind and 2,724 MW of solar PV capacity.

#### Gas deliveries for electricity generation



Gas deliveries for electricity generation
 Difference from previous year

#### **90.4 TWh** Gas deliveries for the electricity

sector (+1.7% vs. 2020)





#### Mainland installed electrical power (31 Dec 2021)





The demand for electricity in Spain, according to REE year-end data, increased by 2.5% in 2021 compared to the previous year.

The technologies that have provided the greatest coverage of demand have been wind power, with 24%, ahead even of nuclear generation, with 22%, followed closely by combined cycle in third place, with coverage of 15%.

The most significant variations with respect to the previous year were as follows:

- The increase in solar and wind production, which have increased their share by 30% and 10%, respectively. The two technologies added up to an increase of 11.1 TWh.
- **The of imports** in international trade. 2021 closed for the fifth consecutive year with an import balance, albeit with a notable decrease to 0.9 TWh, a third of that of 2020.





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#### **Balance of annual electricity**

TWh (e)	2020	2021
Electricity demand	236.5	242.5
Wind	53.8	59.2
Hydraulic	33.3	32.1
Solar	19.4	25.2
Other renewables	33.9	33.7
CHP (cogeneration)	26.9	26.1
Other	7.0	7.6
Thermal gap	43.2	42.7
Coal	4.8	4.9
Gas	38.4	37.7
% gas in TG	89%	88%
Nuclear	55.8	54.1
International balances	3.3 import	0.9 import





#### Source: REE.





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## European comparison of natural gas demand

Total natural gas demand fell in Italy (-0.3%) and Portugal (-5%), while in Spain, France and the United Kingdom it increased by 5.1%, 7% and 4.8%, respectively.



#### Total natural gas demand by country (change 2021 vs. 2020)

Conventional
 Electricity

Source: Prepared by the authors based on data from Snam, GRTgaz, REN, Teréga and National Grid.



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## 2 / Markets and contracting

In 2021, prices in the main European hubs have been characterised by volatility. In terms of contracting in the Spanish system, the Virtual Tank storage service was particularly noteworthy, with levels close to 100% in the last quarter.







## International situation

The prices of the main European hubs have been characterised by volatility during 2021. The year began with the effects in Spain of Storm Filomena, Algerian gas restrictions and a cold snap in Asia that managed to divert ships to its market, raising freight rates to around 300,000 dollars per day.

The start of the year drove prices in Spain to record highs. In Europe, these prices were exceeded throughout the year amid concerns about the level of underground gas storages and the evolution of Russian supplies, reaching record highs on 22 December 2021.



#### History of prices in the main European hubs and JKM

Source: Prepared by the authors based on EEX, MAREX SPECTRON, GME and MIBGAS.



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#### Evolution of prices in the main European hubs and JKM



Source: Prepared by the authors based on EEX, MAREX SPECTRON, GME and MIBGAS.

## MS-ATR

In 2021, 224,574 bilateral OTC transactions were recorded on the MS-ATR platform, representing a registered volume of 943,036 GWh. Compared to the previous year, the number of transactions fell by 13.5%. However, driven by transactions at TVB (regasification plants), the volume exchanged has grown by 25.6%.

It should be noted that the volume recorded in PVB was 342,017 GWh, 94% of the System's total demand.

In the case of TVB, trading has exceeded expectations, with a total of 598,098 GWh, representing 259% of the total annual volume unloaded at plants.

#### **Bilateral transactions**



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#### Volume exchanged and number of operations





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## The role of the GTS in the Organised Market

Law 8/2015 recognised the Technical Manager of the System (GTS) as a participant in the Organised Gas Market.

In 2021, the GTS went to the market in the cases provided for by the legislation in force.

As established in the Balancing Circular (Circular 2/2020 of 9 January), the GTS is responsible for maintaining the transmission network of the Gas System within normal operating limits. For this purpose, it may perform the so-called balancing actions in PVB and imbalance management in TVB and AVB.

In addition, according to Order IET/2736/2015, of 17 December, which establishes the tolls and fees associated with third-party access to gas facilities and the remuneration of regulated activities for 2016, the operating gas paid for by the System must be acquired by the Technical Manager of the System on the Organised Gas Market.

The participation of the GTS in the Market is necessary to maintain a secure Gas System and an efficient, advanced and competent operation.

