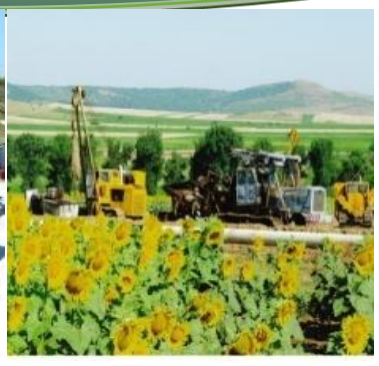
Translation from Romanian

SNTGN TRANSGAZ SA MEDIAŞ

DEVELOPMENT PLAN FOR THE NATIONAL GAS TRANSMISSION SYSTEM

2021 – 2030


CONTENTS

1. INTRODUCTION

For compliance with Art. 22 of European Directive EC/73/2009 on the obligation of all EU gas transmission system operators to prepare TYNDPs**,** Transgaz, as the technical operator of the National Gas Transmission System of Romania, prepared the **Development Plan for the gas transmission system for 2021-2030.**

This document presents the development directions of the Romanian gas transmission network and the major projects that the company envisages over the next 10 years. Our goal is to achieve a maximum level of transparency with respect to the development of the National Gas Transmission System (NTS) in order for the market players to be informed in a timely manner about the existing and planned transmission capacities, in order for the investment decisions regarding the gas transmission network to respond to the market demands, following public consultations.

The Development Plan for the National Gas Transmission System (NTS) for 2021-2030, prepared according to **Electricity and Gas Law no. 123/2012,** with the objectives proposed in Romania`s 2020-2030 Energy Strategy with the 2050 outlook, is compliant with the European energy policy for:

- ensuring safety of gas supply;
- increasing interconnectivity between the national gas transmission network and the European network;
- increasing the flexibility of the national gas transmission network;
- the liberalization of the gas market;
- creating the integrated gas market in the European Union
- ensuring the connection of third parties to the gas transmission system, according to specific regulations, within the limits of transmission capacities and compliant with the technological regimes;
- the extension of the pipeline network up to the entrance to the localities certified as tourist resorts of national or local interest, when such localities are at a distance of maximum 25 km from the connection points of the transmission system operators;
- ensuring the connection to the natural gas network of new investments which generate work places.

TRANSGAZ is a member of ENTSOG (European Network of Transmission System Operators for Gas), an entity where the company works together with all the EU gas transmission system operators in order to establish a common regulatory framework and a common strategy and vision for the development of the European gas transmission system to establish an integrated energy market.

In this context, while preparing The Development Plan for the National Gas Transmission System for 2021-2030, we aimed at coordinating the TYNDP and GRIP with the development plans of the gas transmission operators in the region.

Security of gas supply is underlying any energy policy – any serious disorder leading to gas supply disruptions has significant consequences for the economies of the EU member states. In order to strengthen this reliability, the EU states need to diversify their energy vectors and energy sources, but, at the same time, to act for the modernization of the existing gas transmission infrastructure.

For the sustainable development of the natural gas transmission infrastructure in Romania, Transgaz proposes an extensive investment plan through the TYNDP for the strategic and sustainable development of the Romanian gas transmission infrastructure enabling the alignment of the NTS with European transmission and operation requirements complying at the same time with the requirements of European regulations in the field of environmental protection.

In this regard, Transgaz aims:

- to promote investment projects which contribute to the achievement of a sustainable gas transmission system in safety conditions stipulated in the applicable laws, with the limitation of the impact on the environment and the population;
- to carry out projects in such a way that the impact on the natural and anthropogenic environment is minimal;
- to execute projects in such a way that the impact on biodiversity is minimal

In the context of the geopolitics and geo strategy of the European energy routes, Romania benefits from the advantages of the geographical location on important gas transmission corridors and access to gas resources discovered in the Black Sea, aspect which leads to the need of an efficient exploitation of these opportunities.

According to the legal provisions, the document is subject to the approval of the National Regulatory Authority for Energy (ANRE). This document represents the update and completion of the NTS Development Plan in the period 2020-2029, approved by ANRE by Decision 2210/25.11.2020.

1.1. Update and completion of the 2020-2029 TYNDP

- Updating chapters 2, 3, 4, 5 and 6 with the end of year 2020 data;
- Updating the estimated schedules of the projects, the values and deadlines for completion of the 2020-2029 TYNDP projects as a result of the completion of the pre-feasibility and feasibility studies, of the FEEDS or contracts signing;
- Updating of the major projects list as a result of the completion of certain works;
- Introduction of a new chapter Major projects completed.

Project number	Project name	Status
7.1.1	Development on the Romanian territory of the National Gas Transmission System on the Bulgaria – Romania – Hungary – Austria Corridor – **Phase I**	COMPLETED
7.1.2	Development on the Romanian territory of the National Gas Transmission System on the Bulgaria – Romania – Hungary – Austria Corridor – **Phase II**	
7.2	Development on the Romanian territory of the Southern Transmission Corridor for taking over the Black Sea gas	
7.3	The interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow Isaccea	COMPLETED
7.4	NTS developments in North-East Romania for enhancing gas supply to the area and for ensuring transmission capacities to the Republic of Moldova	
7.5	Extension of the bi-directional gas transmission corridor Bulgaria – Romania - Hungary – Austria (BRUA Phase III)	
7.6	New NTS developments for taking over Black Sea gas	
7.7	Romania – Serbia Interconnection	
7.8	Upgrading GMS Isaccea 1 and GMS Negru Vodă 1	
7.8.1	Upgrading GMS Isaccea 1	COMPLETED
7.8.2	Upgrading GMS Negru Vodă 1	
7.9	Interconnection between the gas transmission systems of Romania and Ukraine in the Gherăești – Siret direction	
7.10	Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania	
7.11	Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction	
7.12	Eastring–Romania	
7.13	Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System	
7.14	Development of the SCADA system for the National Gas Transmission System	
7.15	Upgrading GMS Isaccea 2 and GMS Negru Voda 2 for enabling bidirectional flow on the T2 pipeline	
7.16	Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline	
7.17	Interconnection between NTS and the Black Sea LNG Terminal	

Project included in:

- 2014-2023 TYNDP
- 2017-2026 TYNDP
- 2018-2027 TYNDP
- 2019-2028 TYNDP
- 2020-2029 TYNDP

2. COMPANY PROFILE

2.1. The activity of the company

The National Gas Transmission Company TRANSGAZ SA established under Government Decision no. 334/28 April 2000, following the restructuring of the National Gas Company ROMGAZ SA, is a Romanian legal entity, with the legal form of joint stock company and operates according to the Romanian laws and its bylaws.

Transgaz is the technical operator of the National Gas Transmission System (NTS) ensuring the execution of the national strategy regarding the internal and international gas transmission and dispatching with efficiency, transparency, safety, non-discrimination and competitiveness, as well as the research and project development in its field, in compliance with the provisions of the European and national laws, the quality, performance, environment and sustainable development standards.

The gas transmission activity is performed based on the Concession Agreement regarding the National Transmission System pipelines, facilities and equipment owned by the Romanian State, concluded with the National Agency for Mineral Resources (ANRM), as the representative of the State, approved by GR 668/20 June 2002 (published in OJ 486/8 July 2002, valid until 2032, as further amended and supplemented by seven addenda approved by government resolution.

Domestic gas transmission

The domestic gas transmission activity is carried out by Transgaz based on the gas transmission system operating licence no. 1933/20.12.2013, issued by the National Energy Regulatory Authority (ANRE) and valid until 8 July 2032.

Gas transmission is ensured through over 13,600 km of pipelines and connections for gas supply, with diameters between 50 mm and 1,200 mm, at pressures between 6 bar and 63 bar.

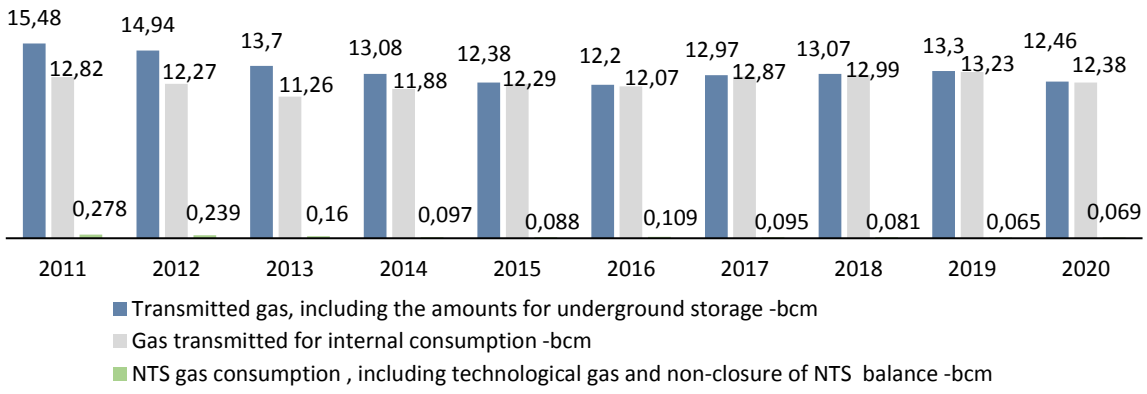


Chart 1 - 2011 – 2020 transmitted gas including underground storage and NTS gas consumption

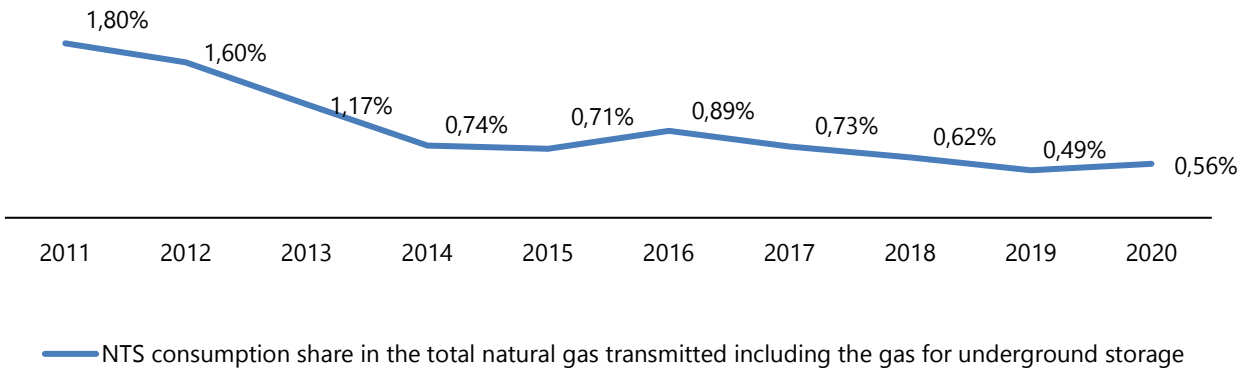
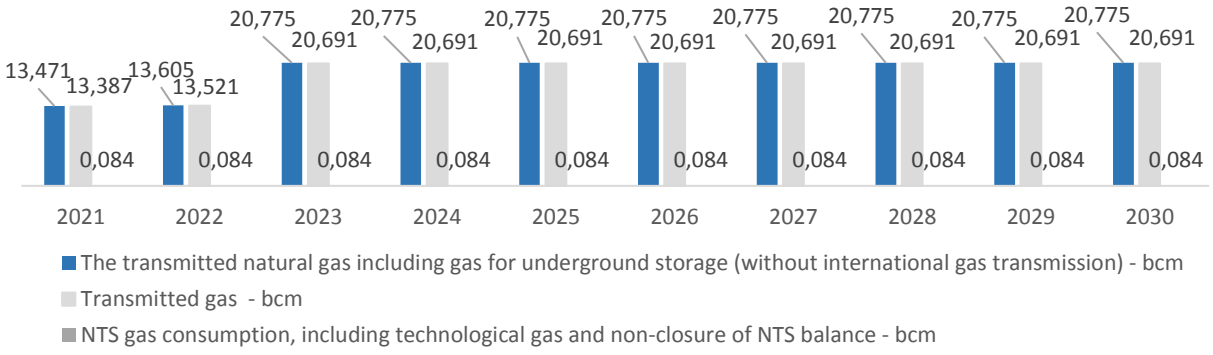


Chart 2 –The share of the NTS gas consumption in the total transmitted gas including underground storage in 2011-2020

Forecasts of the transmitted gas quantities including the ones meant for underground storage **and of the NTS gas consumption for the period 2021–2030:**



2019-2022-annual increase of 1%
Year 2023-increase by 8.17 bcm, the Black Sea source

Chart 3- Forecasts of the transmitted gas quantities including underground storage gas (without international gas transmission) for the period 2021–2030

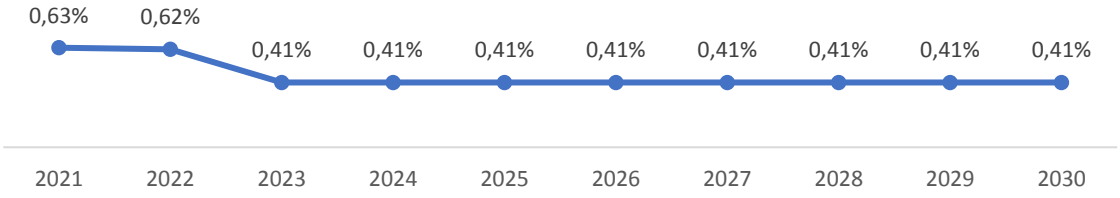


Chart 4 - Forecast of NTS gas consumption share in the total transmitted gas including gas for storage for 2021-2030

International gas transmission

The activity of gas transmission is carried out by Transgaz based on the operating licence for the gas transmission system no. 1933/20.12.2013, issued by the National Energy Regulatory Authority (ANRE) and valid until 8 July 2032, according to Electricity and Gas Law 123/2012, as further amended and supplemented, and according to the applicable regulations in the domain.

The international gas transmission activity is carried out in the South-East of the country (Dobrogea) where the Romanian pipeline section between Isaccea and Negru Voda is included in the Balkan route of the international gas transmission from Russia to Bulgaria, Turkey, Greece and Macedonia.

On the above mentioned route, North of **Isaccea**, there are three interconnections with the similar international gas transmission system of Ukraine, and south of **Negru Voda**, there are three interconnections with the similar international gas transmission system from Bulgaria. Starting with gas year 2016-2017, at the interconnection points located on the T1 pipeline, further to the conclusion of the legacy contract, third party access was granted and the transmission capacity at these points on the T1 pipeline is traded according to ANRE Order no. 215/2019 and to Regulation (EU) no. 459/2017 establishing a network code on capacity allocation mechanisms in gas transmission systems and repealing Regulation (EU) No 984/2013.

Starting with gas year 2019-2020, following the gas transmission pipeline Isaccea 1–Negru Voda 1 / National Gas Transmission System connection, Negru Voda 1 has become a NTS interconnection point to which the provisions of the same tariff setting methodology are applied (methodology approved by ANRE Order 41/2019), which is also applicable to the interconnection points with the EU Member States (Csanadpalota, Giurgiu Ruse) and to the domestic points of the National Transmission System.

The connection between the Isaccea 1–Negru Vodă 1 (T1) gas transmission pipeline and the National Gas Transmission System in the GMS Isaccea area was completed and enables the physical flow of gas from the international transmission pipeline to the NTS and vice versa.

The international gas transmission activity is carried out through two international gas transmission pipelines in the UA-RO-BG-TK-GR direction (T2 and T3), each with the following characteristics: DN 1200, L=186 km and technical capacity = 9,579 billion Scm/year (T2) and DN 1200, L = 183,5 km and 9,679 billion Scm/year (T3), which are not connected to the National Transmission System.

Transmission through the T2 and T3 pipelines is not currently subject to European regulations related to third party access and it is carried out according to the governmental agreements and contracts concluded with Gazprom Export.

The regulation of this situation is a complex process due mainly to factors beyond the scope of Transgaz's competence. However, the company aims to solve these issues and to comply with the provisions of the European regulatory framework.

The operation of the National Gas Transmission System by Transgaz mainly consists of the following activities:

- commercial balancing;
- contracting the gas transmission services;
- dispatch and technological conditions;
- metering and monitoring gas quality;
- gas odorization and international gas transmission.

Transgaz may also carry out other related activities for supporting the core business, according to the applicable laws and its own bylaws, being able to procure gas only for balancing and the safe operation of the National Transmission System.

The company's income is generated from the internal and international gas transmission activity and from connection fees, services and project development, from penalties charged to clients and other related services.

The quality of the transmission services is a constant preoccupation both for Transgaz and for the National Energy Regulatory Authority. For monitoring the gas transmission services, based on specific indicators and minimal performance levels, starting with 1 October 2016, the **Performance Standard for the gas transmission services** entered into force, **approved by ANRE Order 161/26.11.2015.**

2.2. Shareholding

The public offering of 10%, in 2008 and of 15%, in 2013 of Transgaz increased share capital through the Bucharest Stock Exchange contributed to the increase in capitalization and the development of the capital market in Romania, thanks to the dynamics of the sector in which the company activates.

Transgaz shareholding structure on 31 December 2020 is as follows:

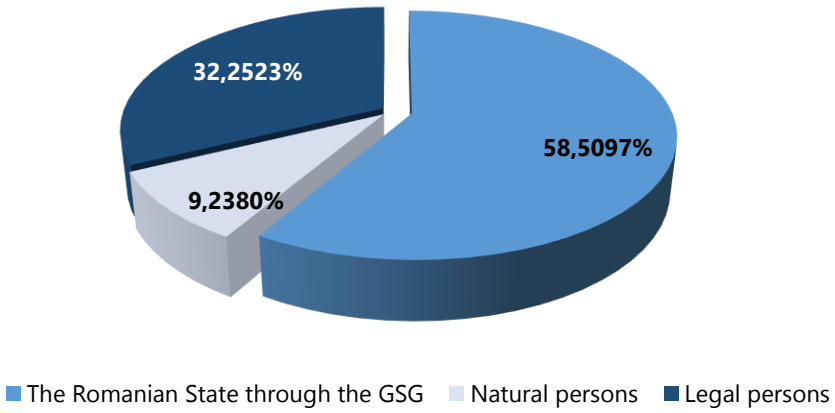


Chart 5 – The current Transgaz shareholding structure

2.3. Organisation and management

Transgaz is administrated in a unitary system by the Board of Administration.

There is a **separation** between the non-executive function (non-executive director) and the executive one (directors) – a mandatory separation in the case of joint stock companies whose annual financial standing is subject to a legal audit obligation.

The Board of Administration has delegated the management of the company to the director - general of Transgaz. The director - general of Transgaz represents the company in its relations with third parties and is responsible for taking all the general management, within the limits of the company's core business and in compliance with the exclusive competences under the law or the Articles of Association, the Board of Administration and the General Meeting of the shareholders.

SNTGN TRANSGAZ SA (Transgaz) carries out its activity in the following locations:

- Transgaz's headquarters: Mediaş, 1 C.I. Motaş Square, Sibiu County, 551130;
- Maintenance and Exploitation Division: Mediaş, 11 George Enescu Street, Sibiu County, 551018;
- Design and Research Division: Mediaş, 6 Unirii Street, Sibiu County, 550173;
- Bucharest Gas Market Operator Division: Bucharest, 30 Dorobanti Road, District 1, 010573;
- Transgaz Representative Office – Romania: Bucharest, 55 Primaverii Blvd.
- Transgaz Representative Office – Brussels, Belgium: Brussels, 23 Luxembourg Street;
- General Inspection Unit: Bucharest, 155 Victoriei Road, District 1, 010073;
- Research – Design Unit Brasov, 2 Nicolae Titulescu Street;
- EUROTRANSGAZ Ltd.: MD-2004, 180 Ștefan cel Mare și Sfânt Blvd., P.O. 506, Chisinau, the Republic of Moldova;
- Secondary office of Transgaz: Mediaș, 3 I.C. Brătianu, building 3, flat 75, Sibiu County.

Transgaz has **9 regional offices and a subsidiary:**

- **Arad Regional Office**, 56 Poetului Street, Arad, Arad County, code 310369;
- **Bacău Regional Office**, 63 George Bacovia Street, Bacău, Bacău County, code 600238;
- **Brăila Regional Office**, 5 Ion Ghica Street, Brăila, Brăila County, code 810089;
- **Braşov Regional Office**, 12A Grigore Ureche Street, Braşov, Braşov County, code 500449;
- **Bucharest Regional Office**, 24 Lacul Ursului Street, District 6, Bucharest, code 060594;
- **Cluj Regional Office**, 12 Crişului Street, Cluj-Napoca, Cluj County, code 400597;
- **Craiova Regional Office**, 33 Arhitect Ioan Mincu Street, Craiova, Dolj County, code 200011;
- **Mediaş Regional Office**, 29 George Coşbuc Street, Mediaş, Sibiu County, code 551027;
- **Constanţa Regional Office**, 1 Albastră Street, Constanţa, Constanţa County, code 900117;
- **Mediaş Subsidiary**, 59 Sibiului Street, Mediaş, Sibiu County

Figure 1- Map of Transgaz regional offices

3. DESCRIPTION OF THE NATIONAL GAS TRANSMISSION SYSTEM

The first pipeline of the National Gas Transmission System was commissioned in 1914, a tradition of over 100 years.

The NTS was designed as an interconnected radial-ring system, being developed and having its starting points at the large gas resources in the Transylvanian Basin (the centre of the country), Oltenia and afterwards Eastern Muntenia (south of the country). The destination represented the large consumers in the Ploiești-Bucharest area, Moldavia, Oltenia, as well as the consumers in the central area (Transylvania) and the northern area of the country.

Later, the gas flows underwent important changes due to the decrease of resources in the Transylvanian Basin, Moldavia and Oltenia, and the emergence of new sources (import, concessions made by third parties, etc.), while the gas transmission infrastructure remained the same.

The National Transmission System is represented by the main pipeline, as well as by the related facilities and equipment, operated at pressures ranging from 6 bar to 63 bar through which the gas is taken over from the production fields or imported and transmitted for delivery to internal gas market customers, export, international transmission, etc.

The main components of the National Gas Transmission System on 31.12.2020 are:

NTS facility/component	MU	Value
Main transmission pipelines and connections for gas supply, of which : - pipelines for international gas transmission (**Transit II, Transit III** - BRUA)	km	13,925 369 479
Operating gas regulating - metering stations (MRS)	pcs	1,128 (1,233 metering directions)
Valve control stations (VCS, TN)	pcs	58
Import gas metering stations (GMS) **(Giurgiu, Horia, Isaccea import, Negru Vodă IV, Medieșu Aurit, Isaccea Transit I, Negru Vodă I)**	pcs	7
Gas metering stations located on the on the gas transit pipelines (GMS) (**Isaccea Transit II, Isaccea Transit III, Negru Vodă II, Negru Vodă III**)	pcs	4
Gas compressor stations (GCS) (**Șinca, Onești, Siliștea, Jupa, Podișor, Bibești)**	pcs	6
Cathodic protection stations (CPS)	pcs	1,040
Gas odorisation stations (GOS)	pcs	982

Table 1 - NTS components on 31.12.2020

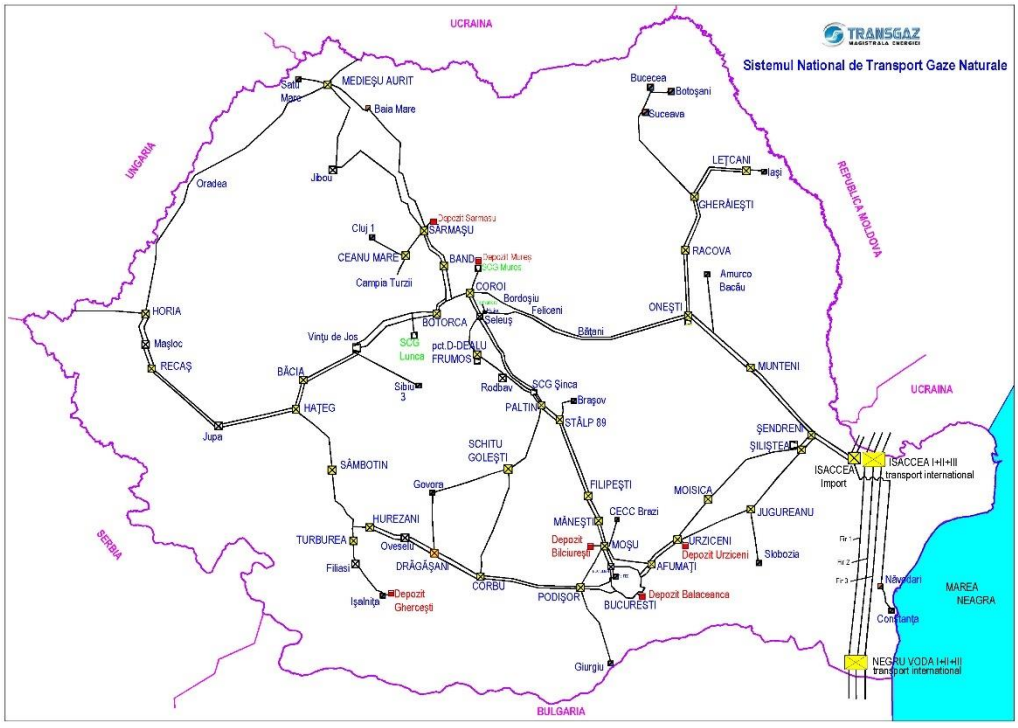


Figure 2 – Map of the National Transmission System

The technical analysis of the National Transmission System on 31.12.2020

Service life	Transmission pipelines (km)	Supply pipelines (km)	Number of directions of metering regulation stations
> 40 years	7,056.17	356.55	150
Between 30 and 40 years	1,675.13	163.50	59
Between 20 and 30 years	720.12	374.74	308
Between 10 and 20 years	1,407.16	841.38	549
< 10 years	639.40	40.10	117
≤ 5 years	623.29	27.47	50
TOTAL	**12,121.28**	**1,803.75**	**1,128 MRSs (1,233 metering directions)**
	13,925.03		

Table 2 - Analysis of technical situation

It is noted that regarding pipelines and gas transmission connections, of the **13,925.03 km** in operation, approximately 74% have an actual service life of more than 20 years. However, their technical condition is maintained at an appropriate level as the operating activity is carried out in the context of a preventive, planned, corrective maintenance system supported by annual development and modernization investment plans.

Gas transmission capacity

The domestic and international gas transmission capacity is ensured through the network of pipelines and gas supply connections with diameters ranging from 50 to 1,200 mm.

The total technical capacity of the NTS entry/exit points is 150,984 thousand cm/day (55.11 bcm/y) at the entry and 276,018 thousand cm/day (100.75 bcm/y) at the exit.

The total technical capacity of the interconnection points located on the T2 and T3 international gas transmission pipelines is approximately 55,018 thousand cm/day (19.3 bcm/y, with a usage factor of 0.959) both at country entry and exit.

The natural gas storage system with a total capacity of 33.28 TWh is one of the elements that contributes to optimizing the use of the gas transmission infrastructure and system balancing.

The compression capacity is ensured by 6 gas compressor stations located on the main transmission routes, which have an installed power of approximately 61 MW.

The NTS is equipped with **1,041 cathodic protection stations**. Cathodic protection reduces to a large extent the piping corrosion speed, thus increasing operation safety and reliability and the service life of the buried metal pipelines.

The technical norms on the classification and service life of the assets establish a normal service life for the pipelines with cathodic protection that is twice as long (40-60 years) as that of the pipelines with no cathodic protection.
Approximately 96% of the pipelines and connections operated are cathodically protected.

Of the **1,128 regulating and metering stations** (**1,233** metering directions), 948 are integrated in an automatic control and monitoring system – SCADA.

All these components of the NTS ensure the taking over of the gas from producers/suppliers and its transmission to the consumers/distributors or storage facilities.

The table below shows a syntesis of the limitations and interruptions scheduled following the repair/investment plans or the unforeseen limitations and interruptions following unexpected/accidental events for 2013-2020:

Period		Scheduled		Unforeseen	
		Limitations	Interruptions	Limitations	Interruptions
Calendar year	2013	7	43	4	113
	2014	5	43	5	158
	2015	8	64	8	164
	2016	7	43	38	160
	2017	11	44	0	198
	2018	0	5	8	121
	2019	1	17	6	72
	2020	1	29	3	63
Gas year	2016-2017	11	58	2	174
	2017-2018	0	5	7	138
	2018-2019	1	17	5	84
	2019-2020	1	28	3	64

Table 3 – Scheduled and unforeseen interruptions

Cross-border interconnection pipelines

The gas imports/exports to/from Romania are ensured through seven cross-border interconnection pipelines:

Cross-border interconnection pipeline features	
UKRAINE	**Orlovka (UA)–Isaccea (RO)** - DN 1000, capacity 8.6 bcm/y, P_{max} =55 bar
	Tekovo (UA)–Medieşu Aurit (RO) - DN 700, capacity =4.0 bcm/y, P_{max} =70 bar
	Isaccea 1/Orlovka 1, capacity 6.8 bcm/y Pmax = 49.5 bar in the import direction and a capacity of 4.1 bcm/y from 01.10.2020 at Pmax=45 bar in the export direction
HUNGARY	**Szeged (HU)–Arad (RO)–Csanadpalota** - DN 700, capacity of 1.22 bcm/y, Pmax = 55 bar in the import direction, and a capacity of 1.75 bcm/y, Pmax = 55 bar, in the export direction.
REPUBLIC OF MOLDOVA	**Ungheni (MO) – Iași (RO) -** DN 500, capacity =0.55 bcm/y, P_{max} =50 bar on the export direction and a capacity of 0.07 bcm/y, Pmax= 16.5-19 bar in import direction.

BULGARIA	**Ruse (BG)–Giurgiu (RO) -** DN 500, capacity of 1.5 bcm/y, P_{max}=40 bar and P_{max}=30 bar in the export and in the import direction.
	Negru Vodă 1/Kardam, capacity of 6.4 bcm/y in the export and in the import direction, capacity of 5.7 bcm/y and Pmax=55 bar in both transmission directions

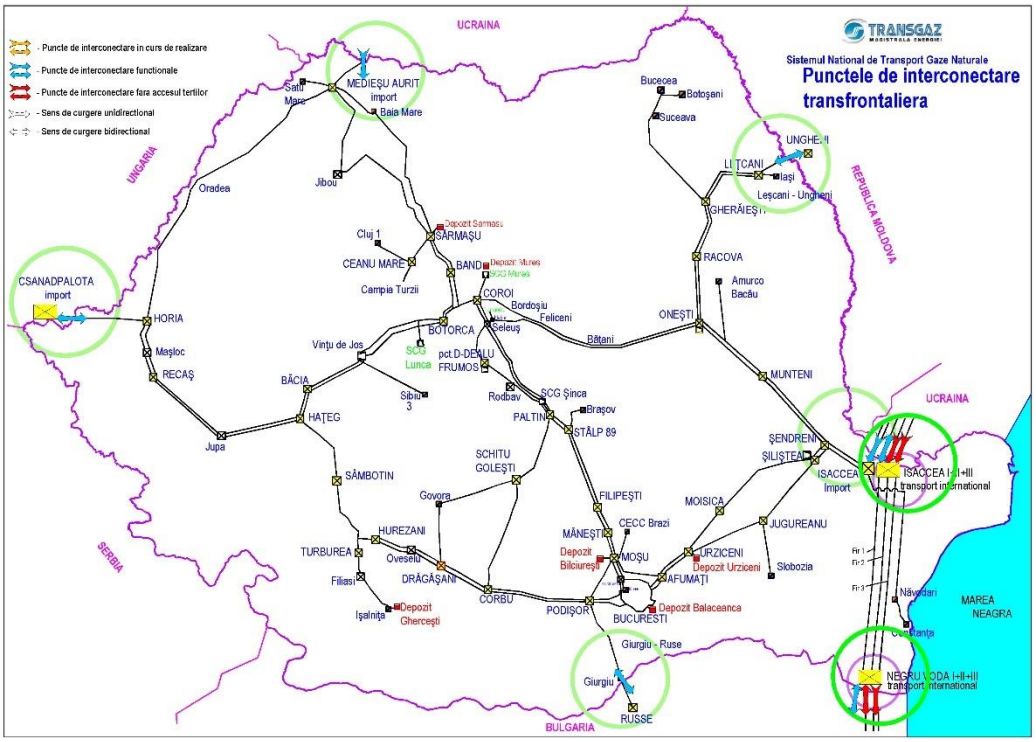


Figure 3 – NTS cross-border interconnection points

4. ROMANIAN AND REGIONAL GAS MARKET

4.1 Romanian gas market

Romania has the largest natural gas market in Central Europe and was the first country to use natural gas for industrial purposes.

The gas market has reached record levels in the early 1980s, following the implementation of government policies aiming at eliminating dependency on the import.
The implementation of these policies led to an intensive exploitation of domestic resources, resulting in a decline in domestic production.

In the context of the radical structural and institutional reforms which characterized the Romanian economy after 1989 and which aimed to decentralize the services in order to increase their quality and efficiency, the Romanian energy market was gradually opened to competition as an integral part of the concept of the liberalization of the national economy and the free movement of products and services.

In particular, the Romanian gas sector has undergone a profound restructuring process, having as main pillars:

- the separation of activities into autonomous sectors of production, storage, transmission and distribution;
- reducing concentration of natural gas production and import by granting licences and authorizations to a growing number of companies;
- regulation of non-discriminatory access of third parties to the natural gas transmission system.

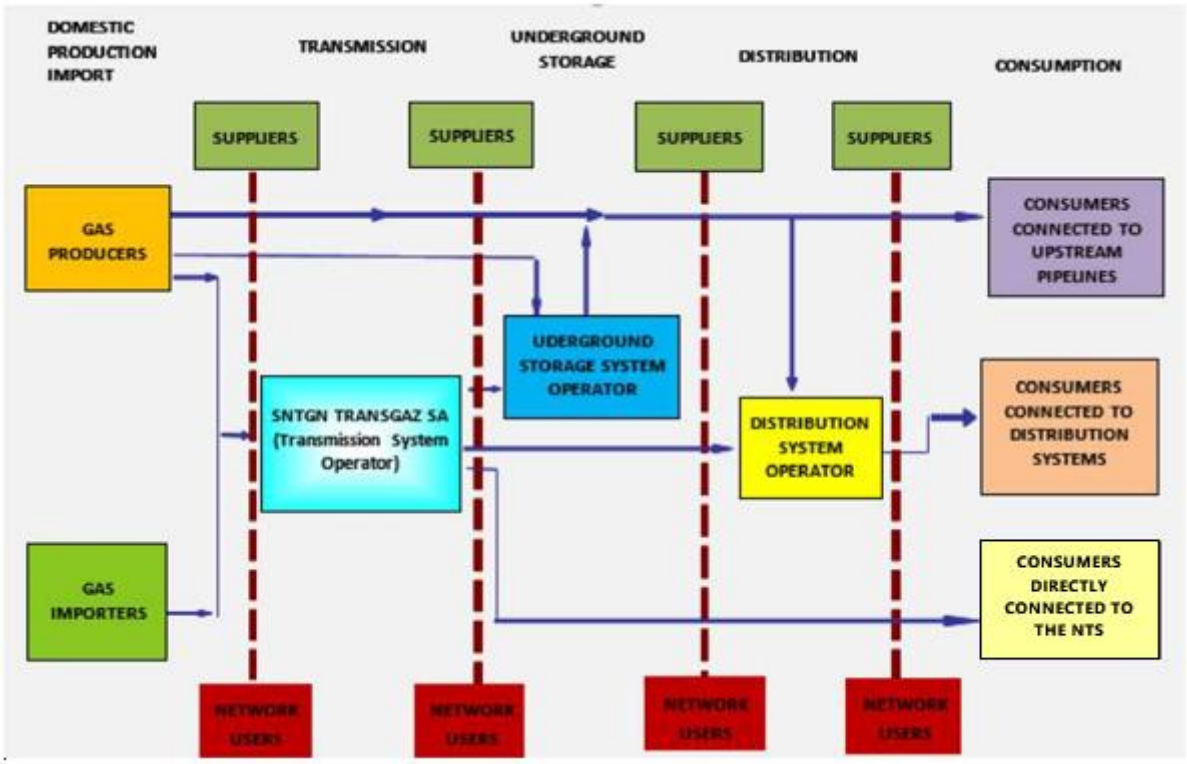


Figure 4 – The Romanian gas market

The current structure of the Romanian gas market includes:

- 1 operator of the National Transmission System – SNTGN TRANSGAZ SA MEDIAȘ;
  - 9 gas producers: OMV Petrom SA, SNGN ROMGAZ SA, SC Amromco SRL, SC Foraj Sonde SA, SC Raffless Energy SRL, Stratum Energy Romania LLC Wilmington the Bucharest Subsidiary, SC Hunt Oil SRL, SC Lotus Petrol SRL, SC Serinus Energy România;
  - 2 underground storage facilities operators: SNGN Romgaz - the Underground Gas Storage Facility Depogaz Ploiesti, SC Depomureș Târgu Mureș;
  - 32 gas distribution companies, the largest being Distrigaz Sud Retele Srl and SC Delgaz Grid;
  - 184 licences gas suppliers.

The internal gas market has two components:

- **the competitive segment**, which includes:
  - the *wholesale market* which functions based on:
    - (i) bilateral contracts between the gas economic operators,
    - (ii) transactions on centralized markets managed by the operator of the gas market or the operator of the balance market, whichever the case,
    - (iii) other types of transactions or contracts.

- the *retail market* where the suppliers sell gas to final clients through contracts with negotiated prices.

- **the regulated segment** which includes the natural monopoly activities, the related activities and gas supply at a regulated price, based on the framework agreements approved by ANRE.

The increase of the competitive market share is achieved gradually by ensuring access to this market for more participants, suppliers and final clients.

The final clients can choose their supplier and can directly negotiate purchase agreements with the supplier.

The Romanian gas market has been gradually opened starting with 2001, from 10% of the total consumption, reaching 100% in January 2007 for industrial consumers.

For domestic consumers, the gas market was liberalized in July 2007 and at present, according to the provisions of Directive 2009/73/EC, the national market is 100% open.

The development of the internal gas market aims at:

- the development of competition between gas suppliers;
- continuing to implement `cap` pricing methods;
- stimulating the opening and/or the rehabilitation of gas deposits, in order to increase the internal production of gas and limit the dependency on imports;
- diversification of the import/export sources;
- flexibility of the storage system.
- establishing a natural gas hub.

Romanian GAS HUB is an ambitious project , which implies a new vision on the natural gas market, namely that of building a free, liquid, responsible, closely supervised market developing ways to support vulnerable customers, uniquely dispatched to prevent crises in exceptional situations and fully integrated into the European Energy Union. The hub involves rethinking all activities in the gas sector for a single purpose that of facilitating the trading of natural gas in order to obtain the best prices and to ensure a good quality of the gas transmission service.

Gas hubs are located in the centre of gas transmission networks: gas transmission pipelines, gas storage systems, liquefied gas terminals (LNG) etc. and are used as central points for the gas prices.

The development of a gas hub implies:

- the existence of a gas transmission pipeline network and gas storage facilities allowing for the trading of gas quantities at short notice;
- the existence of various gas supply sources: domestic production, imports through interconnection pipelines, lng transport overseas;
- the existence of a strong market for gas consumers with competing purchasing interests (from domestic to industrial consumers) is also considered crucial for the development of a diversified market;
- the existence of a regulation allowing domestic and foreign participants to trade and access transmission pipelines and storage facilities is also considered essential for the

creation of a gas hub. participants need to know that they can trust a government that does not intervene when prices go against local interests;
- the existence, in the first stages of the development of a commercial hub, of an excessive supply of natural gas to allow the exchange of significant volumes of goods.

Romania – strengths for setting up a REGIONAL HUB.

- **Romania has investment projects under implementation and/or planned for the development of infrastructure co-financed by EU grants. Transgaz as a TSO (transmission system operator) has a Plan for the development of the natural gas transmission infrastructure (NTS) for the following 10 years, with projects estimated at approx. € 3.5 billion (of which € 698 million for FID and A non-FID projects).**
- Romania has the largest gas market in the region and the lowest dependence on imports, recording 80% of production in the region (new resources from the Black Sea).
- Romania enjoys a geostrategic position being located on important transmission corridors between the well-developed markets in central Europe and the sources of supply in SE Europe.
- Romania has well-developed storage facilities and interconnections with Bulgaria, Ukraine, Hungary, Moldova.

Transgaz, as technical operator of the NTS, has a very important role in ensuring the security of gas supply to the country and in the correct operation of the national gas market.

4.2 Regional gas market and gas supply possibilities

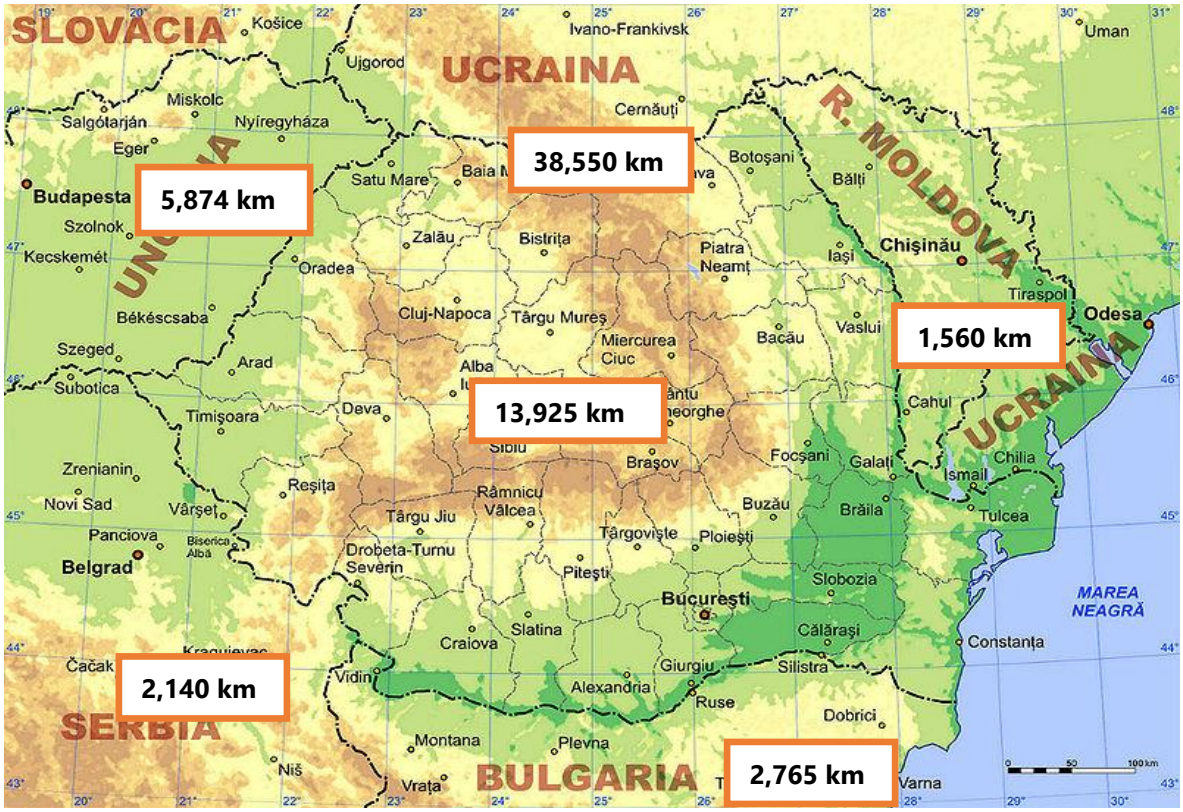


Figure 5- Length of natural gas transmission systems in neighbouring countries

BULGARIA

Bulgaria	
Number of inhabitants (2019)	7 million
Natural gas consumption	3,313 bcm/year
The operator of the national transmission system	**Bulgartransgaz EAD**
Shareholding structure	100% - Bulgarian Energy Holding EAD
Economic indicators (2019)	Turnover - EUR 183.1 million Net profit - EUR 58.7 million Number of employees - 1,160 persons
Company management	Bulgartransgaz has an organizational management structure on two levels: **Supervisory Board** Kiril Georgiev Georgiev – Chairman **Management Board** Tanya Trendafilova Zaharieva – Chairwoman
Volume of transmitted gas	Consumers and storage - 38.18 TWH Transit – 72.93 TWH **TOTAL 111.11 TWH**
Length of gas transmission system	1835 km - NTS - high-pressure pipelines 930 km- Transit **TOTAL 2,765 km**
Map of Gas Transmission System	

Bulgaria	
Description of the transmission system	**The national Bulgarian gas transmission system** is built in a ring-shaped form with a total length of 1835 km, three compressor stations – CS Kardam-1, CS Valchi Dol and CS Polski Senovets with total installed capacity of 49 MW. Its technical transport capacity amounts to 7.4 bcm/year, and the maximum working pressure is 54 bar. **The Bulgarian transit** gas transmission network comprises gas DN 1000 pipelines of total length of 930 km, six compressor stations – CS Kardam-2, CS Provadia, CS Lozenets, CS Strandja, CS Ihtiman and CS Petrich, with total installed capacity of 270 MW. Its total technical capacity is of 17,8 bcm/year and the maximum working pressure is 54 bar.
LNG	-
Interconnections	Negru Vodă I, II and III / Kardam – Transgaz RO Kulata / Sidirokastron –DESFA GR Strandja / Malkoclar –BOTAS TR Kyustendil / Zidilovo - GA-MA MK Ruse / Giurgiu – Transgaz RO
Storages	Chiren - Bulgartransgaz Total capacity: 550 million cubic meters
Investment plan	The 2020-2029 development plan may be found at: https://www.bulgartransgaz.bg/files/useruploads/files/amd/TYNDP%202020-2029%20EN.pdf
The main investments included in the plan	Interconnection Turkey – Bulgaria Interconnector Greece - Bulgaria Interconnection between the national gas transmission systems of Bulgaria and Serbia NTS Rehabilitation, Upgrading and Development Construction of a pipeline between Bulgaria and Romania (investment in the Bulgarian system to increase BRUA related capacity) Alexandroupoli LNG Terminal, Greece Eastring – Bulgaria Expansion of the Chiren UGS storage capacity Construction of a looping CS Valchi Dol - the valve station Novi Iskar to increase capacity and to connect with the existent system Construction of a pipeline between Varna and Oryahovo Construction of a looping between CS Provadia and Rupcha to increase capacity and to connect with the existent system Construction of new storage facilities on the territory of Bulgaria

Source: *www.bulgartransgaz.bg, http://ec.europa.eu/eurostat, www.gie.eu, entsog.eu*

Serbia

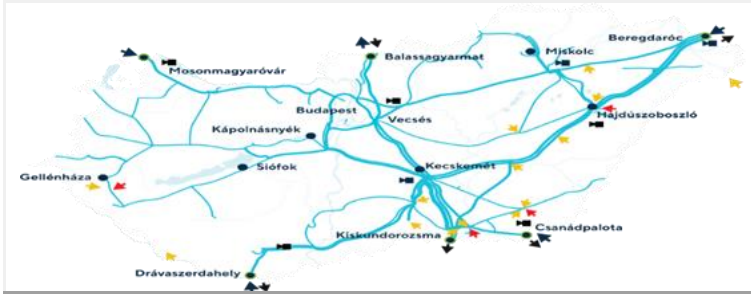
Serbia	
Number of inhabitants (2019)	6.9 million
Natural gas consumption (2019)	**3.4 bcm/year** of which approximately :
The operator of the national transmission system	**JP SRBIJAGAS**
Shareholding structure	**100% - the Serbian state.**
Economic indicators (2019)	Net profit - EUR 64.24 million Number of employees - 3,998 persons
Company management	**Board of Administration** Chairman: - **Muamer Redzović** General Manager: **Dusan Bajatovic**
Volume of transmitted gas	In 2019 the volume of gas transmitted amounted to 13 bcm.
Length of the gas transmission system	2,140 km - pipelines
Map of Gas Transmission System	
Description gas transmission system	✓ the Serbian transmission system is managed by JP Srbijagas, with the exception of Pojate la Niš section MG-9 which is managed by the Yugorosgaz (subsidiary of Gazprom); ✓ the nominal pressure of the system is 16-50 bar; ✓ DN 150-750; ✓ storage facility with a capacity of maximum 850 million cubic meters.
LNG	**-**
Interconnections	**2 interconnections** **-with Hungary : capacity - 6.1 bcm/year;** **-with Bosnia- Herzegovina (Rep. Srpska): capacity - 760 mil.cm/year** Srbijagas Kiskundorozsma –FGSZ HU Zvornik –BH-gas-BA Pojate - YUGOROSGAZ
Storages	Banatski Dvor SRBIJAGAS Total capacity: 450 million cubic meters
Investment plan	***JP Srbijagas 2019-2028 Gas Transmission System Development Plan may be found at:*** www.aers.rs and www.unece.org

Serbia	
The main investments included in the plan	**Investments** : The investments of the company are focused on: - the modernization and refurbishment of the Serbian gas transmission system pipelines, connections, equipment, utilities, etc.); - the upgrading the transmission capacity from 6.1 bcm/year to 6,8 bcm/year; - the construction of an interconnector with Bulgaria and Hungary, until the end of 2020 with a length of 403 km on the territory of Serbia and a capacity of 20 bcm/year to connect Serbia, besides Hungary and Bulgaria, to Russian gas imports from an extension of Turk Stream; Implementation of PCIs approved by the European Commission: - the construction of a reverse flow interconnector (49,6 mil. euro) with Bulgaria with a length of 188 km and a capacity of 1-1.8 bcm/year BG-SRB and 0.15 bcm/year SRB-BG for connecting Serbia to the Southern Gas Corridor/Azerbaijan gas exported through TANAP and TAP; - the construction of an interconnector (18,5 mil. dollars) with Romania , with a length of 76 km and a capacity of 1.6 bcm/year and which would make possible the implementation of a future interconnection of Serbia with Croatia; - the construction of an interconnector (50 mil. dollars) with Bosnia and Herzegovina, with a length of 98 km on the territory of Serbia and a capacity of 1.2 bcm/year; - the possibility of construction of an interconnector with Macedonia, with a capacity of 500 million cubic meters / year. - the construction of the Banatski Dvor storage facility (capacity between 450 million cubic meters and 750 million cubic meters, with a maximum daily capacity of up to 10 million cubic meters) - the construction of the Itebej storage facility (capacity between 800 million and 1 billion cubic meters of gas)

Source: *Internet, http://ec.europa.eu/eurostat*

HUNGARY

HUNGARY	
Population (2019)	9.7 million
Natural gas consumption (2019)	**9.8 bcm** out of which approximately: -60.2 million cm/year domestic consumption
The operator of the national transmission system	**FGSZ Zrt.**
Shareholding structure	**25.2% - the Hungarian state;** **7.1 – Oman Oil Budapest;** **4.9 – OTP Bank;** **4.1 – ING Bank;** **Over 45% - tradable shares.**
Economic indicators (2019)	Number of employees – 2,668 persons
Company management	**Board of Administration** Chairman Dr.: - **Zsolt Hernádi (MOL Group)** CEO: **Szobolcs Ferencz (FGSZ Zrt.)**
Volume of transmitted gas	In 2019, the volume of transmitted gas was 24 bcm.
The length of the natural gas transmission system	5,874 km- main pipelines

HUNGARY	
Natural Gas Transmission System Map	
Description of the natural gas transmission system	✓ 25 entry points; ✓ 400 exit points; ✓ infrastructure with DN between 80-1400 mm; ✓ 8 compressor stations; ✓ 6 technical control centers subordinated to 3 regions; ✓ 1 technical control center in Siófok; ✓ the gas is transmitted at a nomination pressure between 40-75 bar.
Storage	Zsana Magyar Foldgaztarolo Hajuszoboszlo Magyar Foldgaztarolo Pusztaederics Magyar Foldgaztarolo Kardosku Magyar Foldgaztarolo Szoreg-1 MMBF Foldgaztarolo Total capacity 6 bcm
LNG	-
Interconnections	**5 interconnections with**: Beregdaroc–Ukrtransgas (UA) Mosonmagyarovar–OMV Gas (AT) Kiskundarozsma–Srbijagas (RS) Csanadpalota–Transgaz (RO) Dravaszerdahely–Plincro (HR) Balassagyarmat–Eustream Slovakia (SK) Vecses 4/MGT
Investment plan	***The 2019-2028 10-year network development plan of FGSZ Zrt.*** is presented on http://fgsz.hu/en/about-fgsz
The main investments included in the plan	**Investments**: The company will focus on the construction of: Pipelines and installations adjacent to the HUSIIT interconnection with Italy, through Slovenia; Interconnections with Serbia and Ukraine. Also, the continuation of stage II of the interconnection with Romania will be considered by: - supplementing the gas volume with 500,000 cm/h; - refurbishment of the compressor stations at Csanádpalota and Városföld; - construction of a new compressor station at Dorog; - construction of the Kozármisleny-Kaposvár pipeline. Eastring construction, in the direction of RO> HU> SK with transport capacities, between 10-40 bcm/year.