#### Balancing actions in PVB

The Resolution of 28 September 2016, from the Directorate General for Energy Policy and Mines, which approves the detail protocol PD-18 "Technical parameters that determine the normal operation of the transmission grid and the performance of balancing actions at the Virtual Balancing Point by the Technical Manager of the System", defines the values and methodology for calculating the parameters of the transmission network necessary to identify the operating status of the grid, to manage the operational balance of the grid and to perform balancing actions at the Virtual Balancing Point.

A balancing action in PVB is an action taken by the GTS to maintain the transmission and distribution networks within their operational and stock limits, excluding actions related to gas losses and gas used by GTS to operate the transmission network.

In 2021, the intervention of the GTS has been necessary 23% of the total days of the year.

The following tables summarise the balancing actions that have been necessary to be addressed by the GTS in compliance with the prevailing regulations in 2021.

#### Purchasing

(€/MWh)			
Balancing actions	39	Max. price 22/12/2021	177.15
Quantity	1,515,955	Average price	69.53
Cost	€105,409,373.88	Min. price (11/03/2021)	18.13

#### Sales

(€/MWh)			
Balancing actions	56	Max. price 24/12/2021	108
Quantity	-2,361,672	Average price	49.2
Cost	-116,193,441.89	Min. price 21/02/2021	15.02



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The following figure illustrates the temporal distribution of the balancing actions throughout the year together with evolution of the system status.

#### Volume traded and number of balancing actions in PVB



## Temporal distribution of balancing actions and evolution of the System's status





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#### Management of imbalances in TVB and AVB

The management of imbalances in plants and underground gas storages began as of 1 October 2021 with the entry into force of CNMC Circular 2/2020.

Following the entry into force and with the existence of the storage service in regasification plants, any imbalance due to excess in both underground gas storages and in plants is resolved by automatic contracting in the event that there is storage capacity available and the imbalanced user has sufficient guarantees to meet this contracting. Otherwise, and also in the event that the imbalance is negative, the GTS will go to the Organised Market to perform imbalance management.

The following tables summarise the imbalance management that has been necessary to be addressed by the GTS in compliance with the regulations in force during 2021.

#### Purchasing

(€/MWh)			
Balancing actions	36	Max. price 22/12/2021	175
Quantity	20,025	Average price	60.57
Cost	€1,212,996.36	Min. price (26/01/2021)	22.60

#### **Sales**

(€/MWh)			
Balancing actions	14	Max. price 13/12/2021	115.80
Quantity	-49,631	Average price	83.25
Cost	€-4,131,722.00	Min. price (23/02/2021)	15.80





The following figure summarises in monthly detail the number and amounts purchased or sold by the GTS as imbalance management.

#### Volume traded and actions in imbalance management at TVB/AVB



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## Operating gas

Under current legislation, in 2021 the GTS acquired 1,091,354 MWh of operating gas on the Organised Market at an average price of €55.06/MWh.

## 1,091,354 MWh

Operating gas purchased on the Organised Market

#### Volume and price of operating gas



• Volumes of operating gas defrayed • Defrayed operation gas reference price



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## Guarantees in the Gas System

The Spanish Gas System establishes a system of guarantees for users to meet their obligations to pay service contract toll invoices and imbalance surcharges in accordance with the regulations of the CNMC.

The calculation and management of guarantees in contracting and imbalance activities are carried out by the Technical Manager of the System and are notified to the affected user and to the Guarantees Manager.

#### Guarantees for imbalances

CNMC Circular 2/2020, which establishes the natural gas balancing rules, imposes a guarantee regime to cover the risk of non-payment of imbalance surcharges.

Users with a balancing portfolio must have guarantees to cover their level of risk, which takes into account both the user's operating situation and its net debit or credit position with respect to imbalance surcharges.

#### Most relevant indicators of guarantees for imbalances



#### **Guarantees for imbalances**







## Guarantees for capacity contracting

CNMC Circular 8/2019, which establishes the methodology and conditions for access and capacity allocation in the natural gas system, imposes a system of guarantees to cover possible non-payment of fees and tolls for capacity contracts.

The availability of guarantees is a prerequisite to requesting capacity, submitting a bid for an auction and entering into capacity contracts.

#### Most relevant indicators of guarantees for capacity contracting

 648.0 million euros
 526.9 million euros
 576.6 million euros

 Maximum guarantees
 Minimum guarantees
 Average guarantees

#### **Guarantees for capacity contracting**





## Authorisation and access to the Gas System

During 2021 new users have joined the Framework Contract for Access to the Gas System Facilities and the Balance Portfolio Framework Contract.

Thus, as of 31 December 2021:

- **232** users have formalised their adhesion to the Framework Agreement for access to the Spanish Gas System Facilities.
- **210** users adhered to the Balancing Portfolio Framework Contract. Of these, 210 have the Balancing portfolio in PVB, 172 have the Balancing portfolio in TVB and 169 have the Balancing portfolio in AVB.
- **164** companies have been authorised in the Framework Contract for Access to the Spanish Gas System Facilities and in the three Balancing Portfolios (PVB, TVB and AVB).
- 27 Balancing Portfolio groupings are in place: 15 in PVB, 6 in AVB and 6 in TVB. 49 subjects are part of the groupings.
- More than 1,290 active users in the SL-ATR logistics system.

## User satisfaction

As in previous years, at the year-end, the GTS made available to the Gas System agents a brief survey through which it has been able to evaluate the efficiency of the performance of the GTS in relation to the assistance provided and the quality of the information communicated.

This survey consisted of two sections:

- Section I:
  - Third-party access to the System facilities
  - Balances of users and of the System
  - System Operation
- Section II:
  - General aspects

The valuations and considerations of both sections will allow improving the attention and service offered by the GTS to the different agents of the System. The survey was launched on 15 October and was completed by 15 November, via computer, mobile or tablet.

The results have been processed by a company expert in conducting this type of questionnaire, which has guaranteed its anonymity.

The survey was open to shippers, direct market consumers (DMCs), transmission companies, distributors and market platforms.

The customer service score for the processes carried out by the GTS was 8.5, with all processes rated above 8.

Based on the results and comments gathered through the survey, the GTS prepares a customer service plan that includes lines of action with achievable goals in the short or medium term.

The GTS will monitor the achievement of the defined lines of action in order to improve customer service.

For further details on customer service, please consult our reports by clicking **here.** 

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## Capacity contracting

2021 was the first complete year of full implementation of the new Virtual Tank model of the Gas System. The capacity allocation methodology has been based on a market mechanism under current regulations, where the Technical Manager of the System carries out all capacity allocations, with the exception of outputs to an end consumer and international European connections.

The most noteworthy aspects of the year 2021 in the area of capacity contracting include:

- The market's huge interest in the Spanish Gas System continues to be confirmed, as a large number of LNG unloading slots were contracted until September 2036 (1,812 slots contracted).
- Increase of LNG reaching the System. As a result, there has been a high level of LNG tanks at the regasification plants. This aspect can be clearly observed in the contracting of the LNG storage service in the Virtual Tank of the System, which has been close to 100% in the last quarter of the year.
- Boosting the secondary capacity market by putting into production the new SL-ATR module for bilateral capacity assignments and subleases, a tool for flexibility and "anti-capacity hoarding" for users.

**1,812** LNG unloading slots contracted until 2036

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LNG storage service contracting in the Virtual Tank of the System in the last quarter

#### **Regasification plant procurement**

#### LNG storage contracting by product





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#### Regasification contracting by product



In 2021, tanker truck loading at the Bilbao, Sagunto and Barcelona plants has been very close to the value of the nominal capacity of these terminals. During some periods, this value has even been exceeded.

#### Tanker truck loading contracting by plant and product

kWh/day

#### **Barcelona Plant**









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#### Tanker truck loading contracting by plant and product

kWh/day



**Bilbao Plant** 



#### Mugardos Plant







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#### Virtual liquefaction contracting



#### PVB access from TVB contracting



This non-localised service, available from October 2020, entitles the transfer of gas from the Virtual Balancing Point to the Virtual Balancing Tank of the regasification plants, in the form of LNG.



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#### International connections contracting

The contracted capacity on international connections with North Africa has reached 66% by 2021.