Source: *https://fgsz.hu, http://ec.europa.eu/eurostat, entsog.eu*

UKRAINE

Transmission operator	Ukrtransgas subsidiary of Naftogaz
Transmission system length	38,550 km pipelines
Compressor stations power	Transmission: 263 MW Storage: 10 MW
Interconnections	Orlovka – Isaccea (RO) Tekovo – Medieşu Aurit (RO) Platovo RU/ UA Prokorovka RU/UA Sokhranovka RU/UA Pisarevka RU/UA Serebryanka RU/UA Valuyki RU/UA Volchansk RU/UABelgorod RU/UA Sudzha RU/UA Kobryn Belarus-UA Hermanowice – Poland/UA Budince- Slovakia/UA Beregdaroc (HU)- Beregovo (UA) Oleksiivka - MD/UA Grebenyky – MD/ UA
Storage	13 underground storage facilities with a capacity of 31 bcm Krasnopopivske - PJSC Ukrtransgaz Olyshivske – PJSC Ukrtransgaz Bohorodchanske – PJSC Ukrtransgaz Uherske (XIV-XV) – PJSC Ukrtransgaz Oparske – PJSC Ukrtransgaz Solokhivske – PJSC Ukrtransgaz Dashavske – PJSC Ukrtransgaz Kehychivske – PJSC Ukrtransgaz Chervonopartyzanske – PJSC Ukrtransgaz Bilche-Volytsko-Uherske – PJSC Ukrtransgaz Proletarske – PJSC Ukrtransgaz Verhunske – PJSC Ukrtransgaz Hlibovske – PJSC Chornomornaftogaz
Gas consumption (bcm) (2017)	30.92
Gas Import (bcm) (2017)	12.97
Domestic production (bcm) (2017)	19.73
Future Projects	It is important to underline the interest shown by Ukraine both for physical reverse flow at interconnection points with the Romanian system, but especially at Isaccea 1, thus ensuring the delivery of natural gas coming from the south-east through the Bulgarian transmission system and the first transit line. The Romania – Ukraine interconnection project

Source: *utg.ua, http://ec.europa.eu/eurostat, www.entsog.eu, www.gie.eu*

THE REPUBLIC OF MOLDOVA

THE REPUBLIC OF MOLDOVA	
Population (2019)	3.5 mil.
Natural gas consumption (2019)	**2.5 bcm/year** of which approximately:
The operator of the national transmission system	**MOLDOVATRANSGAZ S.R.L**
Shareholding structure	**100% - MOLDOVAGAZ S.A.**
Economic indicators (2019)	Number of employees – 600 persons
Company management	**Board pf Administration** Chairman Dr.: - **Vadim Ceban (Moldovagaz)** Director-General: **Iurie Dolghier**
Volume of transmitted gas	In 2019 the volume of transmitted gas was 16.9 bcm.
The length of the natural gas transmission system	1,560 km - pipelines.
Natural Gas Transmission System Map	
Description of the natural gas transmission system	✓ 656,370 km pipelines; ✓ 903,478 km de pipe-connections; ✓ max. capacity of the transmission system - 20 bcm/year; ✓ 3 GCSs with a total capacity of 75,5 MW; ✓ 7 SGNC; ✓ 81 GDSs; ✓ 222 CPSs; ✓ Over 70 GMRSs; ✓ 1 GMS in Căușeni with a capacity of 80 mil.cm/day; ✓ 2,000 km cable telecommunication lines.
LNG	**-**
Power of compressor stations	Moldovatransgaz 3 compressor stations (75.5 mW) + one gas metering station (with a capacity of 80.0 ml./24h) Vestmoldtransgaz 1 natural gas metering station

THE REPUBLIC OF MOLDOVA	
Interconnections	-The transmission system of the Republic of Moldova is, in fact, a gas transit system (through the 3 pipelines: ATI, RI and ȘDKRI) of from Russia via Ukraine to the Balkan states and the south of the republic. The Moldovan transmission/transit system is connected with the Ukrainian transmission system at 15 interconnection points; **-1 interconnection (reverse-flow system) with Romania:** **L-120 km;** **Capacity RO-MD – 1.5 bcm/an;** **Capacity is requested for booking through the GMOIS Platform managed by SNTGN Transgaz SA.** Moldovatransgaz and Vestmoldtransgaz Ungheni (IUC) RO-MD GMS Alexeevca (ACB) UA-MD GMS Grebeniki (ATI) UA-MD GMS Grebeniki (RI, SDKRI) UA-MD Intermediate GMS Ananiev/Orlovca (ACB) UA-MD SMPG Limanscoe (TO 3) UA-MD Căuşeni (ATI) MD-UA Căuşeni (RI, SDKRI) MD-UA
Investment program	***The development plan of the natural gas transmission system of MOLDOVATRANSGAZ SRL can be found on the website:*** https://moldovatransgaz.md/
The main investments included in the plan	**Investments**: The company's investments focus on: -technical re-fitting, reconstruction and modernization of existing transmission facilities (CS, GDS, GMS, CPS, data transmission networks, etc.); - optimization of existing ones and introduction of new capacities with automated control over the operating processes of the technological equipment; - introduction of telemechanics and telemetry systems for the control of the main technical elements (linear valve nodes (outlets), cathodic protection) on the gas pipelines, with the possibility of transmitting the necessary information to the central dispatcher, to ensure the safe operation of the transmission system; - ensuring the safe and accident-free operation of the transmission system for the transport of natural gas to distribution system operators, as well as for the transit of gas to the Balkan region and Turkey, the elimination of emergency situations; - optimization of existing gas pipeline loads; - Extension of the Iași – Ungheni – Chisinau Interconnector (Phase II); - Construction of the natural gas transmission network with DN 500 on the Ungheni – Bălți segment, with the connection to the transmission network from the North of the republic "Ananiev-Cernăuți-Bogorodiceni"; - Construction of the Natural Gas Compressor Station located in Ungheni district.

Source: *www. moldovatransgaz.md, http://ec.europa.eu/eurostat*

4.3 The conclusions of the regional gas market analysis

All the information about the neighbouring countries' gas markets indicates an important dependency of these markets on import gas sources.

If until recently the only gas supply source for these countries was Russia, today, through the planning and implementation of new infrastructure projects, the neighbouring countries seek to diversify these sources, in order to increase the reliability of gas supply and to ensure competitive prices.

The orientation of the gas transmission system operators from neighbouring countries towards creating new cross-border transmission capacities, or increasing the already existing ones, clearly shows the preoccupation for an important increase in interconnectivity in a European region where there is still much to be done for a perfectly integrated market:

- **Ukraine** completed the reverse flow with Hungary and implemented the project for reversing the flows with Slovakia; It is important to underline the interest shown by Ukraine both for physical reverse flow at interconnection points with the Romanian system, but especially at Isaccea 1, thus ensuring the delivery of natural gas coming from the south-east through the Bulgarian transmission system and the first international gas transmission pipeline.
  Source:
  http://www.dw.com/en/slovakia-opens-reverse-flow-pipeline-to-carry-gas-to-ukraine
  https://spectator.sme.sk/c/20051881/fico-and-yatsenyuk-open-reverse-gas-flow-pipe.html?ref=av-center

- **Hungary** has planned investments for developing interconnections with Serbia, Ukraine, Slovenia, but is also planning to implement a North-South corridor which would link Slovakia and Croatia.
- **Serbia** will benefit from the interconnection with Hungary, Bulgaria and Romania.
- **Bulgaria** , in its turn, is making efforts to execute the Greece – Bulgaria interconnection and a new interconnection with Turkey in order to benefit from the Caspian gas and the Liquefied Natural Gas in the LNG terminal in Greece in view of their transmission towards the Central European markets.

In this context, **Romania** is the least dependent on gas imports.

Adding to this the favourable geostrategic position, the resources discovered in the Black Sea, Romania could play a defining role in the region.

As such, the gas transmission infrastructure probably becomes the most important factor, and **Transgaz** is currently facing a major challenge: the development –as soon as possible– of gas transmission corridors ensuring the necessary interconnectivity at European level and enough gas transmission potential for the use of the resources on the internal and regional markets.

5. GAS CONSUMPTION, PRODUCTION AND STORAGE

5.1 Gas consumption

5.1.1 2011 – 2020 gas consumption

The total gas consumption in the Romanian market in 2011 – 2020, expressed in GWh, is as follows:

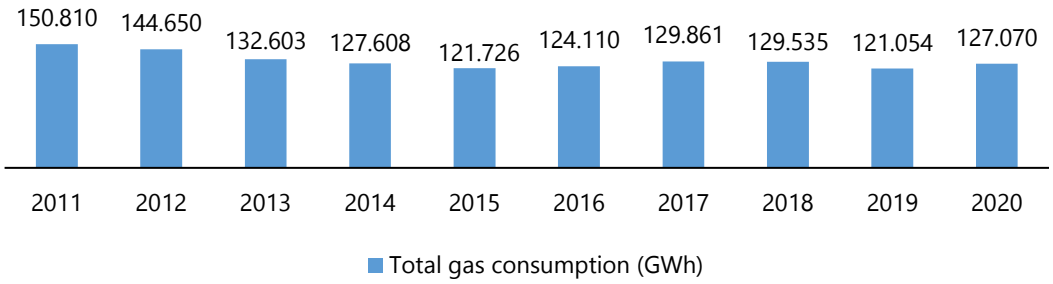


Chart 6 - The total gas consumption in the Romanian market in the period 2011 – 2020 (GWh)

Source: ANRE annual reports and internal

Domestic gas consumption has stabilized in recent years, after a period of major decrease.

5.1.2 Seasonal consumption and consumption peak

Depending on the season (winter, summer), natural gas consumption varies and the gas transmission network has to deal with different levels of transmission demand.
The seasonal variation in the period 2011 – 2020 is represented in the following chart:

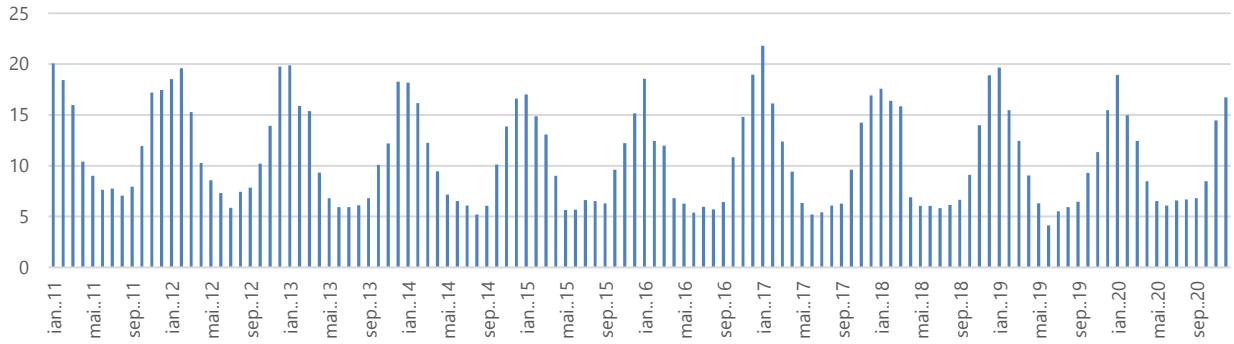


Chart 7 – Seasonal gas consumption in 2011 – 2020

Source: ANRE reports

Key elements to ensure safety of gas supply in critical times have the historical gas consumption data of the **day** of the year with the **highest consumption** and of the **14 consecutive days with the highest consumption in the year**.

The history of the two key elements is as follows:

Maximum daily consumption and 14 days maximum consumption				
Year	**Maximum consumption 1 day (GWh)**	**Date**	**Maximum consumption 14 days (GWh)**	**Period**
2009	745.5	22 December	9,708.5	11-24 December
2010	710.4	31 December	9,480.6	22 January - 4 February
2011	732.7	1 February	9,858.7	24 January - 6 February
2012	773.2	1 February	10,278.3	30 January -11 February
2013	721.0	10 January	9,209.1	7-20 January
2014	734.9	31 January	9,677.7	25 January -7 February

2015	647.5	9 January	8,393.3	1-14 January
2016	728.5	22 January	8,874.6	15-28 January
2017	751.1	9 January	10,145.2	7-20 January
2018	718.2	1 March	9,061.0	20 February – 5 March
2019	709.9	8 January	9,344.90	4-17 January
2020	690.8	8 January	8,864.4	7-20 January

Table 4– PEAK and maximum consumption 14 days

5.1.3 Gas consumption forecasts 2021-2030

For the preparation of gas consumption forecasts the following aspects were considered:

1. *Forecast of the electricity mix*

Romania's electricity mix, according to the Romania's draft Energy Strategy for 2020-2030 with the 2050 outlook, is and will remain balanced and diversified:

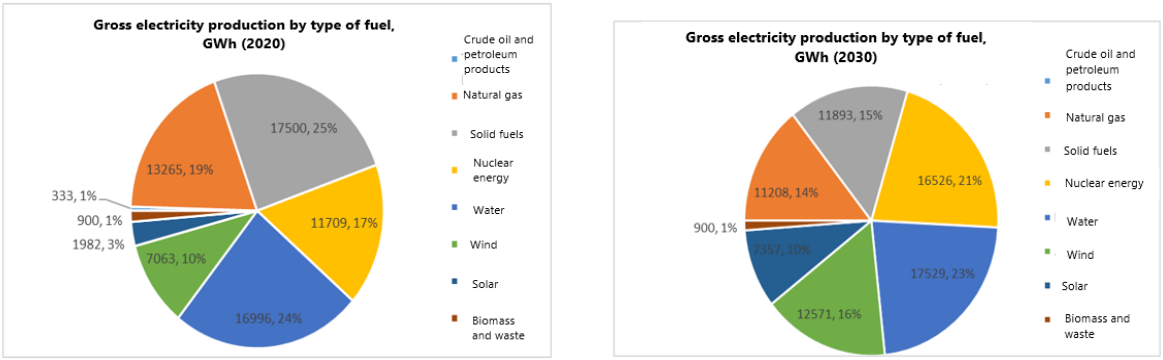


Chart 8 – The structure of the primary energy mix in 2020 and 2030

Source: Romania's 2020 – 2030 Energy Strategy with the 2050 outlook

Significant increases are expected in the production of electricity from solar sources from 1,982 GWh in 2020 to ,7357 GWh in 2030, from wind sources from 7,063 GWh in 2020 to 12,571 GWh in 2030. Overall, production from renewable sources reaches a level of 39% of the total gross electricity production in 2020 and of 49% in 2030.

It is also planned to replace several coal groups with natural gas powered combined cycle units and units based on renewable energy sources, to upgrade a nuclear unit, and to build at least one new nuclear unit by 2030.

Natural gas holds an important share in domestic primary energy consumption, due to the relatively high availability of domestic resources, low environmental impact and increased ability to balance electricity produced from intermittent renewable sources (wind and photovoltaic), given the flexibility gas powered power plants.

2. *Forecast - Reference scenario of the European Commission (REF 2016)*

According to the reference scenario of the European Commission (REF 2016) the evolution of the gas consumption in Romania in 2000-2050 is as follows:

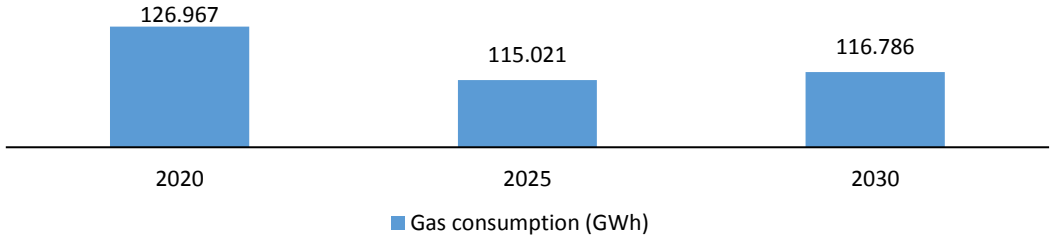


Chart 9 – Forecast of gas consumption for 2000 - 2030 according to the reference scenario of the European Commission

Source: Reference scenario of the European Commission

3. *Forecast of gas consumption for Romania for the 2020 – 2030 according to the National Commission for Strategy and Prognosis.*

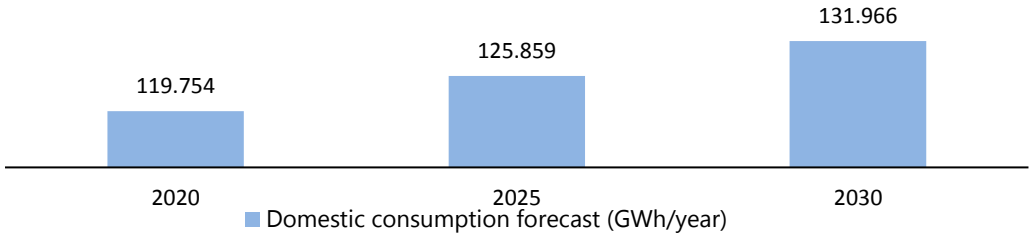


Chart 10 – The domestic gas consumption forecast for 2020 – 2030

Source: National Commission for Strategy and Prognosis

5.2. Gas production

5.2.1. 2011– 2020 gas production

The domestic gas production (bcm) in 2011 –2020 by the main producers was as follows:

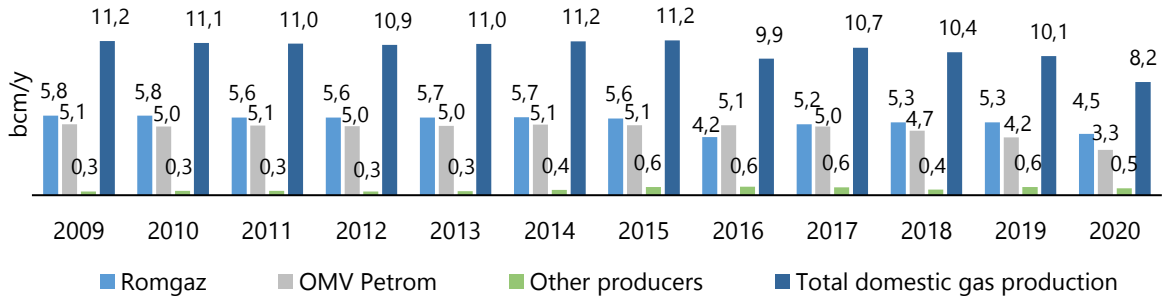


Chart 11 – The domestic gas production depending on the main producers in the period 2011 – 2020 (bcm/y)

Source: Internal – Dispatching Centre

The gas supply sources in 2011 – 2020 were as follows:

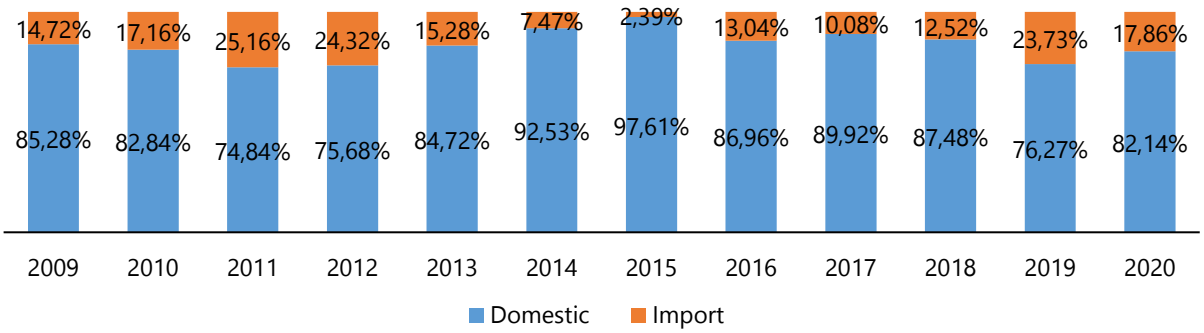


Chart 12- The gas supply sources in the period 2011 – 2020

Source: Annual ANRE reports for 2011 – 2015 and domestic sources in 2016-2020

Relatively steady domestic production, in 2011 - 2015, and declining consumption have reduced the annual share of gas imports from 25.16% in 2011 to only 2.4% in 2015. From 2016, on the background of declining oil prices, imports under long-term contracts reached prices equal to or lower than those for domestic production.

In the following years it is important that natural gas producers in Romania maintain a competitive level of gas price compared to imported sources in the coming years.
Also, until as year 2015-2016, the capacity booking tariff in the NTS for natural gas on import entry points was higher than that on domestic production entry points, so local production benefited from a competitive advantage. Starting with the 2016-2017 gas year, the booking on both types of points (entry /exit) is made at the same tariff.

Consequently, the competitiveness and the speed of reaction to market movements become essential elements in the strategy of each producer and importer.

5.2.2 Forecast of the domestic gas production 2021 – 2030

For the preparation of the gas production forecasts the following were taken into account:

1. *Forecasts from Romania's draft 2019-2030 Energy Strategy with the 2050 outlook*

According to Romania's draft Energy Strategy 2019-2030 with the 2050 outlook, gas production will decrease to 96 TWh in 2030 and to 65 TWh in 2050 after reaching a new peak of 132 TWh in 2025 following the Black Sea production.

Since onshore production is expected to decline, maintaining a low degree of dependence on imports is conditional on the development of the Black Sea sources.

2. *The reference scenario of the European Commission (REF 2016)*

According to the reference scenario of the European Commission (REF 2016) the evolution of the gas production in Romania in the period 2000 -2030 is as follows:

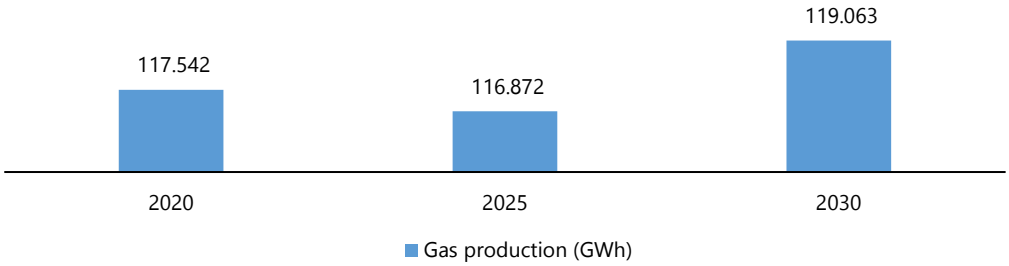


Chart 13 –2000 – 2030 gas production forecast according to the reference scenario of the European Commission

3. *Forecasts of the main gas producers for 2021-2030*

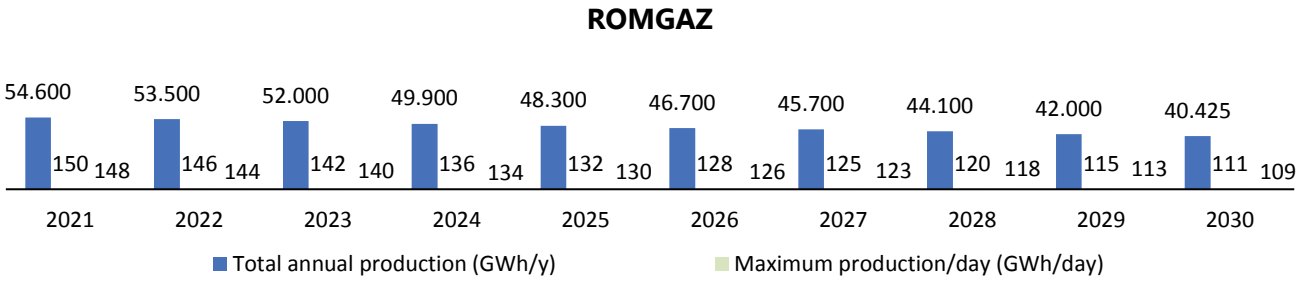


Chart 14– ROMGAZ gas production forecast for 2021–2030

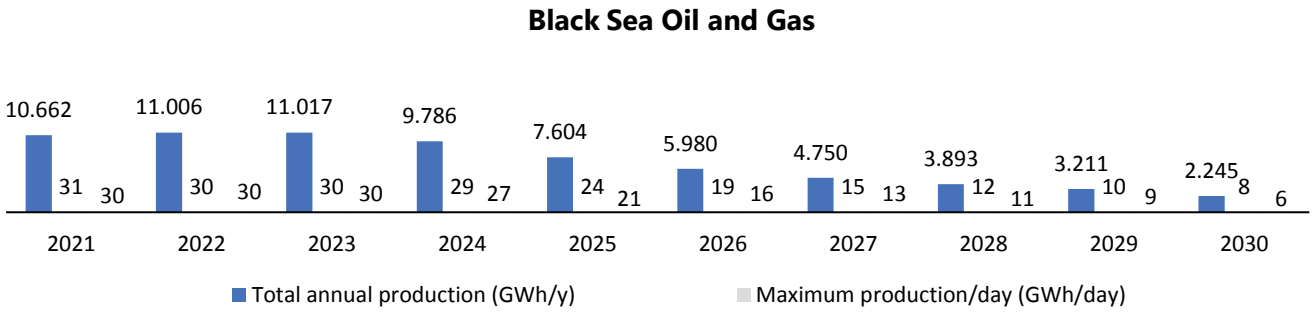


Chart 15 Black Sea Oil and Gas gas production forecast for 2021–2030

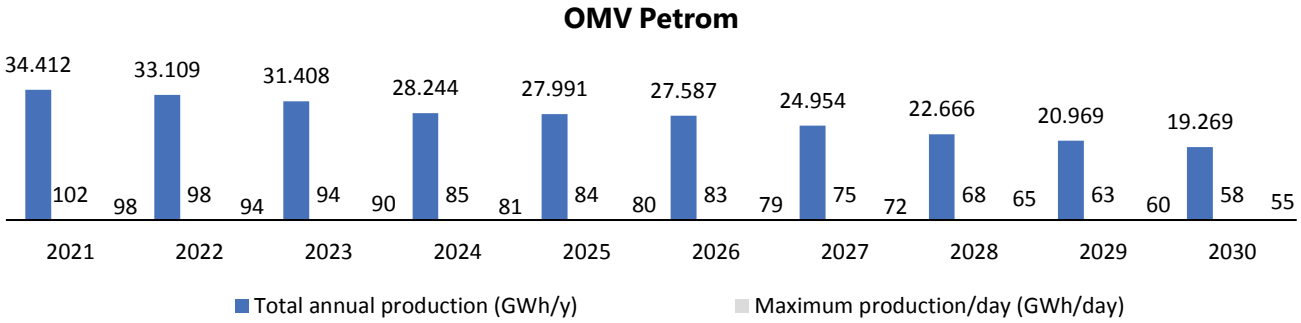


Chart 16–OMV Petrom gas production forecast for 2021–2030

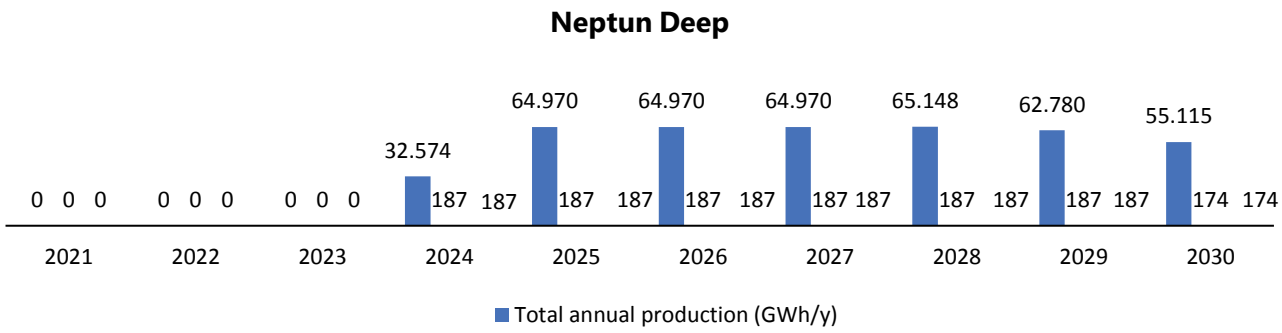


Chart 17 – Exxon Mobil (neptun Deep) gas production forecast for 2021–2030

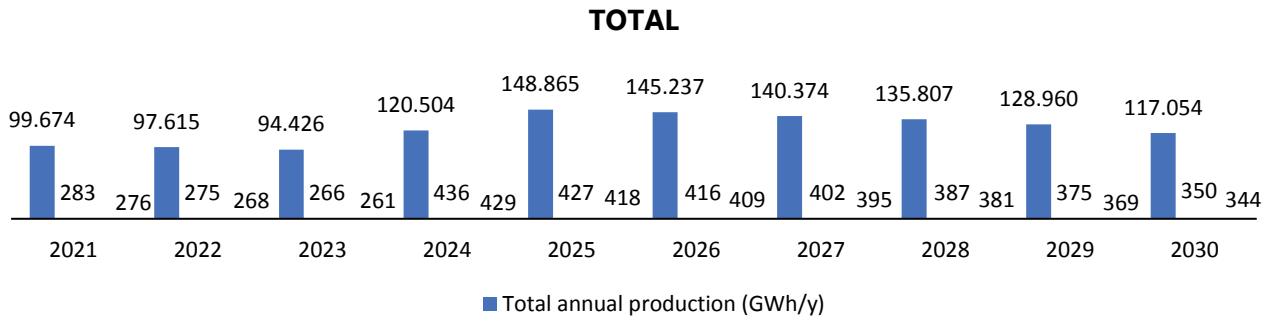


Chart 18 – Gas production forecast for 2001–2030 according to the gas producers

Source: ROMGAZ, Black Sea Oil and Gas, OMV Petrom, Exxon Mobil

5.3 Underground gas storage

5.3.1 Current context of the underground gas storage activity

Underground gas storage has a major role to play in securing natural gas supply, facilitating the balancing of domestic consumption - domestic production - natural gas imports by covering peak consumption mainly due to temperature variations as well as maintaining optimum operating characteristics of the national natural gas transmission system in order to acquire technical and economic advantages.

At the same time, the underground gas storage has the strategic role of ensuring the supply of natural gas from storage facilities, in cases of force majeure (calamities, earthquakes and other unforeseen events).

Climate and environmental challenges are the defining responsibility of our generation. The weather is getting warmer and warmer and the climate is changing more and more from one year to the next. The European Green Deal proposes and presents a new growth strategy aimed at transforming the EU into a fair and prosperous environment, with a modern, competitive and resource-efficient economy, with no net greenhouse gas emissions with a greenhouse effect in 2050 and in which economic growth is decoupled from the use of resources. In this European context, we consider that finding new ways of storing energy, developing and adapting existing capacities to new forms of less polluting energy is a European goal.

The new EU regulations go beyond the framework created in 2010 and require EU countries to work closely together in order to identify potential gas supply interruptions and to mutually agree on the joint actions to be taken to prevent or eliminate the consequences of gas supply interruptions.

In this respect a new principle was created, the one of the solidarity of the member states to reduce the risk of dependence on external sources.

The aim of the EC is to ensure the necessary measures to guarantee uninterruptible gas supply in the entire European Union specially to protected clients in case of adverse weather conditions or of gas supply interruption.

In 2017, a new European regulation on security of gas supply was introduced for achieving several objectives:

- ENTSOG carried out a supply disruption or system failure simulation at EU level to identify the main risks at EU level regarding gas supply disruption;
- Cooperation between Member States within regional groups to assess common security of supply risks and to develop and agree on common preventive and response measures;
- The introduction of the principle of solidarity according to which Member States must help each other so as to permanently guarantee the supply of natural gas to vulnerable consumers even during the most severe crisis situations;
- Improving transparency: gas companies must officially notify the national authority of long-term contracts that may be relevant to security of supply;
- Establish a framework through which the decision on a permanent bidirectional gas flow through pipelines takes into account the views of all EU countries for which such project conveys benefits.

The underground gas storage activity is an activity that can be carried out only by operators licensed by ANRE for this purpose, in accordance with the provisions of Electricity and Gas Law 123/2012. The liberalization of the gas market continues and is reflected in the deregulation of the storage activity at the end of the extraction cycle 2020 - 2021.

Underground gas storage is ensured in Romania through six underground natural gas storage facilities with a total active capacity of 33.2948 TWh per storage cycle and an injection capacity of 262.4450 GWh/day and an extraction capacity of 346.5500 GWh/day.

At a national level, the ratio between the stored gas volume and the annual consumption was approximatively 22% in 2018, at the half of the ranking of European values.

At present, two storage system operators are active on the Romanian storage market:

- DEPOGAZ Ploiești S.R.L. Natural Gas Storage Subsidiary, Subsidiary of SNGN Romgaz SA Mediaș, owning a license for the operation of five underground gas storage facilities having a total capacity of 30.1213 TWh per cycle, which is 90.6% of the total storage capacity, and
- Depomures, which operates the Targu Mureş gas storage facility, with an active capacity of 3.1545 TWh per storage cycle, accounting for 9.4% of the total storage

capacity.

Capacity of the underground storage facilities				
Underground storage	**Storage operator**	**Active capacity**	**Withdrawal capacity**	**Injection capacity**
		TWh/cycle	GWh/day	GWh/day
Bălăceanca	Depogaz	0.5452	13.1760	10.9800
Bilciurești	Depogaz	14.3263	152.7820	109.1300
Ghercești	Depogaz	1.6343	21.4000	21.4000
Sărmășel	Depogaz	9.5987	79.0350	68.4970
Urziceni	Depogaz	4.0168	50.1570	33.4380
Târgu Mureș	Depomureș	3.1545	29.0000	27.0000
Total		**33.2758**	**345.5500**	**270.4450**

Source: Reporting: Depogaz and Depomureș

In terms of capacity booking history, the situation in 2009-2020 is described below:

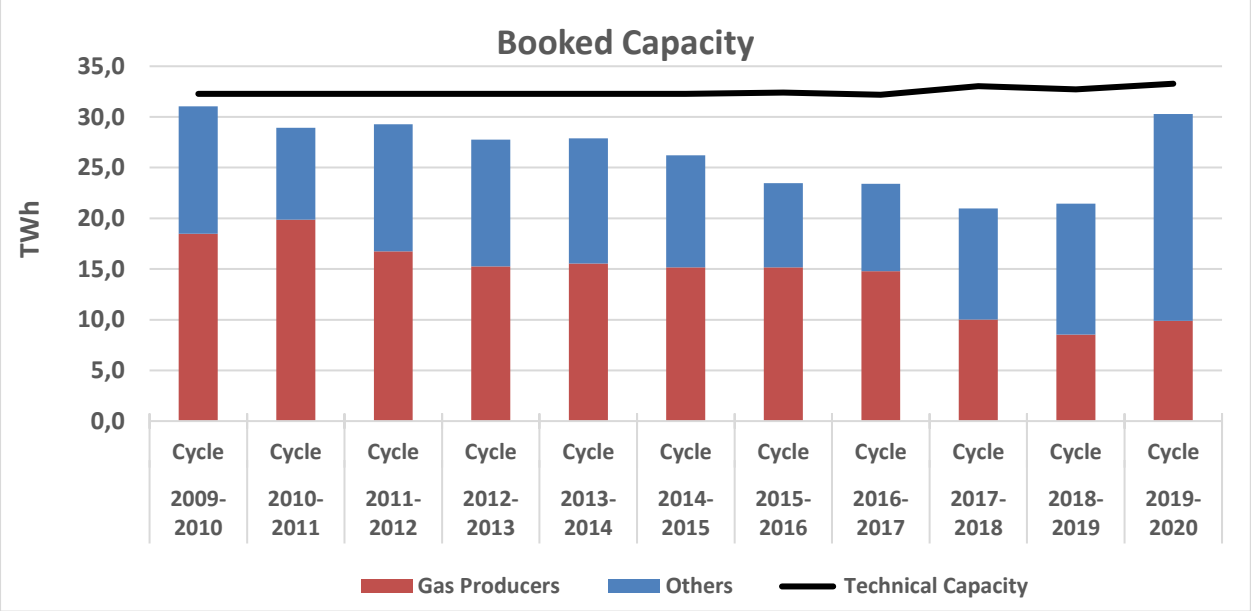


Chart 19 – Capacities booked in 2009-2020

Source: Depogaz and Depomureș

The contribution of the storage activity to the assurance of the quantities of gas necessary for the annual consumption was constantly around 22%. This percentage can be increased by enhancing the technical performance of the storages through a mix which can be achieved by ensuring the conditions for increasing the filling capacity of the storages and by ensuring the technical possibilities of increasing the gas volumes withdrawn daily during the extraction cycles.

5.3.2 Forecasts for underground gas storage

Taking into account both the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a European Union LNG Strategy for 2016 and the Romania's 2019-2030 Energy Strategy with the 2050 outlook, for the storage activity the tendencies are:

- adjusting interconnection degree and regulations to improve the level of regional cooperation to facilitate the cross-border and regional availability of existing storage capacities;
- Upgrading the existing natural gas storage capacities and creating a high degree of flexibility, including by using storage capacities alternatively by injection/withdrawal, thus contributing to the achievement of a competitive national gas market and the development of energy markets and Regional energy security mechanisms, according to the EU common rules.

In order to implement the European Green Deal, the EC Communication to the EU Parliament states that `there is a need to rethink policies for clean energy supply across the economy, industry, production and consumption, large-scale infrastructure, transport, food and agriculture, construction, taxation and social benefits.` The Commission considers that decarbonising the energy system is critical to reach climate objectives in 2030 and 2050. The production and use of energy across economic sectors account for more than 75% of the EU's greenhouse gas emissions. Energy efficiency must be prioritised. A power sector must be developed that is based largely on renewable sources, complemented by the rapid phasing out of coal and decarbonising gas.

Studies carried out at DEPOGAZ show that a 20% increase in own storage capacity generates an economic benefit of 600 million euro by replacing the use of natural gas with coal in electricity production at the national level.

In this respect and correlated with the actions for the development of the national gas transmission, the possibilities for development of the offshore blocks and the transition from coal to gas in power production, use of hydrogen as an alternative fuel source, storage investment projects are promoted by SNGN Romgaz S.A., the Gas Storage Subsidiary DEPOGAZ Ploiești SRL for the period 2021-2030 include the following actions:

- Investments in upgrades of storage facilities in order to increase the daily gas supply capacity;
- Preparation of analyses and studies related to the increasing gas storage capacities and by promoting of the projects as projects of common interest;
- Increasing flexibility in using storage facilities in the injection and withdrawing cycles by promoting alternative operation solutions.

6. SECURITY OF GAS SUPPLY

Regulation (EU) 2017/1938 of 25 October 2017 concerning measures to safeguard the security of gas supply providing for the fulfilment of several objectives, as follows:

- The preparation by ENTSOG of a simulation at EU level for the gas supply interruption situations in order to identify the main risks at EU level related to gas supply interruptions;

- The cooperation between Member States within the regional groups in order to evaluate common risks on the security of supply and to prepare and agree upon joint preventive and response measures;
- Introduction of the solidarity principle according to which Member States have to assist each other so as to permanently guarantee gas supply to vulnerable consumers even during the most severe crisis situations;
- Improving transparency: gas companies have to officially notify the national authority on long term contracts which may be relevant for security of supply;
- The setting of a relevant framework in which the decision on a bidirectional permanent flow takes into account the opinions of all EU countries for which that project brings benefits.

In order to meet the requirements of Regulation (EU) no. 2017/1938 of 25 October 2017, Art. 5, Transgaz shall demonstrate the fulfilment of all the necessary measures, so that, in case the main infrastructure is affected, the capacity of the remaining infrastructure, determined by the N-1 formula, may satisfy the gas demand necessary for the calculated area for one day of peak consumption demand (the peak daily consumption demand over the last 20 years).

The obligation to ensure that the remaining infrastructure has the capacity to satisfy the total gas demand mentioned above is considered to be observed and in the case that the competent authority proves in the preventive action plan that a supply disruption can be sufficiently compensated and in due time through proper measures based on market demand.

The following assumptions were considered for the calculation of the N-1 formula:

- the size of the market, classic consumption scenario;
- network configuration;
- local gas production;
- the forecasted capacity for the new interconnections;
- the forecasted capacity after the reverse flow optimisation.

The calculation of the N-1 formula for Romania

1. Definition of the N-1 formula

The N-1 formula describes the technical capacity of the gas transmission infrastructure to satisfy the total gas demand of the relevant area (Romania) in the case that the single main gas network is affected, for one day of exceptionally high demand, recorded statistically once every 20 years.

The gas infrastructure includes the gas transmission network, including interconnections, as well as the production facilities, LNG and storage facilities connected to the relevant area.

The technical capacity[1] of all the other gas infrastructures, available in the case that the single main gas infrastructure is affected, must be at least equal to the daily total gas demand for the relevant area, during one day of exceptional high gas demand, recorded statistically once every 20 years.

The result of the N-1 formula must be equal to at least 100%.

2. The calculation method for the N-1 formula:

$$N-1[\%] = \frac{EP_m + P_m + S_m + LNG_m - I_m}{D_{max}} \times 100, N-1 \geq 100\%$$

3. Definitions of the parameters of the N-1 formula

`Relevant area` means the geographical region for which the N-1 formula is calculated, as set by the competent authority.

Definitions regarding demand

`$D_{max}$`: daily gas demand (in mcm per day) in Romania during a day with exceptionally high demand, statistically recorded once every 20 years.

Definitions regarding offer

`$EP_m$`: the entry point technical capacity (mil. cm/day), other than production, LNG and storage facility entry points, symbolized by P_m, S_m and LNG_m, meaning the sum of the technical capacities in all border entry points, capable of supplying Romania with gas;
`$P_m$`: the maximum technical capacity for production (mil. cm/day) means the sum of the daily maximum production capacities of all the gas production facilities, capable of supplying Romania with gas;
`$S_m$`: the maximum technical capacity for withdrawal (mil. cm/day) means the sum of the daily maximum capacities for withdrawals from all the storage facilities, that can be supplied to the Romanian entry points, taking account the physical properties of each of them;
`$LNG_m$`: the maximum technical capacity of LNG facilities (mil. cm/day) means the sum of the maximum daily technical capacities for withdrawal from all the LNG facilities in Romania, taking into consideration critical elements, such as unloading, additional services, temporary storage and the regasification of LNG, as well as the technical capacity for extraction;
`$I_m$`: means the technical capacity of the single main gas infrastructure (mil. cm/day), with the highest supply capacity for Romania. If several infrastructures are connected to the same infrastructure upstream or downstream and cannot be operated separately, these are considered as a single gas infrastructure.

[1] According to Art. 2 (1) (18) of Regulation (EC) no. 715/2009, `technical capacity` means the maximum firm capacity that the transmission system operator can offer to the network users, taking account of system integrity and the operational requirements of the transmission network.

The result of the N-1 formula calculated for Romania in 2020 is as follows:

$$N-1[\%] = \frac{44{,}4 + 26{,}3 + 29{,}0 + 0 - 18{,}8}{72} \times 100$$

$$N-1[\%] = 112{,}4\%$$

$$N-1[\%] \geq 100\%$$

Explanations regarding the used values

a) Terms regarding demand:

Terms regarding demand [mil. cm/day]		Explanations
D_{max}	72.0	In 2020 the peak consumption ensured through the NTS amounted to 62.4 million S m^3/day on gas day 08.01.2020, which was lower than the peak consumption statistically existing once every 20 years.

b) Terms regarding offer (capacity):

Terms regarding offer [mil. cm/day]		Explanations
EP_m	**44.4**	The total capacity of import points (Isaccea 1, Negru Vodă 1, Csanadpalota, Ruse-Giurgiu, Ungheni).
P_m	**26.3**	Domestic gas production entered into the NTS (without extraction from storage).
S_m	**29.0**	The sum of the maximum flows extracted from each storage facility.
LNG_m	**0**	There are no LNG terminals.
I_m	**18.8**	The import capacity at Isaccea 1.

For P_m it was considered the production potential and not the technical capacity (70.4 million Sm^3/day).

We consider that this approach ensures a correct image provided by the N-1 standard - the technical capacity mentioned can no longer be achieved due to the decreasing of domestic production.

Upon the determination of the S_m term the sum of the maximum flows extracted from each storage facility was taken into consideration, updated according to the historical data of the past 5 years (2016-2020), namely:

Storage facility	Technological capacity (mil Scm/day)	Maximum flow (mil S m³/day)
Urziceni	4.6	4.5
Bălăceanca	1.3	1.0
Butimanu	16.8	13.2
Sărmașel	8.5	6.1
Târgu Mureș	3.4	2.8
Ghercești	1.5	1.4
Total	**36.1**	**29.0**
Maximum daily flow withdrawn simultaneously from all the storage facilities	*25.8*	

At EP_m value determination, the Isaccea 1, Negru Vodă 1, Csanadpalota and Giurgiu-Ruse and Ungheni entry points were considered as follows:

Entry point	Entry point capacity [mil. Scm/day]
Isaccea 1 entry point	18.8
Negru Voda 1 entry point	15.7
Csanadpalota entry point	7.2
Ruse –Giurgiu entry point	2.5
Ungheni entry point	0.2
Total	**44.4**

Table 5 - Gas import points

4. **The calculation of the N-1 formula by taking into account the demand oriented measures:**

$$N-1[\%] = \frac{EP_m + P_m + S_m + LNG_m - I_m}{D_{max} - D_{eff}} \times 100, N-1 \geq 100\%$$

Definition related to demand:
`$D_{eff}$` means the part of (mil. cm/day) of D_{max} which, in case of gas supply interruption, may be covered to a sufficient extent and in due time by market measures related to demand, in line with Art. 9 (1) (c) and Art. 5 (2).
The calculation result is the same as: $D_{eff}=0$ – no contracts are concluded with interruptible safety clients

Note:

- This document is an evaluation made by SNTGN Transgaz SA Mediaș;
- The official calculation of the N-1 formula is the exclusive task of the Competent Authority assigned for applying Regulation (EU) 1938 of 25 October 2017.

Forecast of the value of the N-1 formula for 10 years for the partial Russian gas supply interruptions (through Isaccea):

YEAR	N-1
2021	133.5
2022	123.1
2023	122.1
2024	142.9
2025	141.7
2026	140.5
2027	138.7
2028	136.9
2029	135.5
2030	132.5

Table 6 – Forecasts for the N-1 value for 10 years

7. DEVELOPMENT PATHS FOR THE NATIONAL GAS TRANSMISSION SYSTEM (NTS)

Overview

The physical structure of the National Gas Transmission System offers the possibility to identify and construct gas transmission corridors that would meet the gas supply safety requirements for the consumption areas in the country and the necessities for the transfer through the Romanian system of gas quantities from the systems of the neighbouring countries, as a requirement imposed by the liberalisation of the gas markets and the European regulations.

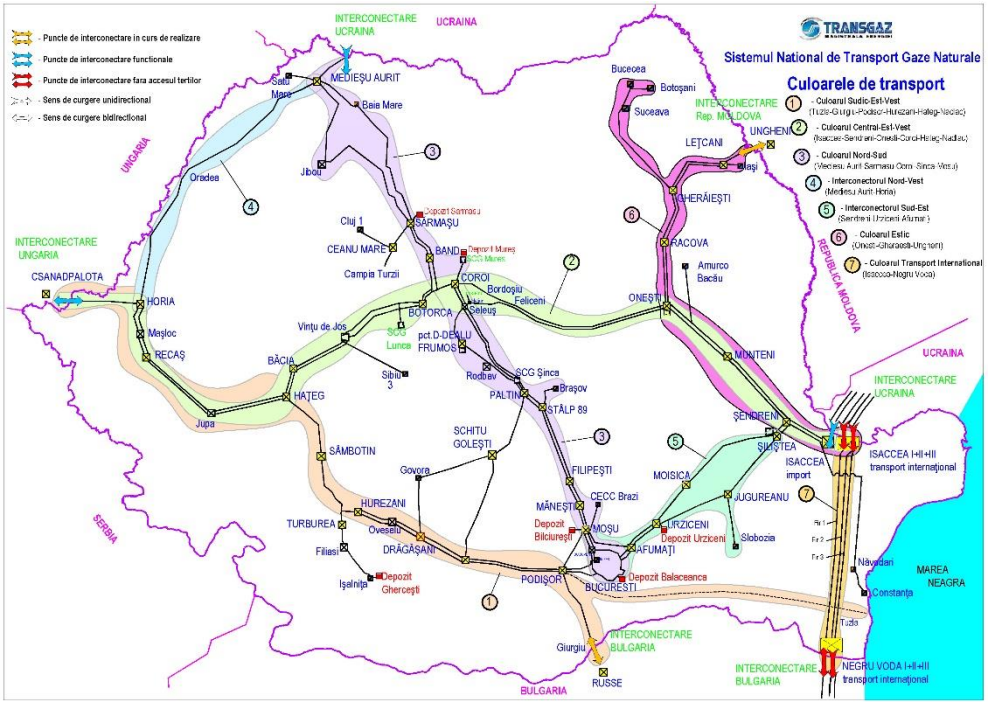


Figure 6 - NTS gas transmission corridors

The Romanian gas transmission system consists mainly of the following transmission corridors:

Southern Corridor 1– East-West
The pipelines related to this interconnection corridor ensure:

- gas import and export through the Csanadpalota interconnection point with Hungary, at a capacity of 2.2 bcm /year;
- gas import and export through the Giurgiu interconnection point with Bulgaria, at a capacity of 1.5 bcm /year;
- taking over the domestic gas production from the sources in Oltenia;
- gas supply for the consumption in the Western and Southern-Bucharest areas.

The development of this gas transmission corridor aims increasing transmission capacity of the cross-border interconnection point with Hungary (at 4.4 bcm/year in the Csanadpalota-Horia direction) and the transmission of gas from the Black Sea deposits to the internal consumption areas and to the cross-border interconnection points of this corridor (Hungary, Bulgaria).

Such development implies the construction of new pipelines and expansion of compressor stations in certain locations (Podisor, Bibesti, Jupa).

Central Corridor 2 East-West
The pipelines related to this interconnection corridor ensure:

- gas import through the Csanadpalota interconnection point with Hungary, at a capacity of 2.2 bcm/year;
- gas import through the Isaccea interconnection point with Ukraine, at a capacity of 8.6 bcm/year;
- taking over the internal gas production from the sources in Transylvania;
- gas supply for consumption in the Eastern and Western areas.

The development of this gas transmission corridor aims at increasing transmission capacity of the cross-border interconnection point with Hungary (at 8.8 bcm/year in the Csanadpalota-Horia direction) and the bidirectional gas flow. In this respect the rehabilitation of some of the existing pipelines on this corridor, the construction of new pipelines and the placement of compressor stations or the extension of the existing ones are necessary.

Corridor 3 North-South
The pipelines related to this interconnection corridor ensure:

- gas import through the Medieșu Aurit interconnection point with Ukraine, at a capacity of 4.0 bcm/year;
- taking over the gas production from the sources in Transylvania;
- storing gas in the internal underground storage facilities;
- gas supply for the consumption in the Northern, Central and South-Eastern-Bucharest areas.

Interconnection 4 North-West
The pipelines related to this interconnection corridor ensure:

- gas supply for the consumption of the Western-Oradea area.
- interconnection of the 1, 2 and 3 corridors (see Figure 6).

Interconnection 5 South-East
The pipelines related to this interconnection corridor are currently ensuring:

- trasmission of imported gas from the Isaccea interconnection point with Ukraine to the Bucharest consumption area and the related underground storage facilities (Bilciurești, Urziceni, Bălăceanca);
- gas supply for the consumption of the South-Eastern area.
- interconnection of the 1, 2, 3 and 6 corridors (see Figure 6).

Eastern Corridor 6
The pipelines related to this interconnection corridor ensure gas transmission from the production areas in Eastern country and the Isaccea interconnection point to the North Moldavia consumption area.

The development of this gas transmission corridor aims at ensuring physical bidirectional interconnection with the Republic of Moldavia (in operation from 2014 between Iasi and Ungheni). For this purpose, some of the pipelines existing on this corridor require rehabilitation and the construction of new pipelines and two new compressor stations.

International Transmission Corridor 7
At present, the corridor pipelines ensure international gas transmission from Russia, via Ukraine, through the IsaccealI+III interconnection point, towards Bulgaria, Greece and Turkey, through the Negru Vodă II+III interconnection point.

The development of this gas transmission corridor aims at ensuring bidirectional flows at the Isaccea and Negru Vodă cross-border interconnection points by upgrading the das metering stations GMS Isaccea II+III and GMS Negru Voda II+III.

The aforementioned developments are combined with the development of the storage system which has a complementary role in supporting the security, stability, optimization and flexibility of the National Gas Transmission System.

Increasing of storage capacities, has an indirect effect on the NTS, the indirect effect of ensuring the gas volumes required to cover the consumption peaks and the necessary pressures in the system for supply to consumers in the respective geographic areas, allowing the relieve of the storage facilities in Southern Romania.

STRATEGIC PROJECTS

The Development Plan for the Romanian National Gas Transmission System consists of large-scale projects meant to reconfigure the gas transmission network, which, although extended and complex, was designed at a time when the main goal was to supply gas to large industrial consumers and to provide them with access to the resources concentrated in the middle of the country and in Oltenia, and to the sole import source.

The identification of the NTS projects that need to be developed was based on the main requirements the system has to meet under the present dynamics of the regional gas market. Taking into account the latest evolutions and trends in the European gas transmission routes, two new important sources for gas supply are clearly emerging: **Caspian** and **Black Sea gas.**

Therefore, the projects planned by the company aim at:

- ensuring a proper interconnectivity with the neighbouring countries;
- creating regional gas transmission routes to ensure gas transmission from new supply sources;
- creating the necessary infrastructure for taking over and transmitting offshore blocks gas to the Romanian market and other markets in the region;
- extending the gas transmission infrastructure to improve gas supply to deficient areas;
- creating the single integrated European market.

In this context, it is very important for Transgaz to implement the described projects on a short notice, in order to connect the Central European markets to the Caspian and Black Sea resources.

The geostrategic position, the primary energy resources, the major investment projects in gas transmission infrastructure can support Romania`s becoming a key player in the region, provided it keeps pace with the technological progress and succeeds in obtaining the necessary financing.

By the envisaged projects for the upgrading and development of the gas transmission infrastructure, by the smart network control, automation, communication and management system implementation, Transgaz intends to **maximize energy efficiency** on the entire chain of activities and to **create** an efficient, reliable and flexible **smart gas transmission system**.

The **`smart energy transmission system`** concept applicable to the **`smart gas transmission systems`** will enhance network management which will also deal with smart tool safety and use issues regarding pressure, flow, metering, in-line inspection, odorization, cathodic protection, traceability, enhancing the system`s operating flexibility, safety and integrity, generating the energy efficiency increase.