#### International connections with North Africa

	2020				2021	
GWh	Nominal	Contracted	% contracted capacity	Nominal	Contracted	% contracted capacity
Tarifa	162,504	69,620	43%	162,060	75,548	47%
Almería	105,774	82,764	78%	112,128	95,440	85%
Total	268,278	152,384	61%	274,188	170,988	66%

#### International connections with North Africa

kWh/day

#### Tarifa International Connection



#### Almería International Connection



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#### **International connections with France**

	2020			2021		
GWh	Nominal	Contracted	% contracted capacity	Nominal	Contracted	% contracted capacity
Import	82,350	63,617	77%	82,125	71,388	87%
Export	82,350	46,392	56%	82,125	46,635	57%

The volume of exports through international connections with France remained unchanged in 2021 compared to the previous year, while imports increased.

#### Underground storage contracting





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#### Underground storage contracting



The average daily contracted capacity for 2021 for the extraction service was 6,570,331 kWh/day (daily) and 709,810 kWh/day (intraday).

The average contracted capacity per day for 2021 for the injection service was 6,930,961 kWh/day (daily) and 1,152,879 kWh/day (intraday).

The allocation of capacity at underground gas storages is conducted in two stages: a first, direct allocation at the request of each user according to their demand, and subsequent auctions of different defined products.

#### Services offered through auctions

Capacity auctions are a mechanism for allocating capacity in the facilities of the Spanish Gas System.

In 2021, 840 long-term capacity auctions have been held.

For further details on service auctions, please refer to **annex 1** of this chapter in the downloadable information by clicking **here.** 

### 840

Long-term capacity auctions

#### Unloading slots allocated in annual procedures

In the annual auction of unloading slots, a total of 1,142 applications were received for a total of 436 available slots, and a total of 412 slots were contracted in the System's plants for 15 years. For the first year, 92% of the offered unloading slots have been allocated.

In July, as in the previous year, the annual 15-year auction of unloading slots at Spanish regasification terminals was held.

#### Unloading slots allocated in monthly procedures

During the monthly slot allocation processes slots in 2021, 168 slots were allocated.

For further details on the allocation of unloading slots, please refer to **annex 2** of this chapter in the downloadable information by clicking **here.** 

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The Spanish Gas System Report 2021

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## **3 / Operation**

The Spanish Gas System operated normally in 2021. **Technical and commercial availability has been 100%, 24 hours a day,** every day, always guaranteeing supply to all consumers.





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# Continuity, quality and security of supply

In 2021, the Technical Manager of the System has continued to guarantee the continuity, quality and security of supply, under the principles of objectivity, transparency and nondiscrimination; seeking the correct operation of the System with criteria of effectiveness, efficiency, better customer service and the correct coordination between access points, storage, transmission and distribution. Following the allocation of capacity in the Spanish system over a 15-year horizon, the long-term use of the gas system has been assured.

As an event in 2021, it is worth mentioning Storm Filomena at the beginning of the year, the biggest snowstorm in Spain since 1971. On 31 December, Operation Note 6/2020 was published announcing the exceptional operation situation -Cold Wave- which started on 1 January 2021 and lasted 18 days. The extraordinary increase in demand with respect to the values expected under normal temperature conditions accumulated 3,760 GWh in those days.

Despite this situation, January ended with sufficient stocks, both in plants and in storage facilities, which ensured security of supply at all times. On the other hand, in 2021, a total of 254 LNG unloadings were carried out at the Spanish regasification terminals as a whole.

#### **Operating Notes**

Twelve Operating Notes have been published during 2021, in the following order:

- Exceptional operation situation -level 0 Cold wave (05/01/2021).
- Exceptional level situation -level 0- Detour of vessels. Change of assigned plants (05/01/2021).
- Reduction of winter reserve obligation 2020-2021 (07/01/2021).
- Exceptional operation situation -level 0 Cold wave (14/01/2021).
- Exceptional operation situation -level 0 Cold wave (18/01/2021).

- Exceptional level situation -level 0- Detour of vessels. Change of assigned plants (03/02/2021).
- Reduction of winter reserve obligation 2020-2021 (18/02/2021).
- Transitional rule in the winter period for the acceptance of a plant-to-ship LNG loading request in the short-term (04/03/2021).
- Low temperature warning (18/03/2021).
- Reduction of storage capacity due to scheduled maintenance at AS Marismas (20/05/2021).
- Reduction of storage capacity due to scheduled maintenance at AS Marismas (continued) (21/07/2021).
- Low temperature warning (24/11/2021).

The Spanish Gas System operated normally in 2021. Availability, both commercial and technical, has been 100%, 24 hours a day, every day, always guaranteeing supply to all consumers.