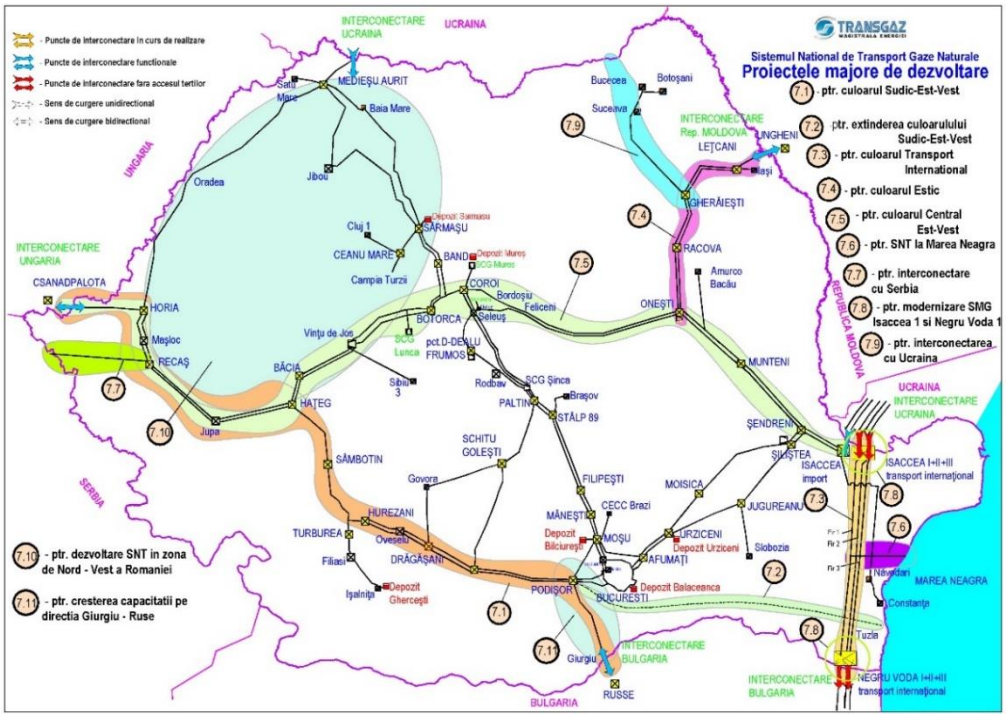


Figure 7 – Major NTS projects

7.1 Development on the Romanian territory of the National Gas Transmission System on the Bulgaria – Romania – Hungary – Austria Corridor (BRUA)

At the European level the implementation of several major projects allowing for the diversification of Europe`s gas supply sources by the transmission of Caspian gas and of the gas available from the LNG terminals to Central Europe:

- enhancement of the South Caucasus Pipeline;
- construction of the Trans-Anatolian Pipeline (TANAP);
- construction of the Trans Adriatic Pipeline (TAP);
- construction of the interconnection Greece - Bulgaria (IGB).

Figure 8– The interconnection points of the Romanian gas transmission system with the similar Bulgarian and Hungarian systems

The implementation of these projects creates the possibility to transmit Caspian gas to the Southern border of Romania.
Under these circumstances, the National Transmission System needed to be adjusted to the new perspectives, by extending the transmission capacities between the existing interconnection points of the Romanian gas transmission system with the Bulgarian system (at Giurgiu) and the Hungarian system (at Nădlac). The NTS entry-exit points Giurgiu and Nădlac were linked through a system of pipelines with a long service life, with diameters of maximum 24" and design pressures of maximum 40 bar.

The gas transmission capacities did not allow for the transmission of important gas volumes.

The project Development on the Romanian territory of the National Gas Transmission System on the Bulgaria – Romania – Hungary – Austria Corridor concerned **developments of the gas transmission system capacities** between the interconnections between the Romanian gas transmission system and the similar systems of Bulgaria and Hungary consisted in the construction of a new transmission pipeline connecting the Podișor Technological Node to the Horia GMS.

The BRUA Project implementation stages according to List 4 of PCIs/2019 are as follows:

- Development of the transmission capacity in Romania from Podișor to Recas, including, a new pipeline, a new metering station and three new compressor stations in Podisor, Bibesti and Jupa – BRUA Phase I - 6.24.1 in List 4 PCI/2019- BRUA Phase 1- project completed;

- Expansion of the transmission capacity in Romania from Recas to Horia towards Hungary up to 4.4 bcm/y, expansion of the compressor stations in Podisor, Bibesti and Jupa - BRUA Phase II - 6.24.4-1 in List 4 PCI/2019- BRUA Phase 2.

Moreover, the BRUA Project was included in the list of priorities of the CESEC (Central East Europe Gas Connectivity) working group as follows:

- **Phase I** of the BRUA Project was included in the list of priority projects;
- **Phase II** of the BRUA Project was included in the list of conditional priority projects.

The BRUA project, with both phases (Phase I and Phase II) is included in the 2020 ENTSOG TYNDP identified with the code TRA–F–358 (Phase I), and TRA-A-1322 (Phase II).

7.1.1 Development on the Romanian territory of the NTS on the Bulgaria – Romania – Hungary – Austria Corridor (BRUA) – Phase I – project completed

7.1.2 Development on the Romanian territory of the NTS on the Bulgaria – Romania – Hungary – Austria Corridor (BRUA) – Phase II

Unlike BRUA Phase I, which is considered a Security of Supply–SoS project, BRUA Phase II is considered a commercial project, and the Final Implementation Decision will be taken only if the project is commercially viable.

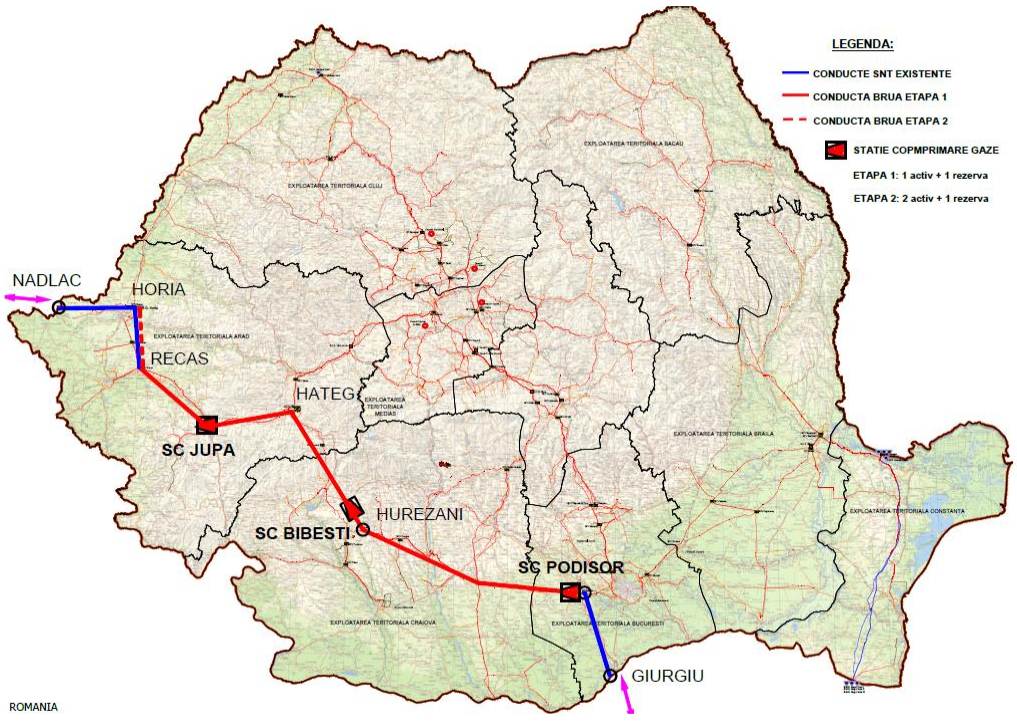


Figure 9 - Map of the key development project of the Bulgaria-Romania-Hungary-Austria Corridor – Phase 2

Project description

Phase II consists in the construction of the following facilities:

- 32" x 63 bar Recaş–Horia gas transmission pipeline, approximately 50 km long;
- Expansion of the three compressor stations (Podișor CS, Bibești CS and Jupa CS) by the mounting of an additional compressor for each station;
- Extension of the Horia GMS gas metering station.

The implementation of BRUA Phase II results in enabling permanent bidirectional gas flows between the interconnections with Bulgaria and Hungary, the following gas transmission capacities being ensured: gas transmission capacity to Hungary of 4.4 bcm/y and of 1.5 bcm/y to Bulgaria.

Indicative project implementation schedule

Development stages	Status/Indicative completion date
Pre-feasibility study	Completed
Feasibility study	Completed
Environmental Impact Assessment	Completed
FEED and permitting documentation for the construction permit	Completed
FID Phase II	2021*
Construction Phase II	2022-2023*
Commissioning Phase II	2023*
Start of operation Phase II	2023*

** The completion of Phase II depends on a future successful incremental capacity process according to CAM NC.*

Estimated completion time: 2023

Estimated investment value: EUR 74.5 million

SNTGN Transgaz S.A. together with FGSZ started at the end of 2017 the Binding Open Season for the Interconnection Point between Romania and Hungary (Csanadpalota).
Initially, the capacity offered was oversubscribed, proving market interest and ensuring the commercial viability of BRUA Phase II, with successful economic tests.

Within the legal term (until 14 December 2018), some network users, which booked capacity under the Open Season used their right to renounce the booked capacity. Under these circumstances the procedure will not be resumed in the previous form. Transgaz will apply Regulation (EU) no. 459/2017 establishing a network code on capacity allocation mechanisms in gas transmission systems **to determine the appropriateness of launching an incremental capacity process**.

Inclusion in international plans

- **PCI project (first list):** 7.1.5;
- **PCI project (second list):** Phase II: 6.24.7;
- **PCI project (third list):** Phase II: 6.24.4–4;
- **PCI project (fourth list):** Phase II: 6.24.4 -1 within ***Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor (currently known as ROHUAT/BRUA) to enable 1.75 bcm/y in the 1st phase, 4.4 bcm/y in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase***;
- **2020 ENTSOG TYNDP**: TRA-A-1322.

Priority corridor: Gas interconnections on the North-South corridor of Central Europe and South-Eastern Europe («NSI East Gas»). Cluster number EAST 12b and 12c.

Changes compared to previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	**Phase II** 32" x 63 bar Recaş – Horia pipeline, approximately 50 km long; The extension of the three gas compressor stations (Podisor CS, Bibesti CS and Jupa CS) by mounting an additional compressor in each station; The extension of the existing gas metering station - Horia GMS.	There are no changes.
Estimated completion time	**Phase II: 2022**	**Phase II: 2023**
Total estimated amount of the project (million Euro)	**74.5**	There are no changes.

7.2 Development on the Romanian territory of the Southern Transmission Corridor for taking over the Black Sea gas

While Europe becomes more dependent on imported gas, access to new sources becomes a vital necessity.

Under these circumstances, the development on the Romanian territory of a gas transmission infrastructure from the Black Sea shore to Romania's border with Hungary is one of TRANSGAZ`s major priorities.

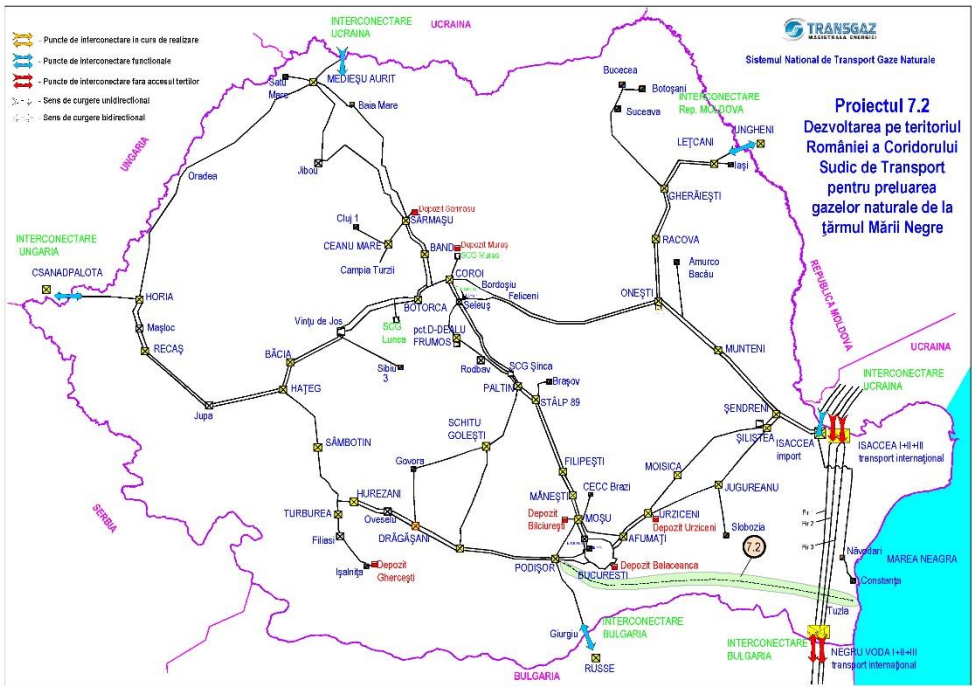


Figure 10 – Map of the major development project for taking over the gas from the Black Sea shore by extending the Southern East-West corridor

Project description

The major objective of this investment is to construct a gas transmission telescoping pipeline Tuzla – Podișor, 308.3 km long, DN 1,200 and DN 1,000, linking the natural gas resources available at the Black Sea shore and the BULGARIA - ROMANIA - HUNGARY - AUSTRIA corridor, thus enabling gas transmission to Bulgaria and Hungary through the existing interconnections - Giurgiu - Ruse (with Bulgaria) and Nadlac - Szeged (with Hungary). This pipeline will be interconnected with the T1 gas transmission pipeline, and crosses the Constanța, Călărași and Giurgiu counties.

The pipeline consists of two sections:

- Section I, Tuzla – Amzacea, 32.4 km long, will have a diameter of Ø 48" (DN1200) and the technical capacity of 12 bcm/year;
- Section II, Amzacea – Podișor, 275.9 km long, will have a diameter of Ø 40" (DN1000) and the technical capacity of 6 bcm/y.

Indicative project implementation schedule:

Development stages	Status/ Estimated completion time
Pre-feasibility study	Completed
Feasibility study	Completed
FEED	Completed
Environmental impact assessment study	Completed
Obtaining the Environmental Agreement	Completed
Authority engineering	Completed

Development stages	Status/ Estimated completion time
Obtaining the construction permit	Completed
Obtaining the comprehensive decision	Completed
Taking the final investment decision	Completed
Construction	2021-2022
Commissioning	2022

Estimated completion time: 2022

Estimated investment value: EUR 371.6 million.

Inclusion in international plans

- **PCI project (second list):** 6.24.8;
- **PCI project (third list):** 6.24.4-2;
- **PCI project (fourth list):** 6.24.4–5 6.24.4-2 *Black Sea shore — Podișor (RO) pipeline for taking over the Black Sea gas* within **Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor (currently known as ROHUAT/BRUA) to enable 1.75 bcm/y in the 1st phase, 4.4 bcm/y in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase**;
- List of conditional priority projects prepared within CESEC;
- **2020 ENTSOG TYNDP**: TRA-A-362.

Priority corridor: Gas interconnections on the North-South corridor of Central Europe and South-Eastern Europe («NSI East Gas»). Cluster number EAST 12b and 12c.

Changes compared to previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Pipeline length: 308.3 km.	There are no changes.
Estimated completion time	2022	There are no changes.
Total estimated amount of the project (million Euro)	371.6	There are no changes.

7.3 The interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow Isaccea – project completed

7.4 NTS developments in North-East Romania for enhancing gas supply to the area and for ensuring transmission capacities to/from the Republic of Moldova

Taking into account the need for improving gas supply to the North-East Romania and also keeping in mind the perspective offered by the interconnection pipeline between Romania and the Republic of Moldova (Iași-Ungheni) to offer gas transmission capacities to the Republic of Moldova, a series of developments need to be performed in the Romanian gas transmission system to ensure the required technical parameters for the consumption in the relevant regions.

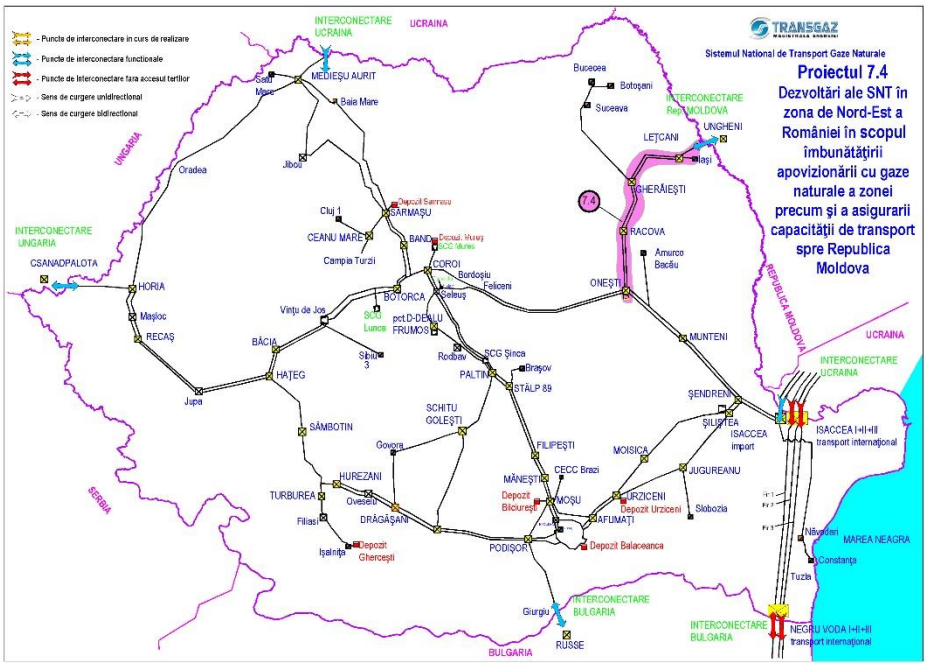


Figure 11 – NTS developments in the North-Eastern area of Romania

Project description:

For enhancing the implementation process and obtaining funds under the regional development programmes, the project was divided into 2 subprojects.

- Construction of a new gas transmission pipeline DN 700, Pn 55 bar, in the Oneşti – Gherăeşti direction, 104.1 km long. The route of this pipeline will be parallel mainly to the existing pipelines DN 500 Oneşti – Gherăeşti;
- Construction of a new gas transmission pipeline DN 700, Pn 55 bar, in the Gherăești – Leţcani direction, 61.05 km long. This pipeline will replace the existing DN 400 pipeline Gherăești – Iaşi on the Gherăești – Leţcani section.
- Construction of a new gas compressor station at Onești with an installed power of 9.14 MW, compressors of 4.57 MW each, one active one backup,
- Construction of a new gas compressor station at Gherăeşti with an installed power of 9.14 MW, 2 compressors of 4.57 MW each, one active one backup.

Indicative project implementation schedule:

Development stages	Status/ Estimated completion time
Concept study	completed
Feasibility study	completed
FEED for the pipelines	completed
FEED for the compressor stations	completed
Issuance of construction permits for the pipelines	completed
Issuance of construction permits for the compressor stations	completed
Construction	2020-2021
Commissioning/start up	2021

Estimated completion time: 2021

The total estimated value of the investment: EUR 174.25 million.

The estimated value of the investment	
Estimated value for procurement of materials	EUR 64.95 million
Onești–Gherăești gas transmission pipeline	EUR 17.32 million
Gherăești–Lețcani gas transmission pipeline	EUR 15.19 million
Onești Compressor Station	EUR 48.46 million
Gherăești Compressor Station	
Pipeline securing and automation	
Other activities (procurement of land, design, technical consultancy, audit and technical assistance	EUR 28.32 million
TOTAL	**EUR 174.25 million**

By the achievement of this project, the necessary pressure and gas transmission capacity of 1.5 billion cubic meters/a can be ensured at the interconnection point between the gas transmission systems of Romania and the Republic of Moldova.

The project meets the eligibility criteria of the Large Infrastructure Operational Programme (POIM). Priority Axis 8 - Strategic Objective (OS) 8.2, programme developed by the Management Authority of the Ministry of European Funds and receiving a non-reimbursable funding through PAP8 - *Intelligent and sustainable transport systems for electricity and natural gas* amounting to lei 214,496,026.71 (EUR 46.3 million).

On 22.11.2018 Grant Agreement 226 was signed in this regard with the Ministry of European Funds.

Inclusion in international plans

- **2020 ENTSOG TYNDP :** TRA-F-357

Changes compared to previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Pipeline length: 165.15 km	There are no changes.
Estimated completion time	2021	There are no changes.
Total estimated amount of the project (million Euro)	174.25	There are no changes.

7.5 Extension of the bi-directional gas transmission corridor Bulgaria – Romania - Hungary – Austria (BRUA Phase III)

Provided that the gas transmission capacities required to transport the Black Sea gas to the Central-Western EU market exceed the transmission potential of BRUA Phase II, Transgaz envisaged the development of the **central corridor**, which follows the route of existing pipelines currently operated at technical parameters inadequate for main pipelines.

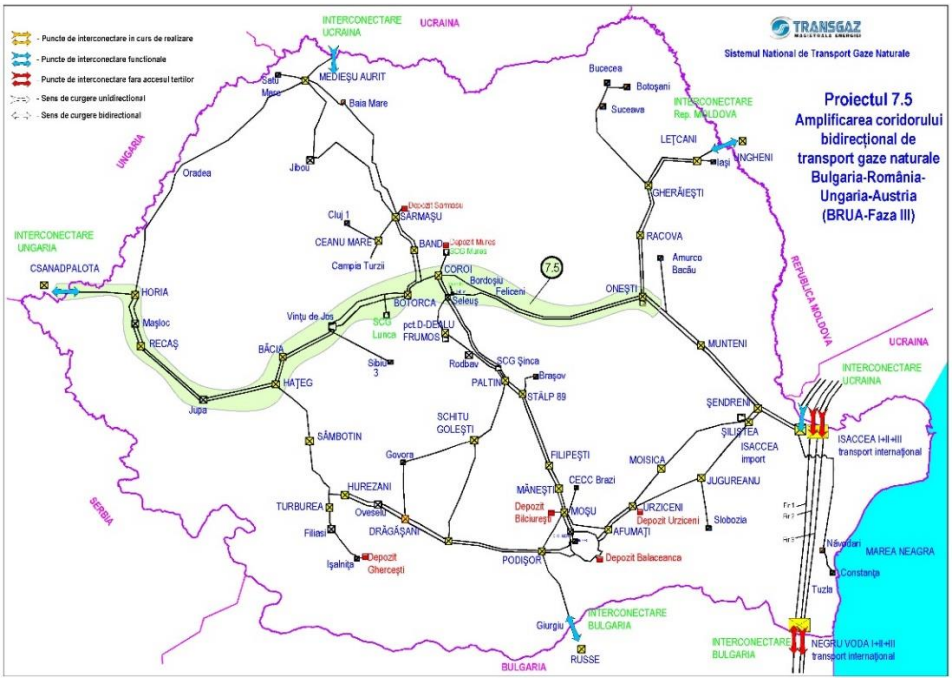


Figure 12 - BRUA 3 development

Project description

Depending on the volumes of natural gas available at the Black Sea shore (which cannot be taken over by the BRUA Corridor), the long-term development of the transmission capacity on the Oneşti - Coroi - Haţeg - Nadlac corridor is envisaged.

The development of this gas transmission corridor implies the following:

- upgrading of the existing pipelines belonging to the NTS;
- replacement of NTS existing pipelines with new pipelines or the construction of new pipelines installed in parallel with existing ones;

- the development of 4 or 5 new compressor stations with a total installed power of approx. 66 - 82.5MW.
- increasing gas transmission capacity towards Hungary by 4.4 bcm/y.

At present, Transgaz has developed the pre-feasibility study on the development of this gas **transmission corridor**, and in order to optimize and streamline both the implementation process and the possibilities of attracting non-reimbursable funds, the **corridor** has been divided into two projects.

The two projects are:

1. Ensuring the reversible flow on the Romania – Hungary interconnection:
   - **PCI Project (the second list):** 6.25.3;
   - **PCI Project (the third list):** 6.24.10–position 2;
   - **Priority corridor**: NSI EAST;
   - **2020 NTSOG TYNDP**: TRA-N-959.

   The project consists in the following:
   - New gas transmission pipeline Băcia – Haţeg – Horia – Nădlac, approximately 280 km long ;
   - Two new gas compressor stations located along the route.
2. NTS development between Onești and Băcia :
   - **PCI Project (the second list):** 6.25.3;
   - **PCI Project (the third list):** 6.24.10– position 2;
   - **Priority corridor**: NSI EAST;
   - **2020 NTSOG TYNDP**: TRA-N-959.

   The project consists in the following:
   - Upgrading some pipeline sections;
   - Replacement of existing pipelines with new pipelines with higher diameters and operating pressure ;
   - Two or three new gas compressor stations.

Inclusion in international plans

The projects above were grouped in List 3/2017 **of projects of common interest** published as annex to Regulation 347/2013 being included at position **6.24.10-2 under** the name ***Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor (currently known as "ROHUAT/BRUA") to enable 1.75 bcm/y in the 1st phase, 4.4 bcm/y in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase.***

The completion deadline for the entire corridor: 2026

The estimated investment amount is EUR 530 million.

The development of this corridor still depends on the evolution of the capacity demand and on the results of the exploration processes of the Black Sea or other on-shore blocks, a final investment decision being taken only when the demand for additional capacity is confirmed by booking contracts and agreements.

Changes compared to previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Corridor Oneşti–Coroi–Haţeg–Nădlac.	There are no changes.
Estimated completion time	2025	2026
Total estimated amount of the project (million Euro)	530	There are no changes.

7.6 NTS developments for taking over Black Sea gas

Taking into account the natural gas reserves discovered at the Black Sea, Transgaz intends to expand the NTS with the aim of creating an additional taking over point for the natural gas coming from the Black Sea blocks.

This project became necessary as a result of the discussions held/initiated by Transgaz during 2015 with license holders for exploration and exploitation of the Black Sea blocks.

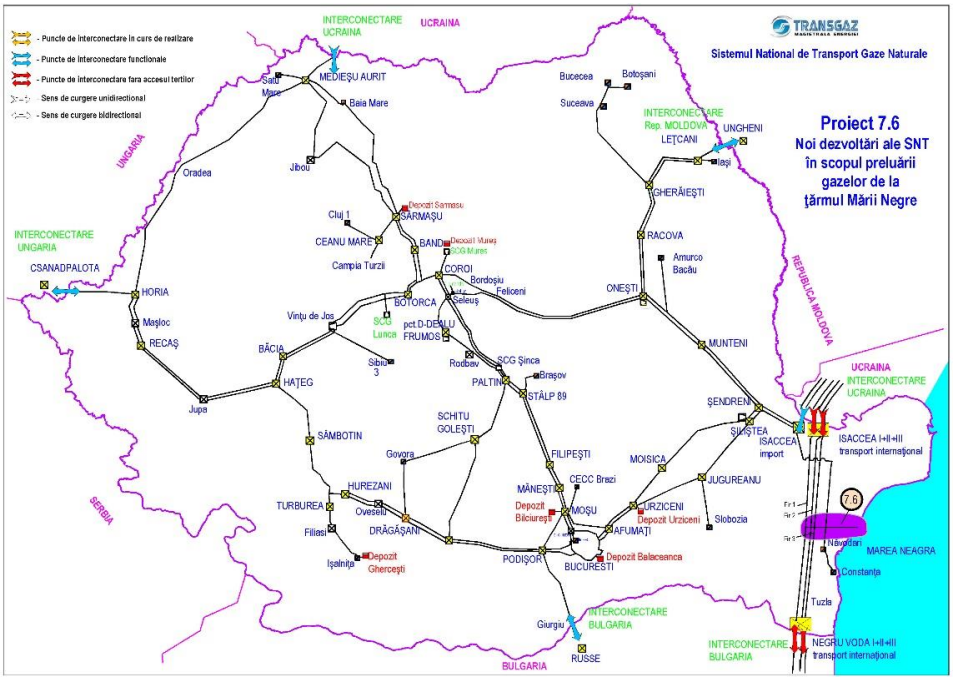


Figure 13 – NTS developments at the Black Sea

Project description

Transgaz has completed the pre-feasibility study for a transmission pipeline of approximately 25 km and a Dn 500 diameter, from the Black Sea shore to the existing T1 international gas transmission pipeline.