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## NG and LNG supplies

In 2021, natural gas supplies reached 416,685 GWh.

For the third year running, supplies in the form of liquefied natural gas (LNG) have exceeded those of natural gas (NG). The entry of LNG has accounted for 54% of the gas supply for the Spanish Gas System. In 2021, LNG was received from 14 different sources, mostly from the USA, Nigeria, Russia and Qatar.

LNG offloaded in 2021 has registered a decrease of 9% over 2020. Three terminals, Cartagena, Sagunto and Mugardos, have experienced an increase in the number of unloadings, while the rest have decreased in offloaded volume.

#### Input to the Spanish Gas System

Inflows in the form of NG amounted to 189,504 GWh, up 38% compared to the previous year.

LNG supply, meanwhile, reached 227,181 GWh. The plants in which the greatest growth in gas unloaded was recorded were those of Cartagena and Sagunto.

For more detailed information on procurement by infrastructure, see **Annex 1** of this chapter in the downloadable information by clicking **here.** 



#### **Supplies evolution**

• In the form of LNG • In the form of NG

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#### **Origin of supplies**

GWh



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In the supply portfolio, Algeria continued to be the main supplier to the Spanish Gas System, accounting for practically 43% of supplies in 2021, followed by the USA, with 14%.

#### **Supplies evolution**



#### Number of LNG vessel unloadings

	2020	2021	vs. 2020
Barcelona	48	47	-2%
Huelva	53	52	-2%
Cartagena	36	44	22%
Bilbao	58	49	-16%
Sagunto	21	38	81%
Mugardos	22	24	9%
Total	238	254	7%

254

Vessels unloaded to the System in 2021 (+7% vs. 2020)



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#### Evolution of average volume: Unloaded LNG





As for the average volume unloaded per vessel in 2021, the figure reached 892 GWh, slightly lower than in 2020.

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#### Unloading by origins and regasification plants

No. of unloadings	Algeria	Nigeria	Belgium	USA	Norway	Peru	Qatar	T&T	France	Angola	Russia	Egypt	Argentina	Equatorial Guinea	Papua New Guinea	Australia	Spain	Total	Average size unloaded GWh
Barcelona	6	5	-	11	-	-	18	2	-	3	-	-	-	-	1	1	-	47	817
Huelva	3	23	-	20	-	-	-	2	1	1	1	-	-	1	-	-	-	52	953
Cartagena	10	13	-	6	-	-	8	3	-	-	-	2	-	1	-	1	-	44	838
Bilbao	-	3	-	12	-	-	2	5	-	-	21	-	-	5	-	-	1	49	982
Sagunto	19	3	-	9	-	1	2	1	-	-	1	1	-	1	-	-	-	38	753
Mugardos	-	4	-	6	-	-	-	2	-	-	10	1	-	1	-	-	-	24	1,042
Total	38	51		64		1	30	15	1	4	33	4		9	1	2	1	254	898
Average size unloaded GWh	616	950	-	925	-	865	872	865	1,059	1,031	1,077	976	-	987	168	421	926	898	

In 2021, each regasification plant has received gas from at least six different countries, which has helped to strengthen the security of the System. The terminal with the highest number of unloadings was Huelva, followed by Bilbao and Barcelona.

By origin, the USA and Nigeria have received the highest number of loads, with 64 and 51 methane tankers respectively, followed by Algeria and Russia, with 38 and 33 tankers respectively.

#### 6

Minimum number of countries from which natural gas has been received at each regasification plant

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The supply in the form of NG during 2021 has accumulated almost 190 TWh.

#### Natural gas connections

		2020		2021				
GWh	Balance	Inputs	Outputs	Balance	Inputs	Outputs		
IC North African	100,644	100,644	-	154,566	154,566	-		
VIP Pyrenees	28,080	33,767	5,687	17,129	30,905	13,776		
VIP Iberia	-4,460	1,857	6,317	-1,425	3,560	4,985		
National	616	616	-	487	487	-		
Total	124,880	136,884	12,004	170,757	189,518	18,761		



Natural gas supply



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## **Regasification plants**

Spain continues to lead Europe in terms of the number of LNG infrastructures and LNG vaporisation and storage capacity.

The facilities maintain their characteristics and technical capabilities. The Spanish Gas System has a total of 25 storage tanks, with eight berths and a capacity for methane tankers of up to 270,000 m<sup>3</sup>.