The transmission capacity is 1,23 bcm/year according to the Open Season results published on the Transgaz website.

Indicative project implementation schedule:

Development stages	Status/Estimated completion time
Pre-feasibility study	Completed
Feasibility study	Completed
Technical documentation for obtaining the construction permits	Completed
Obtaining construction permits	Completed
Obtaining the comprehensive decision	Completed
Taking the final investment decision	2020
Construction	2020-2021
Commissioning/start up	2021

Estimated completion time: 2021, depending on the upstream off-shore projects development schedules.

Estimated investment amount: **EUR 9.14 million.**

Inclusion in international plans

- **PCI project (third list)** 6.24.10-3 – within ***Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor (currently known as "ROHUAT/BRUA") to enable 1,75 bcm/y in the 1st phase, 4.4 bcm/y in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase***
- **2020 ENTSOG TYNDP:** TRA-F-964

Priority corridor: Gas interconnections on the North-South corridor of Central Europe and South-Eastern Europe («NSI East Gas»).

Changes compared to previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Pipeline length 25 km and DN 500	There are no changes
Estimated completion time	2021	There are no changes
Total estimated amount of the project (million Euro)	9.14	There are no changes

7.7 Romania – Serbia Interconnection – interconnection of the national gas transmission system with the similar gas transmission system in Serbia

In the context of the provisions of the EU Strategy on the Energy Union and of the actions for the implementation of the objectives of such strategy (competitiveness, sustainability and security of energy supply), Romania shows special interest to safeguarding energy security, the development of the energy infrastructure by the diversification of energy transmission sources and routes, by increasing solidarity between member states and by ensuring effective operation of the energy market.

In order to increase the interconnectivity between gas transmission systems in EU member states and to increase energy security in the region the project on the achievement of the interconnection of the National transmission System in Romania with the one in Serbia is necessary.

Project description:

The project *Interconnection of the National Gas Transmission System of Romania with the similar natural gas transmission system of Serbia* involves the construction of a new natural gas transmission pipeline that will ensure the connection between the BRUA gas pipeline and the Mokrin Technological Node in Serbia.
On the territory of Romania, the gas transmission pipeline will be connected to BRUA Phase I pipeline (Petrovaselo, Timis County) and will have a length of 85.56 km (the border between Romania and Serbia - Comloşu Mare, Timiş County).

The project consists in the following:

- Construction of an approximately 97 km long pipeline to interconnect the national gas transmission system in Serbia, in the Recas – Mokrin direction of which about 85 km on the territory of Romania and 12 km on the territory of Serbia with the following characteristics:
  - Pressure of the BRUA pipeline in the Recaș area: 50 – 54 bar (PN BRUA – 63 bar);
  - Diameter of the interconnection pipeline: Dn 600;
  - Transmission capacity: max. 1.6 bScm/a (183,000 Scm/h), both in the Romania - Serbia direction and in the Serbia - Romania direction.
- Construction of a gas metering station (located on the Romanian territory).

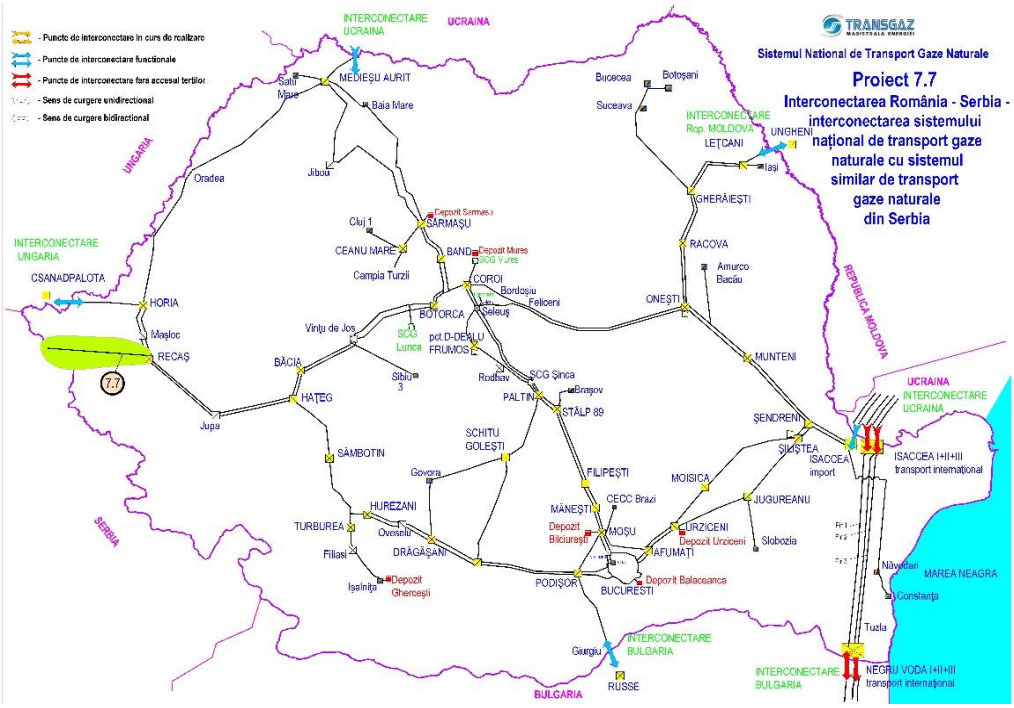


Figure 14- Interconnection of the NTS with Serbia in the Recas – Mokrin direction

Indicative project implementation schedule

Development stages	Status/ Estimated completion time
Pre-feasibility study	Completed
Feasibility study	Completed
FEED and tender books	Completed
FEED and permitting documentation for the construction permit	2021
Initiation of the procedure for the procurement of the execution works	2021
Construction	2022 - 2023
Commissioning /start-up	2023

Estimated completion time: 2023

Total estimated investment amount: EUR 56.21 million of which:

The estimated value of the investment	
Execution works	EUR 43.93 million
Other activities (procurement of land, design, technical consultancy, audit and technical assistance)	EUR 12.28 million
TOTAL	**EUR 56.21 million**

Gas export towards Serbia will be performed only after the completion of the BRUA project (Phase 1).

If gas will be taken over from Serbia to Romania, it may be redirected towards the Timisoara – Arad consumption area, through the DN 600 Horia – Mașloc – Recaș (25 bar) pipeline, at lower pressures than through the BRUA pipeline.

Inclusion in international plans

- **2020 ENTSOG TYNDP**: TRA-A-1268

Changes compared to previous TYNDPs

Following the completion of the Feasibility study and FEED the following changes were made:

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Pipeline length 97 km (85 km România)	There are no changes
Estimated completion time	2021	2023
Total estimated amount of the project (mil. Euro)	56.21	There are no changes

7.8 Upgrading GMS Isaccea 1 and GMS Negru Vodă 1

7.8.1 Upgrading GMS Isaccea 1 – project completed

7.8.2 Upgrading GMS Negru Vodă 1

In order to increase the level of energy security in the region, the following Interconnection Agreements were signed:

- **Interconnection Agreement for the Interconnection Point Isaccea 1**, concluded with PJSC Ukrtransgaz, Ukraine, on 19.07.2016;
- **Interconnection Agreement for the Interconnection Point Negru Vodă 1**, concluded with Bulgartransgaz, Bulgaria, on 19.05.2016.

The actions included in these Agreements include the upgrading of the gas metering stations at the two interconnection points.

The project *Upgrading GMS Isaccea 1 and GMS Negru Vodă 1* consists in the construction of two new gas metering stations to replace the existing ones. GMS Isaccea 1 was completed in 2020.

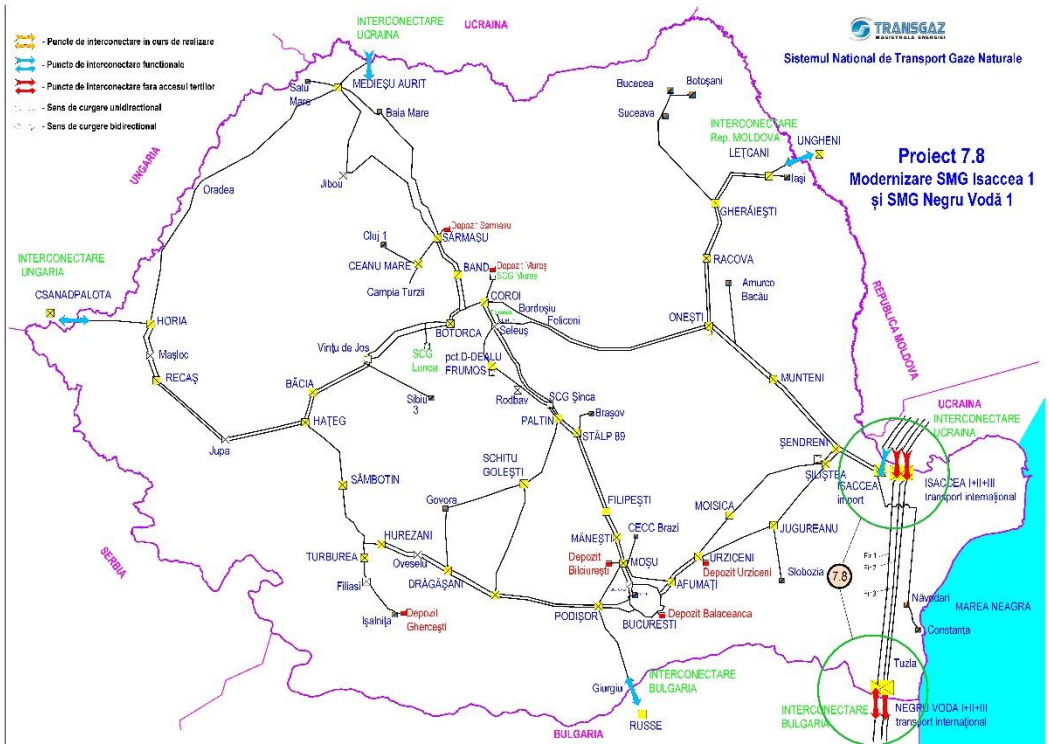


Figure 15 - Upgrading GMS Negru Vodă 1

Project description:

1. **The metering station GMS Negru Vodă 1**

The upgraded Metering Station will be equipped with a separating/filtering installation and a metering installation

- The Separation/filtering is ensured by a separating/filtering battery.
- The metering installation will be made up of several parallel metering lines (in operation and back up) equipped with ultrasonic meters for metering the delivered gas quantities, each line being equipped identically with two independent metering systems (Pay and Check). The independent Pay and Check systems will use dual ultrasonic meters.

The number of the metering lines is sufficient to allow for the metering of the gas quantities to be delivered through the GMS. The number of lines in operation will depend on the quantities of natural gas to be circulated through the GMS. To verify the traceability of ultrasonic meters on the metering lines, they will be periodically connected in series with a reference metering line equipped with a turbine meter.

If one of the systems no longer meets the established standards and/or error limits, that metering line will be closed and withdrawn from normal operation until the causes that led to these malfunctions are remedied. The project implies the upgrading of the two metering stations for the existing capacities and enables the bidirectional operation in Isaccea as well.
The volumes resulting from the independent metering of the Pay, Check and Verification systems will be monitored continuously.

Indicative project implementation schedule

Development stages	Status/ Estimated completion time
Feasibility study	Completed
Design	Under preparation
FEED and permitting documentation for the construction permit	2021*
Construction	2021
Commissioning /start-up	2021

*the time depends on the legal regulation of the land

Estimated completion time: 2021

The total estimated investment amount: EUR 12.77 million:

Inclusion in international plans

- **2020 ENTSOG TYNDP**: TRA-F-1277

Changes compared to previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Construction of two new gas metering stations in the existing facilities	Isaccea - completed Negru Vodă - There are no changes.

	2020-2029 TYNDP	2021-2030 TYNDP
Estimated completion time	2020-GMS Isaccea 1 2021-GMS Negru Vodă1	Isaccea - completed Negru Vodă - There are no changes.
Total estimated amount of the project (mil. Euro)	13.88 Isaccea 1 12.77 Negru Vodă 1	Isaccea - completed Negru Vodă - There are no changes.

7.9 Interconnection between the gas transmission systems of Romania and Ukraine in the Gherăești – Siret direction

Through the application of the TYNDP Transgaz intends to increase the interconnectivity between the national and the European gas transmission networks.

Therefore, in addition to the Project for NTS developments in North-Eastern Romania for improving gas supply to the region and ensuring transmission capacities to/from Ukraine, Transgaz identified the opportunity to construct an interconnection between the NTS and the gas transmission system in Ukraine, in the Gherăești – Siret direction.

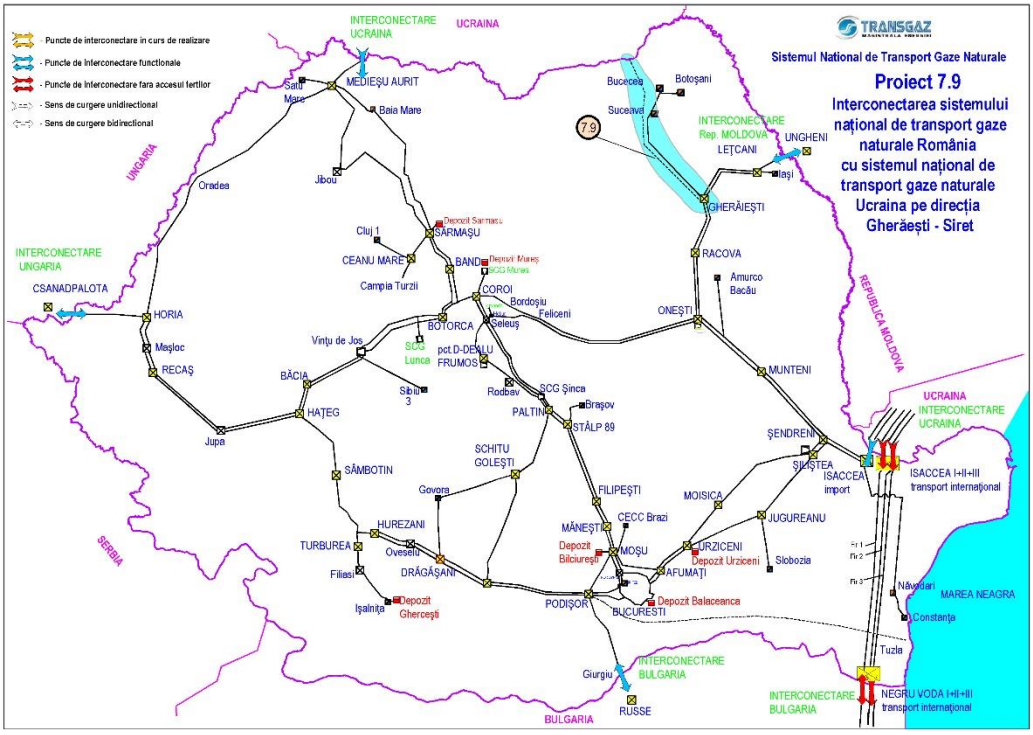


Figure 16 - Interconnection between the gas transmission systems of Romania and Ukraine in the Gherăești – Siret direction

Project description:

The project Interconnection between the gas transmission systems of Romania and Ukraine in the Gherăești – Siret direction consists in:

- the construction of a 146 km gas transmission pipeline and the related facilities, in the Gherăești – Siret direction;
- the construction of a cross-border gas metering station;
- the extension of the Onești and Gherăești compressor stations, if applicable.

The project is in an early stage and the capacities to be developed under the project will be established subsequently.

Indicative project implementation schedule

Development stages	Status/ Estimated completion time
Prefeasibility study	Completed
Feasibility study	2021-2022
FEED	2022-2023*
Public procurement (material and works)	2023*
Construction	2023-2026*
Commissioning start-up	2026*

*It depends on the establishment of the parameters related to the interconnection point and upon the project implementation schedule on the Ukrainian territory.

Estimated completion time: 2026

Total estimated value of the investment: EUR 150 million

Inclusion in international plans

- **2020 ENTSOG TYNDP**: TRA-N-596

Priority corridor: Gas interconnections on the North-South corridor of Central Europe and South-Eastern Europe («NSI East Gas»). Cluster number EAST 22.

Changes compared to previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	– construction of a gas transmission pipeline (130 km long) and of the related equipment in the Gherăești–Siret direction; – construction of a cross-border gas metering station; – expansion of the Onești and Gherăești compressor stations.	- construction of a 146-km long gas transmission pipeline and of related facilities in the Gherăești–Siret direction;.
Estimated completion time	2025	2026
Total estimated value (mil. Euro)	125	150

7.10 Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania

The project aims to achieve/upgrade objectives related to the National Gas Transmission System in the North-Western part of Romania for the creation of new gas transmission capacities or for the increase in the existing ones.

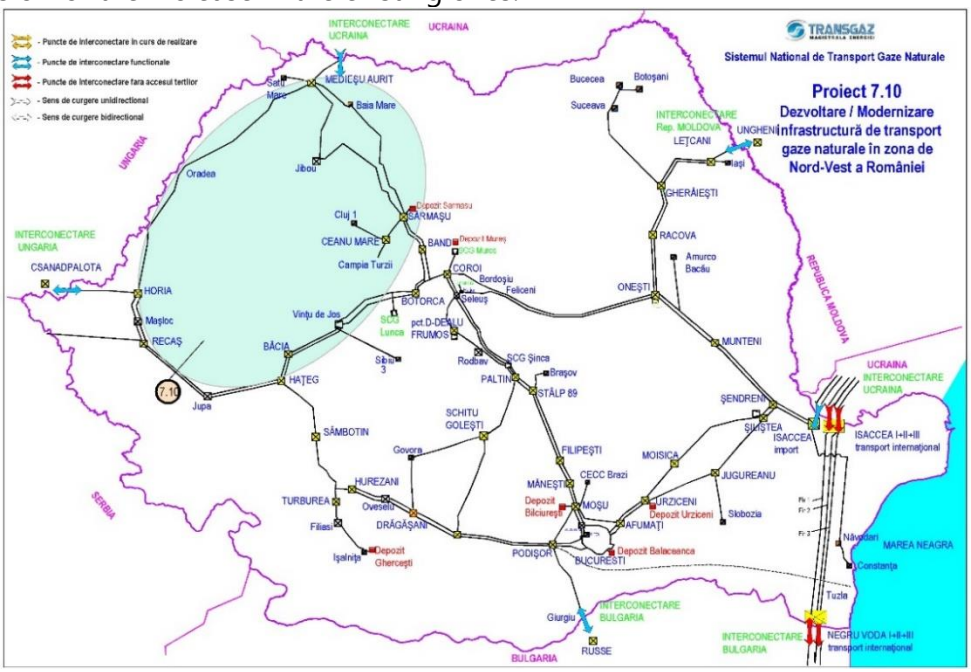


Figure 17- Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania

Project description

According to the Pre-Feasibility study, the project consists of:

- construction of a pipeline and of the related equipment in the Horia–Mediești Aurit direction;
- construction of a pipeline and of the related equipment in the Sărmășel–Mediești Aurit direction;
- construction of a pipeline and of the related equipment in the Huedin–Aleșd direction;
- construction of a Gas Compressor Station at Mediești Aurit.

The project is to be developed taking into account the ongoing key importance projects to be implemented on the territory of Romania. The prioritization of this project is based on the evolution of the other projects.

Considering the large dimension of such project, it is supposed to be implemented in stages, as follows:

- **Stage 1:**
  - construction of the pipeline and of the related equipment in the Horia–Borș direction.
- **Stage 2:**
  - construction of the pipeline and of the related equipment in the Borș–Abrămuț direction;
  - construction of a Gas Compressor Station Mediești Aurit;

- construction of the pipeline and of the related equipment in the Huedin–Aleșd direction.

- **Stage 3:**
  - construction of the pipeline and of the related equipment in the Abrămuț–Mediești Aurit direction;
  - construction of the pipeline and of the related equipment in the Sărmășel–Mediești Aurit direction.

Indicative project implementation schedule:

Development stages	Status / Estimated completion time
Stage 1	**2023**
Pre-feasibility study	Completed
Feasibility study	2021
FEED	2021-2022
Public procurement	2022
Construction	2022-2023
Commissioning/start up	2023
Stage 2	**2025**
Pre-feasibility study	Completed
Feasibility study	2021
FEED	2022-2023
Public procurement	2023
Construction	2023-2025
Commissioning/start up	2025
Stage 3	**2026**
Pre-feasibility study	Completed
Feasibility study	2021
FEED	2022-2023
Public procurement	2023
Construction	2024-2026
Commissioning/start up	2026

Estimated completion time: 2023 Stage 1, 2025 Stage 2 and 2026 Stage 3

Estimated value: EUR 405 million

The project is at an early phase with the completed Pre-feasibility Study.

Inclusion in international plans

2020 ENTSOG TYNDP: TRA-N-598

Changes compared to the previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	▪ **Stage 1:** -construction of the pipeline and of the related equipment in the Horia–Borș direction ▪ **Stage 2:** -construction of the pipeline and of the related equipment in the Borș–Abrămuț direction; -construction of a Gas Compressor Station at Mediești Aurit; -construction of the pipeline and of the related equipment in the Huedin–Aleșd direction. ▪ **Stage 3:** - construction of the gas transmission pipeline and of the related equipment in the Abrămuț–Mediești Aurit direction; - construction of the pipeline and of the related equipment in the Sărmășel–Mediești Aurit direction	There are no changes.
Estimated completion time	2022 – Stage 1 2025 – Stage 2 2026 – Stage 3	2023 – Stage 1 Stage 2 - There are no changes. Stage 3 - There are no changes
Total estimated project value (mil. Euro)	405	There are no changes.

7.11 Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction

In July 2017, in Bucharest, Transgaz, Bulgartransgaz, DESFA, FGSZ and ICGB signed a Memorandum of Understanding on the Vertical Corridor. In order to achieve its scope, the parties agreed to assess the technical requirements such as new pipelines, interconnections or enhancements of the national transmission systems.

The estimations in terms of the gas transport in the Southern part of Europe illustrate a rapid evolution and the new key projects to be achieved in this area envisage gas flows in the South-North direction.

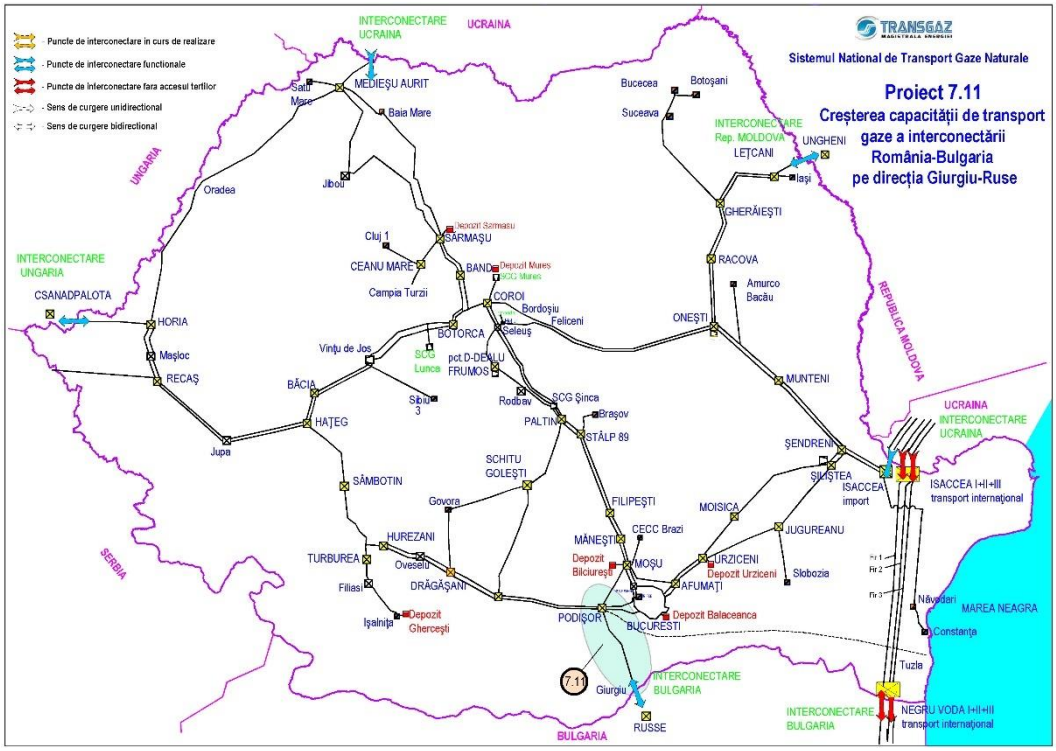


Figure 18- Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction

Project description

Based on the capacities, the project consists of:

- construction of a new gas transmission pipeline and of the related facilities
- construction of a new Danube undercrossing
- enhancement of GMS Giurgiu

Indicative project implementation schedule:

Development stages	Status / Estimated completion time
Pre-feasibility study	2021
Feasibility study	2021-2022
FEED	2023-2024
Public procurement	2024
Construction	2025-2027
Commissioning/start up	2027

Estimated completion time: 2027

Estimated value: EUR 51.8 million

The project is at an early implementation stage, the capacities to be developed within this project will be later on established and the final technical solution will be based on such capacities.

Changes compared to the previous TYNDP:

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Based on the capacities, the project consists in: -the construction of a new gas transmission pipeline and the related facilities; -the construction of a new Danube undercrossing pipeline; -the extension of GMS Giurgiu.	There are no changes.
Estimated completion time	2027	There are no changes.
Total estimated project value (mil. Euro)	51.8	There are no changes.

7.12 Eastring-Romania

The Eastring project promoted by Eustream is a bidirectional gas transmission pipeline dedicated to Central and South-Eastern Europe which is meant to interconnect the gas transmission systems of Slovakia, Hungary, Romania and Bulgaria in order to ensure access to the Caspian and Middle East gas reserves.

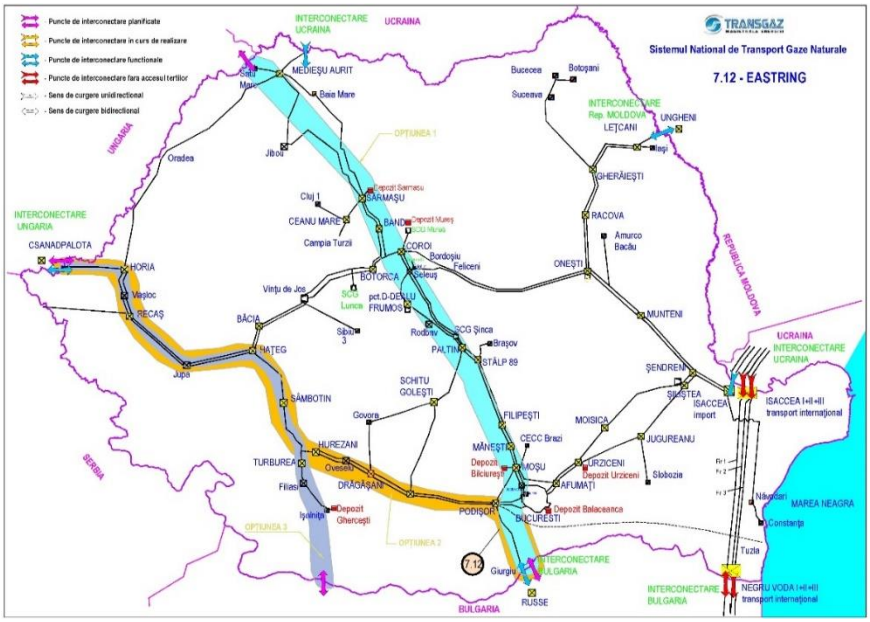


Figure 19- Eastring

Project description

EASTRING is a bidirectional gas transmission pipeline with an annual capacity between 225.500 GWh and 451.000 GWh (approx. 20 bcm up to 40 bcm) which connects Slovakia with the EU external border through Bulgaria, Hungary and Romania.

EASTRING will ensure the most cost-reflective and direct transmission route between the gas platforms from the Western European region and the Balkans/Western Turkey – a region with very high potential to offer gas from various sources. The possibility to diversify transmission routes and gas supply sources will safeguard the regional security of gas supply to the region, mainly in the South-Eastern European countries.

According to the feasibility study, the project will be implemented in two stages as follows:

- Stage 1 – Maximum capacity 20 bcm/y;
- Stage 2 – Maximum capacity 40 bcm/y.

Indicative project implementation schedule:

Development stages	Status / Estimated completion time
Stage 1	**2027**
Pre-feasibility study	Completed
Feasibility study	Completed
FEED	2019-2025
Public procurement	2022-2023
Construction	2025-2027
Commissioning/start up	2027
Stage 2	**2030**
Pre-feasibility study	Completed
Feasibility study	Completed
FEED	2025-2028
Public procurement	2028-2029
Construction	2028-2030
Commissioning/start up	2030

Estimated completion time: 2027 Stage 1, 2030 Stage 2

Estimated investment:

- **Stage 1 - EUR 1,297 mil. for Romania (EUR 2,600 mil. – total);**
- **Stage 2 - EUR 357 mil. for Romania (EUR 739 mil. – total).**

In 2018 the Feasibility Study was completed. The scope of the Feasibility Study was the design of a bidirectional pipeline to interconnect the Slovakian gas transmission system with the South-Eastern European border (Black Sea or Turkey) through Hungary, Romania and Bulgaria.

Project inclusion in international plans

- **PCI Project (List III):** 6.25.1;
- **2020 ENTSOG TYNDP (Eastring–Romania)**: TRA-A-655.

Changes compared to the previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Bidirectional gas interconnection pipeline with an annual capacity ranging from 225,500 GWh and 451,000 GWh (approx. 20 bcm up to 40 bcm), connecting Slovakia with the EU external border across Bulgaria, Hungary and Romania.	There are no changes.

	2020-2029 TYNDP	2021-2030 TYNDP
Estimated completion time	2025 – Stage 1 2030 – Stage 2	2027 – Phase 1 2030 – Phase 2
Total estimated project value (mil. Euro)	Stage 1 - EUR 1,297 mil. for Romania (EUR 2,600 mil. –total); Stage 2 - EUR 357 mil. for Romania (EUR 739 mil. –total).	There are no changes.

7.13 Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System

The implementation of the data acquisition, control and monitoring system for the cathodic protection system will ensure increased durability and safety in the operation of the transmission pipelines based on the data acquired, will ensure simplicity in operation for a complex pipeline protection system with low maintenance costs.

At the same time, it will provide information about the electro-security of the pipeline as well as for the intrinsic cathodic protection (without external cathodic power source) by providing information at some points or sections for the limiting recovery of the induced alternating currents in the pipeline.

Project description

At TRANSGAZ SA, the cathodic protection stations are the main active protection system of the gas transmission pipelines.

There are currently approximately 1.038 cathodic protection stations recorded (CPS).
The reduction in the corrosion of the pipelines maintaining them in operation for a longer period of time and the reduction in the maintenance costs are the main objectives.

The centralized cathodic protection system will provide the possibility the remotely set, monitor and operate clearly and precisely the points of interest in the system, it will eliminate costs related to data reading it will avoid the situations when because of the weather conditions it is impossible to read data and human errors, it will allow for the distributed control of the locations, it will reduce operation and maintenance costs and considerably reduce the configuration time.

The implementation of such a system will reduce the micro-management, the testing time and the commissioning.

The architecture distributed will offer minimum unavailability risks and it will offer maximum viability of the cathodic protection system.

The system will be intuitive, easy to use and acceptable in any SCADA system structure and the training requirements for the operators are short and simple.

The implementation of such a system will reduce personnel costs and will train the personnel responsible for operation and maintenance.

The decision on the system maintenance and the related regulation of the cathodic protection station in integrated system will be the decision of a well-trained dispatcher relying on the data received in real time and based on a historical data base.

The remote control of the parameters of the cathodic protection stations and corrosion monitoring in the critical points of the gas transmission system is mandatory for corrosion reduction and proper management of the power consumers in each location.

The implementation of the SCADA system for cathodic protection will ensure increased sustainability and safety in the exploitation of the gas transmission pipelines based on the data acquired it will ensure the simple operation of a complex pipeline protection system.

Indicative project implementation schedule:

Development stages	Status/Estimated completion time
Feasibility study	2021
FEED	2021-2022
Environmental impact assessment	N/A
Obtaining the Environmental Agreement =	N/A
Technical documentation for obtaining the construction permit	N/A
Obtaining the construction permit	N/A
Making the final investment decision	2021
Construction	2022-2023
Commissioning/start up	2023

Estimated completion time: 2023

Estimated investment amount: EUR 8 million

Changes compared to the previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	-	There are no changes.
Estimated completion time	2023	There are no changes.
Total estimated project value (mil. Euro)	8	There are no changes.

7.14 Development of the SCADA system for the National Gas Transmission System

SNTGN Transgaz has implemented and commissioned in 2015 a SCADA system structured as follows:

- 2 central dispatching centres, Mediaș and Bucharest;
- 9 local dispatching units;
- 948 MRSs;
- 106 line valves;
- 33 technological nodes;
- 3 compressor stations;
- 4 international transmission stations;
- 2 import stations;
- 7 underground storage facilities.

The National Gas Transmission System has a continuous evolution justified by the dynamics of the gas flows circulated and the strategic position Romania has in ensuring the national and European energy independence and security:

- development of the Southern Transit Corridor on the territory of Romania for taking over the natural gas from the Black Sea shore;
- interconnection of the national gas transmission system with the T1 natural gas international transmission pipeline and reverse flow at Isaccea;
- NTS developments in the North-East of Romania in order to improve the natural gas supply of the area and to ensure the transmission capacities to/from the Republic of Moldova;
- enhancement of Bulgaria-Romania-Hungary-Austria bi-directional gas transmission corridor (BRUA-Phase III);
- capitalization of Romania's technical and energy resources through the development of the NTS interconnection projects with other European transmission systems (Ukraine, Moldova, Serbia, Hungary, Bulgaria);
- project on new NTS developments for taking over gas from the Black Sea shore;
- Romania-Serbia interconnection - interconnection of the National Gas Transmission System with the similar natural gas transmission system of Serbia;
- upgrading GMS Isaccea 1 and GMS Negru Vodă 1;
- interconnection of the national gas transmission system with the natural gas transmission system from Ukraine, on the Gherãesti-Siret direction;
- expansion, development and upgrading of natural gas transmission infrastructure (development of the natural gas compressor stations, modernization of the storage system infrastructure, etc.);
- meeting the legislative requirements imposed by the National Regulatory Authority for Energy (ANRE) regarding the integration into the SCADA system TRANSGAZ of all the exit points from the NTS, which were not included in the SCADA System implemented by the Supply Contract no.17095 / 2009.

Security of gas supply underlies any energy policy - any gas supply disruption has important consequences for the economies of EU Member States.

To strengthen this security, European Union countries need to diversify their energy drivers and energy sources, but at the same time to act for the modernization of natural gas transmission infrastructure.
The upgrading of the gas transmission infrastructure must be supported in the coming years by the development of an efficient and flexible SCADA system by modernizing the hardware and software architecture by migrating to a decentralized architecture with control distributed on organizational administrative units in accordance with the structure of SNGG TRANSGAZ.

Project description

The Project related to the *Development of the SCADA System (Supervisory Control and Data Acquisition) for the National Gas Transmission System* will consist in:

- analysis of the possibilities of optimizing the architecture of the SCADA system;
- upgrading/replacing, at the level of national/regional SCADA dispatching centres the obsolete hardware equipment in order to ensure, through the new firmware options/operating systems/ software applications used, an increase in the volume and power of data processing and the degree of computer security;
- ensuring a spare hardware/software capacity at the level of national and regional SCADA dispatching centres necessary for the future integration in the SCADA system of the NTS facilities to be commissioned in the period 2022-2027;
- additional integration of about 170 MRSs (Metering Regulating Stations) operational at the level of the National Gas Transmission System (NTS);
- ensuring the continuous transmission, real-time monitoring at national and regional SCADA dispatching centres, of the relevant and necessary technological parameters within the NTS facilities, in accordance with the level and pace of development of the technological installations in the short and medium term, in order to monitor and operate the NTS under conditions of safety, efficiency and protection of the environment;
- integration of the new local automations that will be commissioned by 2022 resulting from the refurbishment/ development of the gas compressor stations, technological nodes, line valves located on the main pipelines, etc.;
- installation of SCADA Intrusion Detection System LAN SCADA type systems;
- installation of dedicated IP&DS systems with supervision at the level of industrial protocols for sensitive applications (remotely controlled stations through the SCADA system: technological nodes, interconnection stations, compressor stations, future Pipeline automation systems);
- installation of a simulation system and PMS (Pipeline Monitoring Software) or NSM (Network Program Management);
- identification and provision of technical solutions for securing the industrial data network in which the control and data acquisition systems are installed (SCADA);
- analysis of the technical opportunities regarding the design and construction of an emergency dispatching centre, if the study on the opportunity and necessity of the existence of an emergency dispatching centre so requires, training of SCADA operation/technical

Indicative project implementation schedule:

Development stages	Status/Estimated completion time
Feasibility study	2021
FEED	2022
Environmental impact assessment	N/A
Obtaining the Environmental Agreement	N/A
Technical documentation for obtaining the construction permit	N/A
Obtaining the construction permit	N/A
Making the final investment decision	2021 - 2022
Construction	2021 - 2023
Commissioning/start up	2023

Estimated completion time: 2023

Estimated investment amount: EUR 5.5 million
Changes compared to the previous TYNDP:

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	-	There are no changes
Estimated completion time	2023	There are no changes
Total estimated value of the project (mil. Euro)	5.5	There are no changes

7.15 Upgrading GMS Isaccea 2 and GMS Negru Voda 2 for enabling bidirectional flow on the T2 pipeline

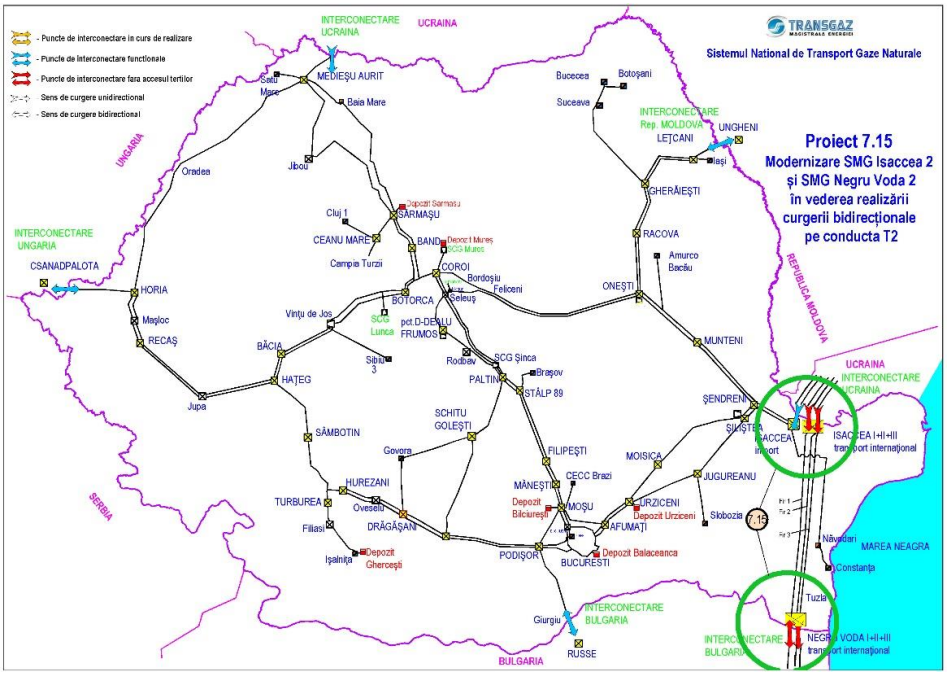


Figure 20 - Upgrading GMS Isaccea 2 and GMS Negru Voda2 for enabling bidirectional flow on the T2 pipeline

Project description

In order to ensure the bidirectional flow at the border with Ukraine and Bulgaria on the T2 transit pipeline, it is necessary to upgrade the gas metering stations GMS Isaccea 2 and GMS Negru Vodă 2.

1. Gas Metering Station GMS Isaccea 2

The upgraded metering station will be equipped with a separation/filtration installation and a metering installation:

- the separation/filtration is ensured by a separation/filtration battery;
- the metering installation will consist of several parallel metering lines (operating and backup) equipped with ultrasonic meters for metering the quantities of natural gas delivered, each line being identically equipped with three independent metering systems (Pay, Check and Control); the independent systems Pay and Check will use dual ultrasound meters, and the Control systems will use a simple ultrasound meter.

The number of metering lines is sufficient to allow the metering of the gas quantities which will be delivered through the GMS. The number of lines in operation will depend on the gas quantities to be circulated through the GMS. To verify the traceability of the ultrasonic meters on the metering lines, they shall be regularly connected in series with a reference metering line equipped with a turbine meter.
If one of the systems no longer meets the established standards and/or error limits, the relevant metering line shall be closed and withdrawn from normal operation until the causes of these malfunctions have been remedied.
The volumes resulting from the independent measurement of the Pay, Check and Verification systems will be continuously monitored.

2. Gas Metering Station GMS Negru Vodă 2

The upgraded Metering Station will be equipped with a separation/filtering equipment and metering equipment:

- the separation/filtering is ensured by a separation/filtering battery;
- the metering installation will consist of several parallel metering lines (operating and backup) equipped with ultrasonic meters in order to measure the gas quantities delivered, each line being identically equipped with two independent metering systems (Pay and Check); the independent Pay and Check systems will use dual ultrasonic meters.

The number of metering lines is sufficient to allow the metering of the gas quantities that will be delivered through the GMS. The number of lines in operation will depend on the quantities of natural gas to be transported through the GMS. In order to check the traceability of the ultrasonic meters on the metering lines, they shall be regularly connected in series with a reference metering line equipped with a turbine meter.
If one of the systems no longer meets the established standards and/or error limits, the respective metering line shall be closed and withdrawn from normal operation until the causes of such malfunctions have been remedied.
The project involves the upgrading of the two metering stations for the existing capacities and offers the possibility to operate bidirectionally at Isaccea as well.
The volumes resulting from the independent metering of the Pay and Check systems will be continuously monitored.

Indicative project implementation schedule:

evelopment stages	Status/Estimated completion time
Feasibility study	2021-2022*
FEED	2022-2023*
Technical documentation for obtaining the construction permits	2023*
Obtaining the construction permit	2023*
Making the final investment decision	2023*
Construction	2023-2024*
Commissioning/start-up	2024*

** The project will be developed according to the results of the evaluation of the market demand for incremental capacity for the interconnection points located on the T2 and T3 pipelines on the Bulgaria - Romania - Ukraine (Trans-Balkan Corridor) transmission direction.*

Estimated completion time: 2024

Estimated investment amount: EUR 26.65 million

Changes compared to the previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Upgrading of Isaccea 2 Upgrading of Negru Voda 2	There are no changes.
Estimated completion time	2024	There are no changes.
Total estimated value of the project (mil. Euro)	26.65	There are no changes.

7.16 Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline

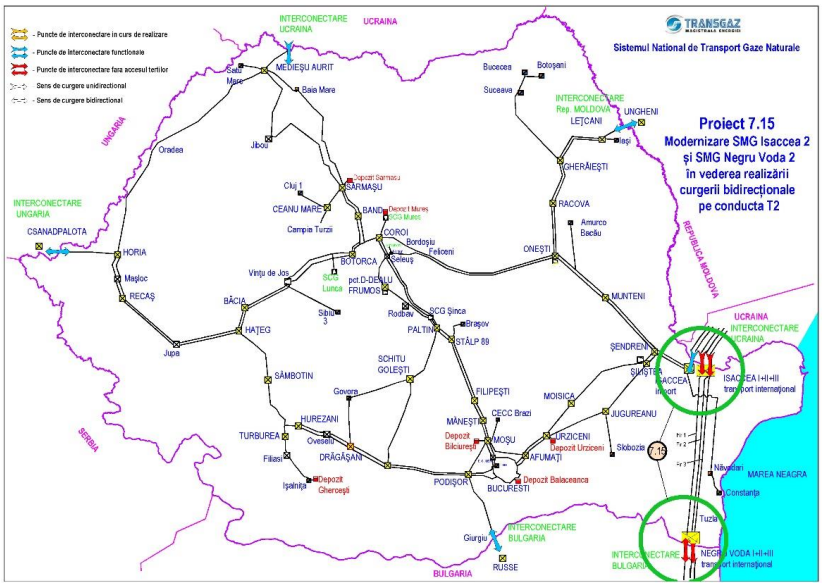


Figure 21- Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline

In order to ensure the bidirectional flow at the border with Ukraine and Bulgaria on the T3 transit pipeline, it is necessary to upgrade the natural gas metering stations GMS Isaccea 3 and GMS Negru Vodă 3.

1. Gas Metering Station GMS Isaccea 3

The upgraded metering station will be equipped with a separation/filtration installation and a metering installation:

- the separation/filtration is ensured by a separation/filtration battery;
- the metering installation will consist of several parallel metering lines (operating and backup) equipped with ultrasonic meters for metering the quantities of natural gas delivered, each line being identically equipped with three independent metering systems (Pay, Check and Control); the independent systems Pay and Check will use dual ultrasound meters, and the Control systems will use a simple ultrasound meter.

The number of metering lines is sufficient to allow the measurement of the gas quantities that will be delivered through the GMS. The number of lines in operation will depend on the quantities of natural gas to be transported through the GMS. To check the traceability of the ultrasonic meters on the metering lines, they shall be regularly connected in series with a reference metering line equipped with a turbine meter.

If one of the systems no longer meets the established standards and/or error limits, the respective metering line shall be closed and withdrawn from normal operation until the causes of these malfunctions have been remedied.

The volumes resulting from the independent metering of the Pay, Check and Control systems will be continuously monitored.

2. Gas Metering Station GMS Negru Vodă 3

The upgraded metering station will be equipped with a separation/filtration installation and a metering installation:

- the separation/filtration is ensured by a separation/filtration battery;
- the metering installation will consist of several parallel metering lines (operating and backup) equipped with ultrasonic meters for metering the quantities of natural gas delivered, each line being identically equipped with two independent metering systems (Pay, Check and Control); the independent systems Pay and Check will use dual ultrasound meters.

The number of metering lines is sufficient to allow the measurement of the gas quantities that will be delivered through the GMS. The number of lines in operation will depend on the quantities of natural gas to be transported through the GMS. To check the traceability of the ultrasonic meters on the metering lines, they shall be regularly connected in series with a reference metering line equipped with a turbine meter.

If one of the systems no longer meets the established standards and/or error limits, the respective metering line shall be closed and withdrawn from normal operation until the causes of these malfunctions have been remedied.
The project involves the upgrading of the two metering stations for the existing capacities and offers the possibility to operate bidirectionally at Isaccea as well.

The volumes resulting from the independent metering of the Pay and Check systems will be continuously monitored.

Indicative project implementation schedule:

Development stages	Status/Estimated completion time
Feasibility study	2023-2024*
FEED	2024-2025*
Technical documentation for obtaining the construction permits	2025*
Obtaining the construction permit	2025*
Making the final investment decision	2025*
Construction	2026-2027*
Commissioning/start-up	2028*

**The project will be developed according to the results of the evaluation of the market demand for incremental capacity for the interconnection points located on the T2 and T3 pipelines on the Bulgaria - Romania - Ukraine (Trans-Balkan Corridor) transmission direction*

Estimated completion time: 2028

Estimated investment amount: EUR 26.65 million

Changes compared to the previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Upgrading of Isaccea 3 Upgrading of Negru Voda 3	There are no changes.
Estimated completion time	2028	There are no changes.
Total estimated value of the project (mil. Euro)	26.65	There are no changes.

7.17 Interconnection between NTS and the Black Sea LNG Terminal

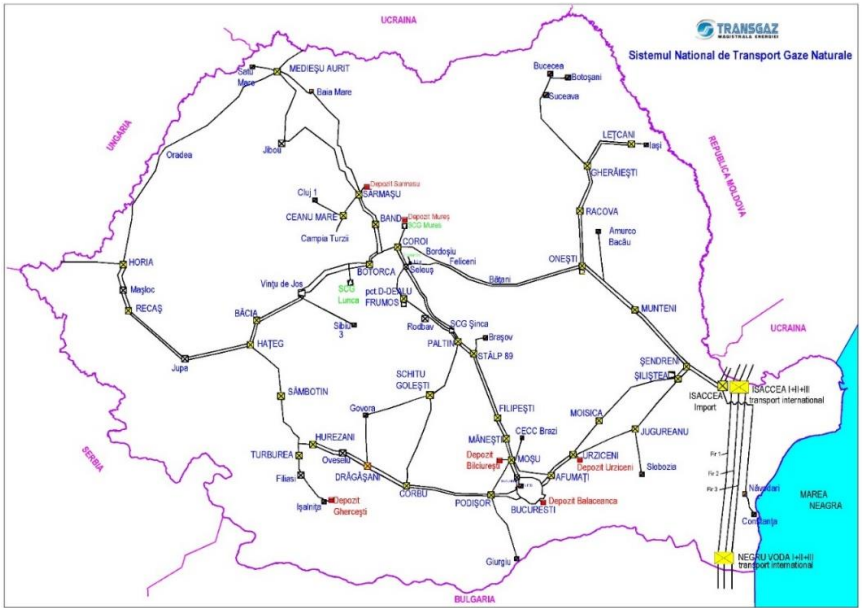


Figure 22 - Interconnection between NTS and the Black Sea LNG Terminal

Project description

The taking over of Black Sea gas through a LNG terminal involves the interconnection of the national gas transmission system and of the LNG terminal by the construction of a gas transmission pipeline, approximately 25 km long, from the Black Sea coast to the T1 and T2 pipelines.

The design capacity and pressure for this pipeline will be determined based on the Black Sea gas quantities available.

Indicative project implementation schedule:

Development stages	Status/Estimated completion time
Feasibility study	2022-2023
FEED	2023-2024
Technical documentation for obtaining the construction permits	2025
Obtaining the construction permit	2025
Making the final investment decision	2025
Construction	2026-2028
Commissioning/start-up	2028

Estimated completion time: 2028

Estimated value of the investment: EUR 19.6 million

Changes compared to the previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	Pipeline length - 25 km	There are no changes.
Estimated completion time	2028	There are no changes.
Total estimated value of the project (mil. Euro)	19.6	There are no changes.

8. DEVELOPMENT DIRECTIONS OF THE GAS STORAGE SYSTEM

I. OPERATED BY DEPOGAZ PLOIESTI – MAJOR STORAGE PROJECTS

Figure 23 – Major natural gas storage projects – Depogaz

8.1 Modernization of Bilciurești underground gas storage system infrastructure

The project aims at increasing the daily delivery capacity for the gas in the Bilciurești storage up to a 18 million m^3/day flow and ensuring increased safety during operation.

Project description:

The project consists in:

- the modernisation of the collection, separation, metering and drying facilities of the Bilciurești groups;
- the systematisation and modernisation of the gas suction/discharge pipeline system and modernisation of cooling system of Butimanu compressor station;
- the modernisation of 39 injection/withdrawal wells;
- the upgrading of the cooling equipment of the M3 Butimanu compressor;
- the drilling of 4 new wells;
- a new gas transmission pipeline (11 km) between the Bilciurești storage and the Butimanu compressor station.

The project will be implemented by stages for not impeding the gas storage activity.

Indicative project implementation schedule

Development stages	Progress/Indicative completion time
Feasibility study	Completed
FID	2017
Engineering	Staged 2018 - 2020
Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	Staged 2018 - 2022
Bidding and procurement documents	Staged 2018 - 2022
Construction	Staged 2018 - 2025
Commissioning/start of operation	Staged 2019 - 2025

NOTE: In 2020, the Feasibility Study was updated.

Estimated completion time: 2025

Total estimated value of the investment: EUR 123 million

FID: 2017

Financing sources - own sources, attracted sources

Changes as compared to the previous TYNDP

	2018-2027 TYNDP	2020-2029 TYNDP
Project description	- upgrading of separation, metering and drying facilities Bilcureşti; - systematization and modernization of aspiration / discharge gas pipeline system and modernization of cooling system compressor station Butimanu; - upgrading of 19 injection / extraction wells; - drilling 4 new wells; - New gas transmission pipeline (11 Km) between the Bilcureşti storage facility and the Butimanu compressor station.	- the modernisation of the collection, separation, metering and drying facilities of the Bilciurești groups; - the systematisation and modernisation of the gas suction/discharge pipeline system and modernisation of cooling system of Butimanu compressor station; - the modernisation of 39 injection/withdrawal wells; - the upgrading of the cooling equipment of the M3 Butimanu compressor; - the drilling of 4 new wells; - a new gas transmission pipeline (11 km) between the Bilciurești storage and the Butimanu compressor station
Estimated completion time	2025	There are no changes.
Total estimated project value (mill. Euro)	59	123

8.2 Increasing underground gas storage capacity at the Ghercești Underground Gas Storage Facility

The project aims at completing the Ghercești gas storage system infrastructure to ensure the operating conditions at the capacity of 600 million cm/cycle.

Project description:

The project consists in:

- gas compressor station;
- expansion of gas drying and metering installations;
- upgrading of 20 injection/withdrawal wells;
- Ghercești gas storage facility/NTS interconnection;
- inactive gas reserves.

Indicative project implementation schedule

Development stages	Progress/Indicative completion time
Feasibility study	2021
FID	2021
Engineering	2022
Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	2023
Bidding and procurement documents	2024
Construction	2026
Commissioning/start of operation	2026

Estimated completion time: 2026

Total estimated value of the investment: EUR 122 million

FID: 2021

Financing sources - own sources, attracted sources

Changes as compared to the previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	– gas compressor station; – expansion of gas drying and metering installations; – upgrading of 20 injection/withdrawal wells; – Ghercești gas storage facility/NTS interconnection; – Inactive gas reserves.	There are no changes.
Estimated completion time	2026	There are no changes.
Total estimated project value (mill. Euro)	122	There are no changes.