#### Single LNG Tank Model

2021 was the first full year in which the pooled tank model was in effect. This has made commercial management easier for users and has provided greater flexibility and liquidity to the Spanish regasification plant system.

#### Technical characteristics of the regasification plants

		LNG stor	age	Truck loading capacity	Bert	ıs
Regasification plant	Maximum vaporisation capacity (Nm <sup>3</sup> /h)	No. of tanks	m <sup>3</sup> LNG	GWh/day	No. of berths	m <sup>3</sup> LNG
Barcelona	1,950,000	6	760,000	15	2	266,000
Huelva	1,350,000	5	619,500	15	1	175,000
Cartagena	1,350,000	5	587,000	15	2	266,000
Bilbao	800,000	3	450,000	5	1	270,000
Sagunto	1,000,000	4	600,000	11	1	266,000
Mugardos	412,800	2	300,000	11	1	266,000
Total	6,862,800	25	3,316,500	71	8	Up to 270,000



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## Production at regasification plants

In 2021, inflows from regasification plants to the System have decreased by 14%, compared to 2020. The Sagunto and Reganosa plants have seen an increase of 18% and 9%, respectively.

Average daily production at the regasification plants reached 522 GWh/day and average contracting was 562 GWh/day.

In terms of stocks in tanks, the annual average has been 52%, on some days reaching 91%.

On the other hand, tanker truck loading in general has increased by 8.5%, with the Cartagena Plant standing out with 19% year on year.

## 522 GWh/day

Average daily production of regasification plants in 2021

#### **Regasification evolution**



#### Tanker truck loading evolution



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#### **Evolution of total stocks in tanks**







In 2021, the average use of contracting capacity has risen to 93%.

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#### Nominal and daily production evolution

#### Productions and capacities by regasification plant



See the evolution of average nominal and daily production in **Annex 2** of this chapter in the downloadable information by clicking **here.** 

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See the average and maximum productions in 2021 in **Annex 2** of this chapter in the downloadable information by clicking **here.** 

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## Tanker truck loading at regasification plants

In 2021, the volume of tanks managed was 14,494 GWh, 9% more than in 2020, continuing the upward trend in demand for this service.

The most notable increase can be seen at the Cartagena Plant, with an increase of 18%. The plants in Sagunto (9%) and Barcelona (6%) also grew.

#### Tanker truck loading at regasification plants

	2020				
	Total GWh	Total GWh	∆ vs. 2020	Max. daily GWh/day	% vs. total 2021
Barcelona	3,319	3,531	+6.4%	15	+24.4%
Huelva	2,919	3,102	+6.3%	15	+21.4%
Cartagena	2,611	3,088	+18.3%	14	+21.3%
Bilbao	1,124	1,145	+1.9%	6	+7.9%
Sagunto	2,058	2,235	+8.6%	10	+15.4%
Mugardos	1,310	1,393	+6.3%	7	+9.6%
Total	13,341	14,494	+8.6%	67	

## 67 GWh/day

Maximum daily tanker truck loading in regasification plants

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#### Plant stocks

#### **Evolution of plant stocks**



LNG stock level in tanks
 Cushion

For average tank stock levels, please refer to **Annex 2** of this chapter in the downloadable information by clicking **here.** 

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## International connections

In 2021, the Gas System received 189,504 GWh of natural gas through international connections. Exports amounted to 18,761 GWh, 56% higher than the previous year.

In France we have an export/import flow depending on the price arbitrage on both sides.

In Tarifa, imports ceased as of 1 November 2021. In Almería, higher amounts have been recorded throughout the year compared to 2020.

**189,504 GWh** Natural gas received into the System through international connections



#### **Commercial movements on international connections**



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## International connections with North Africa

#### **Physical movements**

GWh/day

#### Tarifa gas entry



• Nominal

#### Almería gas entry

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In 2021, imports through the Tarifa international connection reached 65,877 GWh. Gas imported through the Almería international connection amounted to 88,689 GWh.

#### **Commercial movements**

30,000

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IC Almería

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2021

88,689

84%

2021

#### International connections with France

In 2021, natural gas imports via international connections with France have fallen by 9%. However, through this interconnection exports increased by 142% compared to 2020.

Connections with France have registered net import flows although there has been higher export than in the previous year.

#### **Commercial movements - IC France**



180,000 150,000 120,000 57% 90,000 60,000 59,840



2020



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#### International connections with Portugal

Exports through international connections with Portugal amounted to 4,985 GWh in 2021. The flow of imports increased by more than 91%.





#### Contracting

		2021				
GWh	Nominal	Contracted	% contracted capacity	Nominal	Contracted	% contracted capacity
Import	29,280	3,218	11%	29,280	4,656	16%
Export	52,560	35,375	67%	52,560	6,311	12%

#### **Commercial movements - IC Portugal**



In terms of contracted export capacity, outputs to Portugal reached 6,311 GWh, equivalent to 12% of its nominal capacity. The contracted import capacity was 5% higher than in 2020, reaching 4,656 GWh.



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## Underground gas storages

Gas injected during 2021 amounted to 8,175 GWh. Extraction, on the other hand, amounted to 12,724 GWh.

Circular 8/2019 introduced a change in the calculation of users' injection and extraction rights. From 1 October 2020, the capacity contracted by each user for the maintenance of strategic minimum stocks does not count for the calculation of injection/extraction rights.

At the end of the injection campaign, storage reached almost 85% of capacity in Gaviota and Serrablo, followed by Yela with 75%. Marismas finished with just over 50%.



#### **Extraction/injection in storage**





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51,465 GWh

in underground gas storages

Final stocks

Stocks in underground gas storages





		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Available capacity	GWh	33,787	33,787	33,787	35,500	35,200	35,200	35,200	34,910	34,910	34,910	34,910	34,910
Volume of cushion gas	GWh	28,793	28,793	28,793	28,793	28,793	28,793	28,793	28,793	28,793	28,793	28,793	28,793
Initial stocks	GWh	56,154	53,111	50,907	49,387	49,526	50,830	52,104	53,184	53,667	53,923	57,131	54,684
Injection (net)	GWh/month	0	0	0	159	1,305	1,277	1,081	484	256	3,209	250	0
Average daily injection	GWh/day	0	0	0	5	44	43	35	16	9	104	8	0
Extraction (gross)	GWh/month	3,042	2,205	1,545	19	0	0	0	0	0	0	2,697	3,218
Average daily extraction	GWh/day	99	42	51	1	0	0	0	0	0	0	90	104
Final stocks	GWh	53,111	50,907	49,361	49,526	50,830	52,104	53,184	53,667	53,923	57,131	54,684	51,465



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## Gas transmission

In 2021, the Spanish Gas System remained with the same infrastructures as the previous year.

The Gas System had 11,369 km of primary transmission pipelines at the end of 2021, and a total of 13,361 km, including secondary pipelines.

11,369 km

Primary transmission pipelines

(13,361 km, including secondary)



#### **Transmission infrastructures**

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## Compressor stations

The gas pipeline network has nineteen compressor stations, as well as transmission centres, regulation and measurement stations and connection points to the network. These facilities allow the correct primary distribution of gas throughout national territory and provide security of supply of natural gas even in situations of peak demand.

#### **Compressor stations**



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#### Average emission gas quality in 2021

	Barcelona	Huelva	Cartagena	Bilbao	Sagunto	Mugardos	Aznalcázar Gas Field	Poseidon Gas Field	Viura Gas Field	Valdemingómez	Portugal Connection	France Connection	Tarifa	Almería
Molar fractions %														
Nitrogen (N <sub>2</sub> )	0.253	0.105	0.264	0.121	0.287	0.153	0.786	0.670	1.489	0.592	0.181	0.729	1.070	1.434
Carbon dioxide (CO <sub>2</sub> )	0.000	0.000	0.000	0.000	0.000	0.000	0.147	0.054	0.041	1.438	0.049	0.557	1.326	1.687
Gas quality														
SCV [KWh/m <sup>3</sup> (n)]	11.760	11.747	11.826	11.571	11.789	11.601	11.576	11.021	11.697	10.894	11.642	11.663	11.497	11.646
SCV [MJ/m <sup>3</sup> (n)]	42.338	42.287	42.574	41.654	42.441	41.765	41.674	39.675	42.110	39.218	41.912	41.986	41.388	41.927
Relative density	0.597	0.594	0.601	0.584	0.599	0.586	0.594	0.559	0.607	0.574	0.590	0.605	0.611	0.630



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## 4 / Renewable gases

In 2021, regulatory developments have continued and the GTS has actively worked on two lines of action: a public consultation to analyse the possibilities of integrating renewable gases into the system and calculation of admissible ranges with hydrogen.





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Renewable gases, mainly biomethane and green hydrogen, are a key element in the decarbonisation of the energy system. Particularly in sectors that present a greater complexity in their electrification, such as intensive industry -which requires a high calorific value in its production processes- or heavy transport.

The Climate Change and Energy Transition Law, approved in May 2021, promotes these energies with provisions that encourage their development.

Along the same lines, at the end of 2020 the Government approved the "Hydrogen Roadmap: a commitment to renewable hydrogen", which recognises the key role of green hydrogen for Spain to achieve climate neutrality and a 100% renewable electricity system no later than 2050.

This roadmap sets national targets for renewable hydrogen deployment by 2030. It includes, inter alia, the installation of 4 GW of electrolyser power and a minimum contribution of 25% of renewable hydrogen consumption in industry, along with the implementation of hydrogenerators and the promotion of trains and heavy transport vehicles powered by this fuel. These targets imply a production of green hydrogen in 2030 of about 5 TWh/year, which implies about 3% of the current consumption of natural gas in industry.

On the other hand, in July 2021 the Ministry for the Ecological Transition and the Demographic Challenge (MITERD) published the Draft of the Biogas Roadmap, including 43 lines of action for the development of biogas and biomethane in Spain. The aim is to multiply the sustainable production of this gas of renewable origin by 3.8 by 2030, which would mean a biogas production target of 10.41 TWh per year in 2030. Of this, 45% (4.7 TWh/year) would be consumed directly as biogas for thermal uses or electricity generation, and the rest (5.7 TWh/year) would be transformed into biomethane to displace natural gas of fossil origin in its usual uses.

In addition, this roadmap recognises the huge importance of biogas and biomethane in other aspects in addition to the energy sector, such as the circular economy, the demographic challenge and the just and inclusive energy transition. This renewable gas provides important environmental, economic and social benefits, especially in rural areas and in the waste sector, reducing energy dependence and boosting R&D&I. The targets set in the renewable hydrogen and biogas roadmaps would achieve a reduction of 3.2 million tonnes of  $CO_2$  equivalent each year





The GTS has launched a public consultation in 2021 to analyse the possibilities of integrating renewable gases into the system. In addition, in collaboration with the entire industry, the admissible ranges with hydrogen have been developed The targets set in the renewable hydrogen and biogas roadmaps would achieve a very significant reduction of 3.2 million tonnes of  $CO_2$  equivalent each year. Biogas production will also help to prevent methane from escaping into the atmosphere, a gas with a greenhouse gas potential far greater than  $CO_2$ .

In addition to these regulatory developments, the GTS has been actively working throughout 2021 on two lines of work in relation to renewable gases.

On the one hand, in July 2021, with the agreement of the MITERD, a non-binding public consultation was launched to the sector called "System Analysis 2021-2030", in which first-hand information was gathered from the different agents in relation to the supply and demand of renewable hydrogen and biomethane in the 2030 horizon. The purpose is to

analyse the different possibilities of integrating renewable gases into the Gas System and to guarantee their correct operation and security of supply.

This information is part of a unique repository of renewable gas projects that the GTS will make available exclusively to regulatory authorities. On the other hand, in 2021 the GTS has worked in collaboration with the entire sector in the elaboration of the admissible ranges with hydrogen, which constitute the first exercise of calculation of hydrogen injection capacities blended with natural gas in the Spanish gas network, focusing on the basic network of gas pipelines. Over the course of 2022, it will be complemented, in collaboration with transmission companies and distributors, with the inclusion of regional transport and distribution networks.



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## **Downloads**

In this section you can download in editable format (Excel) much of the **graphic content of Enagás GTS published in this report,** as well as the **annexes** referred to in **chapters 2 and 3** on the operation of the Spanish Gas System during 2021.

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Annex 1. Results of auctions	$\downarrow$
Annex 2. Allocation of download slots	$\checkmark$
3 / Operation	$\checkmark$
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Annex 2. Breakdown of regasification plants	$\downarrow$

Some published data are subject to change, as they are provisional data at the close of this report. In the event of any discrepancy, the SL-ATR information prevails.





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