8.3 New underground storage facility in Falticeni (Moldova)

The project aims at the development of a new underground gas storage facility in North-East Romania (the Moldova area).

Project description:

Conversion into underground storage facility of one or several of the following depleted fields: Pocoleni, Comănești, Todirești or Davideni.

Features:

- a capacity of approximately 200 million cm/cycle;
- an injection capacity of approximately 1.4 million cm/day;
- a withdrawal capacity of approximately 2 million cm/ day.

The project will consist in the following:

- gas compressor station;
- gas drying and metering installations;
- injection/withdrawal wells technological installations;
- injection/withdrawal well drilling;
- gas storage facility/NTS interconnection;
- base gas.

Indicative project implementation schedule

Development stages	Progress/Indicative completion time
Feasibility study	2021
Engineering	2023
FID	2025
Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	2026
Bidding and procurement documents	2027
Construction	2029
Commissioning/start of operation	2029

Estimated completion time: 2029

Total estimated value of the investment: EUR 80 million

Financing sources - own sources, attracted sources

FID: 2023

Changes as compared to the previous TYNDP

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	–Compressor stations; –Gas drying and metering installations; –technological installations for injection/withdrawal wells; –injection/withdrawal wells drilling; –gas storage / NTS interconnection; –Inactive gas reserves.	There are no changes.
Estimated completion time	2025	There are no changes.
Total estimated project value (mill. Euro)	80	There are no changes.

8.4 Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)

The project aims at developing the current underground storage at Sărmăşel by increasing capacity from 900 million m^3/cycle to 1,550 million m^3/cycle (an increase by 650 million m^3/cycle), increasing the injection capacity by 4 million m^3/day up to a total 10 million m^3/day, increasing the extraction capacity by 4 million m^3/day up to a total 12 million m^3/day.

From a technical point of view, the project consists in drilling new wells, creating a modern surface infrastructure, compliant with the requirements of European safety and control standards, expanding gas compressor installations and retrofitting and optimizing existing separation and fiscal metering facilities.
The injection/extraction system is designed to ensure the flow of gas for injection/extraction on gathering pipelines dedicated to each objective.

Project description:

The project consists of the extension of the Sărmășel Gas Storage facilities with the following objectives:

- 38 wells;
- 48.6 km adduction pipelines;
- 8 groups;
- 19.2 km gathering pipelines;
- 3 compressors;
- 2 gas drying installations;
- Separation and metering installation (SMI);
- Renewable energy production system;
- Connection to the National Natural Gas Transmission System (NTS).

Following the implementation of the technical solution resulting from the feasibility study, the new designed infrastructure will allow:

- **separation of the gas flows circulated in the three geological objectives that make up the deposit, which will make possible the simultaneous use of the deposit both for injection and withdrawal;**
- **reduction of electricity consumption, required in the storage process, by 25%.**

Indicative project implementation schedule

Development stages	Progress/Indicative completion time
Feasibility study	2021
FID	2021
Engineering	2022
Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	2023
Bidding and procurement documents	2023
Construction	2026
Commissioning/start of operation	2026

Estimated completion time: 2026

Total estimated value of the investment: **EUR 163.1 million**

Inclusion in international plans

The project is included in the NSI East Gas Corridor – (North-South East Gas Interconnection) for the Central and East European Region, from 900 million m^3/cycle to 1,550 million m^3/cycle, reference number **PCI 6.20.6**.

FID: 2021

Financing sources - own sources, attracted sources

Changes as compared to the previous NTS Development Plan

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	-extension of compressor station; - extension of drying and natural gas installations; -technological installations injection / withdrawal wells; -upgrading 46 injection/withdrawal wells; - drilling 15 new wells; -inactive natural gas reserve.	- 38 wells; - 48.6 km adduction pipelines; - 8 Groups; - 19.2 km gathering pipelines; - 3 compressors; - 2 gas drying installations; - Separation and metering installation (SMI); - Renewable energy production system; - Connection to the National Natural Gas Transmission System (NTS).
Estimated completion time	2024	2026
Total estimated amount of the project (mill. Euro)	136	163.1

II. OPERATED BY DEPOMUREȘ TARGU MURES – MAJOR GAS STORAGE PROJECTS

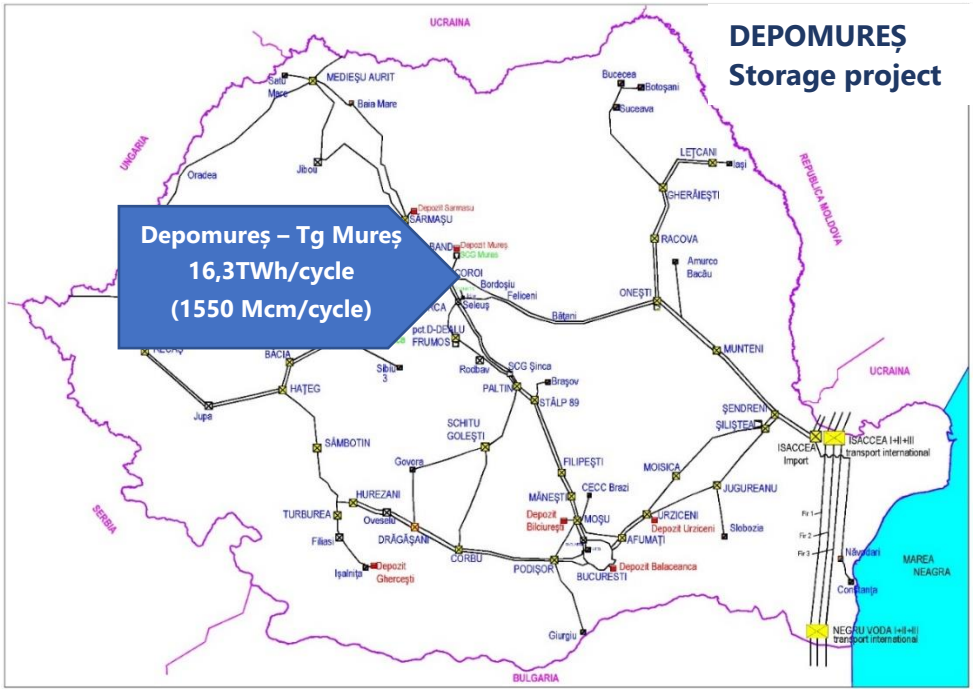


Figure 24 - Major natural gas storage projects - Depomures

8.5 Depomureș storage facility

The project aims at the retrofitting and development of the Târgu Mureș underground gas storage facility for **the improvement of the technical conditions for the storage in the storage facility Targu Mureș and implicitly the increase in the level of performance of the services provided especially in the context of the current dynamics of the gas market**.

Project description:

The project initiated by Depomureș consists in the retrofitting and development of the Târgu Mureș gas underground storage, with a current capacity of 300 mill. m^3.

The development project of the gas storage operator Depomures is a phased one (2 phases).

The main objectives of this project are:

(i) enhancing flexibility of the storage facility by increasing the daily injection and withdrawal capacity from the current average of approximately 1.7 mil. m^3/day to approximately 3.5 mil. m^3/day after the implementation of phase 1 pf the project, and approximately 5 mil. m^3/day, after the implementation of phase 2 of the development, and

(ii) increasing the useful volume of the underground storage to 400 mil.m^3 in a first phase (Phase 1), and to 600 mil.m^3 in a later phase (Phase 2).

The project consists mainly in:

- a central gas station (compressors, drying facilities, bi-directional commercial metering board, related facilities)
- a new storage collector
- upgrading aboveground technological installations to increase the operating pressure, new wells.

Indicative project implementation schedule

Development stages (Phase 1)*	Progress/Indicative completion time **
Feasibility study	• Completed
Engineering	Completed
Construction Permit (updating)	2021
Bidding and procurement procedure	2021
Construction	2023
Commissioning/start of operation	2023

*Phase 2 will be initiated only following completion of implementation of Phase 1.
**The implementation schedule is indicative, the estimated end time for the stages following to the updated depending on the FID date.

Estimated completion time: 2023 (Phase 1)

Total estimated value of the investment: EUR 30 million (Phase 1)

Estimated total value of investment (completion of Phase 1): approximately **EUR 30 million**, value included in the 2019-2023 5-year Prospective Study for the Targu-Mures underground gas storage.

FID Phase 1: 2021; FID Phase 2–after completion of Phase 1 implementation.

Inclusion in international plans

The Depomures Development Project was declared by the European Commission in 2013 as a Project of Common Interest ((PCI). The PCI status was reconfirmed by the European Commission later, in 2015, 2017 and 2019, when the updated lists of the European projects of common interest were published. Thus, the project is included in the current list of Projects of Common Interest in the NSI Gas corridor (Central Eastern Europe) under reference number 6.20.4.

The inclusion and preservation of the Depomureş project on the list of key European energy infrastructure projects of common interest proves and strengthens its strategic importance not only at national level but also at European level.

In accordance with the company's statutory provisions, the project financing sources will be approved by the company's governing bodies (own funds, loans, non-refundable funds) at the taking of the final investment decision.

Changes as compared to the previous TYNDPs

	2020-2029 TYNDP	2021-2030 TYNDP
Project description	– central gas station (compressor units, gas drying, bidirectional fiscal gas metering panel, neighbouring facilities); – new storage collector; – upgrading of above ground technological installations for increasing the operating pressure, new probes.	There are no changes.
Estimated completion time	2022 (Phase 1)	2023 (Phase 1)
Total estimated amount of the project (mill. Euro)	30 (Phase 1)	There are no changes.

8.6 ANALYSIS OF STORAGE PROJECTS

8.6.1. The status of the projects by the final investment decision (FID):

Storage projects		2020 TYNDP	PCI (the 4th list)	
8.1	Modernization of Bilciurești underground gas storage system infrastructure	UGS – F - 311		FID
8.2	Increasing underground gas storage capacity at the Ghercești underground gas storage facility	UGS - N - 398		LA non FID
8.3	New underground storage facility in Falticeni (Moldova)	UGS – N - 399		LA non FID
8.4	Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)	UGS – N - 371	6.20.6	A non FID
8.5	Retrofitting and development of the Târgu Mureș underground gas storage	UGS – A - 233	6.20.4	A non FID

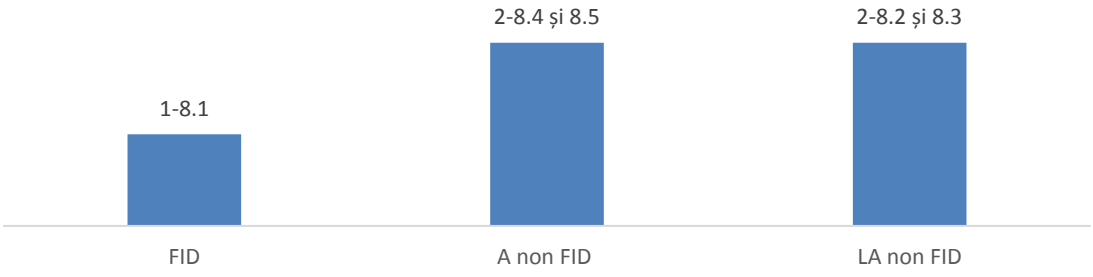


Chart 20 – Status of key storage projects

8.6.2. Cost of major storage projects

No.	Project	Estimated value mill. Euro	Completion deadline	Importance of the project
8.1	Modernization of Bilciurești underground gas storage system infrastructure	123	2025	Increasing the daily gas delivery capacity of the Bilciuresti storage facility
8.2	Increasing underground gas storage capacity at the Ghercești Underground Gas Storage Facility	122	2026	Increasing the daily gas delivery capacity of the Ghercești storage facility
8.3	New underground storage facility in Falticeni (Moldova)	80	2026	Increasing the gas storage facility capacity to ensure security of gas supply
8.4	Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)	163.1	2026	Increasing the gas storage facility capacity to ensure security of gas supply
8.5	Retrofitting and development of the underground gas storage facility Târgu Mureș	30 (Phase 1)	2023 (Phase 1)	Improvement of the technical storage conditions of Tg Mures storage capacity and implicitly increasing the performance level of the services provided, especially in the context of the current dynamics of the gas market
TOTAL storage projects		**~ Euro 0.52 billion**		

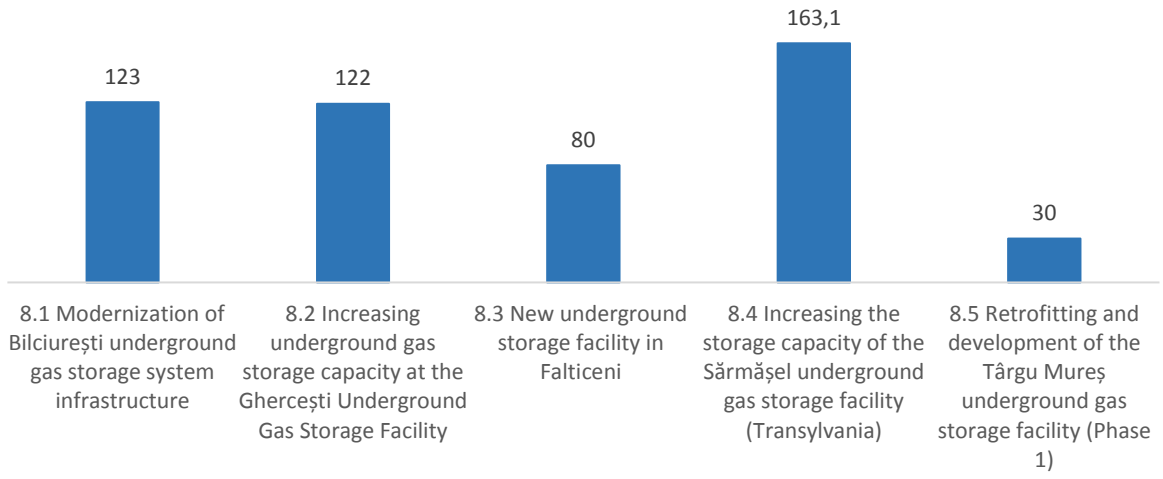


Chart 21 – Cost of major storage projects (mill. EURO)

The investment effort necessary for the achievement of major storage projects depending on the completion deadlines:

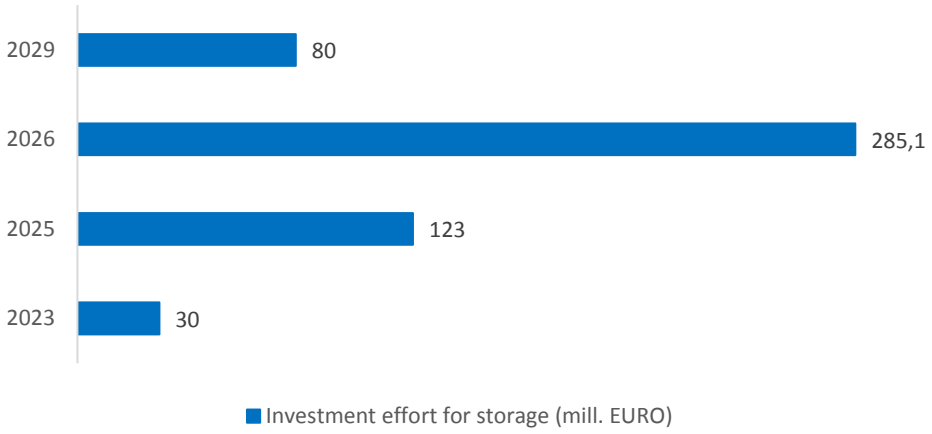


Chart 22 - Investment effort – depending on the completion deadlines (mill. EURO)

Regarding the projects *Upgrading of the gas storage system infrastructure – Bilciurești (FID project)* and *Depomureș Storage Facility (A non FID project)*, Transgaz confirms that it has the necessary capacity to take over the relevant quantities, considering the discussions held with Romgaz and Depomureș Târgu Mureș.

Regarding the projects:

- *Increasing underground gas storage capacity at the Ghercești Underground Gas Storage Facility* in the LA non FID stage (FID 2021);
- *New underground storage facility in Falticeni (Moldova)* in the LA non FID (FID 2023);
- *Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)* in the LA non FID (FID 2020);

Transgaz SA has not been yet involved in analyses and has not received requests for taking over capacity.

9. ANALYSIS OF TRANSGAZ'S STRATEGIC PROJECTS

9.1 Status of the Projects

According to the Final Investment Decision (FID) in the 2015 TYNDP projects were classified in two categories: FID projects – projects for which the Final Investment Decision was taken and non-FID projects for which the Final Investment Decision was not taken.

In the 2017 TYNDP the basic non-FID status was divided into the subcategories:

- Advanced Non-FID (A non-FID),
- Less advanced non-FID (LA non-FID).

Depending on such classification the drafts of the Ten Year gas Transmission Network Development Plan 2021-2030 is presented as follows:

Project no.	Project name	Status
7.1.1	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – **Phase I**	Completed
7.1.2	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – **Phase II**	A non FID
7.2	Development on the Romanian territory of the Southern Corridor for taking over Black Sea shore gas	FID**
7.3	Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow at Isaccea	Completed
7.4	Project regarding the NTS development in the North-Eastern part of Romania for improving the security of gas supply in the area and to ensure the transmission capacities towards the Republic of Moldova	FID
7.5	Extension of the bidirectional gas transmission corridor Bulgaria – Romania – Hungary – Austria (BRUA Phase III)	LA non FID
7.6	Project on the new NTS developments for taking over Black Sea shore gas	FID
7.7	Romania - Serbia Interconnection	A non FID
7.8	Upgrading GMS Isaccea 1 and GMS Negru Vodă 1	FID
7.8.1	Upgrading GMS Isaccea 1	Completed
7.8.2	Upgrading GMS Negru Vodă 1	
7.9	Interconnection between the gas transmission systems of Romania and Ukraine in the Gherăești – Siret direction	LA non FID
7.10	Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania	LA non FID
7.11	Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction	LA non FID*
7.12	Eastring-Romania	LA non FID
7.13	Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System	LA non FID*
7.14	Development of the SCADA system for the National Gas Transmission System	LA non FID*
7.15	Upgrading GMS Isaccea 2 and GMS Negru Voda 2 for enabling bidirectional flow on the T2 pipeline	LA non FID*
7.16	Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline	LA non FID*
7.17	Interconnection between NTS and the Black Sea LNG Terminal	LA non FID*

Projects not included in the 2020 TYNDP

***** Transgaz took the Investment Decision. The start of the execution depends on the Final Investment Decision of the title holders of the Black Sea Neptune Deep Water block.***

Table 7 – Status of key projects for 2021-2030

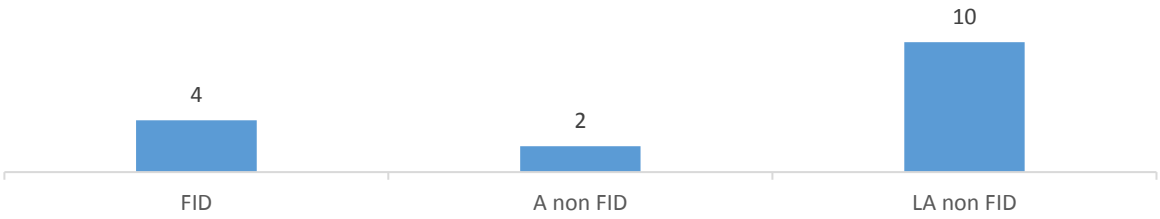


Chart 23 – Status of Transgaz key projects

Note

Compared to the 2020-2029 TYNDP, the status of the project *Development on the Romanian territory of the Southern Corridor for taking over Black Sea shore gas* changed from A non FID to FID, and the project *Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow at Isaccea* was completed.

Project no.	Project name	Projects for which the Open Season procedure applies
7.1.2	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – **Phase 2**	x
7.2	Development on the Romanian territory of the Southern Corridor for taking over Black Sea shore gas	x
7.5	Extension of the bidirectional gas transmission corridor Bulgaria – Romania – Hungary – Austria (BRUA Phase 3)	
7.6	Project on the new NTS developments for taking over Black Sea shore gas	x

Table 8 – Projects for which the Open Season procedure applies

9.2 The cost of the projects

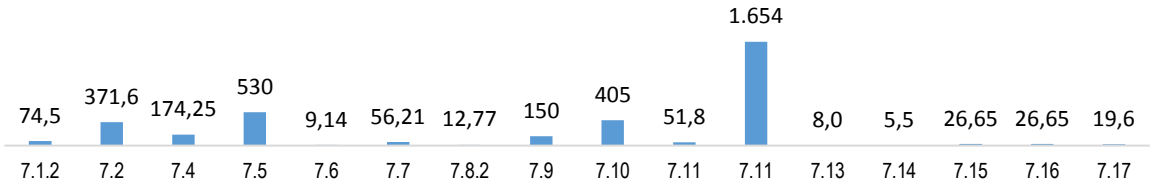


Chart 24 -Cost of major projects (mill. Euro)

Summary of the major projects:

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
1	**7.1.2**	Development on the territory of Romania of the National Gas Transmission System on the **Bulgaria-Romania-Hungary-Austria Route** (**Phase** II)	74.5	2023	Ensuring a gas transmission capacity to Hungary of 4.4 billion cm/year and 1.5 billion cm/year to Bulgaria. The importance of the project at the level of the European Union is reflected by the nomination of the project `Gas pipeline from Bulgaria to Austria via Romania and Hungary` on both the first and the second and the third list of projects of common interest	A non FID
2	**7.2**	Development of the **Southern Transmission Corridor** on the territory of Romania for taking over natural gas from the Black Sea shore	371.6	2022	Taking-over natural gas to be produced in the Black Sea in the NTS for their transmission to the Romanian and European markets is of strategic importance to Transgaz. The importance of the project at the level of the European Union is reflected in the nomination of the Project on the second and third list of projects of common interest.	FID
3	**7.4**	**Developments of the NTS in the North-East Area of Romania** in order to improve the natural gas supply of the area and to ensure transmission capacities to the Republic of Moldova	174.25	2021	Ensuring a transmission capacity of 1.5 billion cm/year at the interconnection point between the Romanian and Moldovan gas transmission systems.	FID
4	**7.5**	**Extension** of the bidirectional **gas transmission corridor Bulgaria–Romania–Hungary–Austria (BRUA-Phase III)***	530	2026	Depending on the increase in offshore production, the Black Sea is considering the further development of the network: an additional route through the centre of Romania and a new interconnection with Hungary.	LA non FID
5	**7.6**	**New developments for taking-over gas from the Black Sea shore.**	9.14	2021	Creating an additional point for taking over natural gas from the Black Sea offshore exploitation blocks.	FID
6	**7.7**	**Romania-Serbia Interconnection**	56.21	2023	Construction of an interconnection pipeline with Serbia to diversify sources of supply and increase energy security in the region.	A non FID
7	**7.8.2**	**Upgrading Negru Vodă 1**	12.77	2021	Upgrading the gas metering stations at interconnection	FID

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
					points to increase the level of energy security in the region.	
8	**7.9**	**Interconnection** of the national gas transmission system with the natural gas transmission system of **Ukraine, Gherăeşti-Siret**	150	2026	Establishing an interconnection with Ukraine in the of Gherăieşti-Siret direction, completing the project on NTS developments in the North-East area of Romania, in order to improve the natural gas supply in the area.	LA non FID
9	**7.10**	Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania	405	Stage 1 2023 Stage 2 2025 Stage 3 2026	Increasing the natural gas transmission capacities in the North-West of Romania to ensure the trends of consumption growth in the region.	LA non FID
10	**7.11**	Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction	51.8	2027	Improving the natural gas supply of the area.	LA non FID
11	**7.12**	Eastring-Romania	Phase 1: 1,297 Romania Phase 2: 357 million Romania	Phase 1: 2027 Phase 2: 2030	EASTRING will be open to well-established sources as well as alternative sources. It will bring gas from new sources from the Caspian / Mediterranean / Black Sea / Middle East regions. At the same time, it will ensure the supply of Southeast Europe from European gas hubs. Total capacity will be available to any carrier or vendor.	LA non FID
12	**7.13**	Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System	8	2023	Provides the ability to set, monitor and operate remotely and accurately the points of interest of the system, eliminates the cost of reading data, avoids situations where due to weather conditions it is not possible to read data and human errors, allow distributed control of locations, operating and maintenance costs, considerably reduces setup time.	LA non FID
13	**7.14**	Development of the SCADA system for the National Gas Transmission System	5.5	2023	Upgrading the natural gas transmission infrastructure by upgrading hardware and software architecture.	LA non FID
14	**7.15**	Upgrading GMS Isaccea 2 and GMS Negru Voda 2 for enabling bidirectional flow on the T2 pipeline	26.65	2024	Enabling bidirectional flow on the T2 pipeline, part of the Trans-Balkan Corridor.	LA non FID

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
15	**7.16**	Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline	26.65	2028	Enabling bidirectional flow on the T3, pipeline, part of the Trans-Balkan Corridor.	LA non FID
16	**7.17**	Interconnection between NTS and the Black Sea LNG Terminal	19.6	2028	Creating transmission capacity for taking over gas from the Black Sea LNG.	LA non FID
	TOTAL		**EUR 3,575.67 million**			

- ***on certain sections the existing capacities will be used by upgrading the National Gas Transmission System***

Total estimated amount of the FID projects:

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
1	**7.2**	Development on the territory of Romania of the **Southern Gas Transmission Corridor** to take over gas from the Black Sea Shore	371.6	2022	The taking over into the NTS of the Black Sea and its transmission to the Romanian and European markets is of strategic importance to Transgaz. The importance of the project at the EU level is reflected in the nomination of the Project on the second and third list of projects of common interest.	FID
2	**7.4**	**NTS Developments in the North-Eastern part of Romania** to improve gas supply to the area and to ensure gas transmission capacities towards the Republic of Moldova	174.25	2021	Ensuring gas transmission capacity of 1,5 bcm/year at the interconnection point between the Romanian and Moldovan gas transmission systems.	FID
3	**7.6**	**New NTS developments to take over gas from the Black Sea shore**	9.14	2021	Creating an additional point for taking over natural gas from the Black Sea offshore exploitation blocks.	FID
4	**7.8.2**	**Upgrading of Negru Vodă 1**	12.77	2021	The upgrading of the gas metering stations related to the interconnection points to increase the regional energy security.	FID
	TOTAL FID projects:		**EURO 567.76 mil.**			

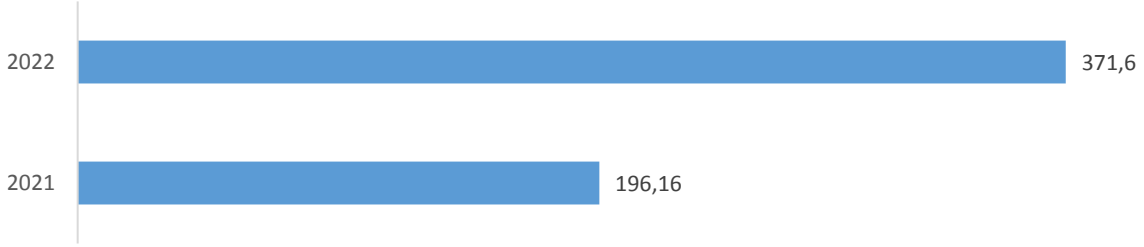


Chart 25– Investment effort of Transgaz for FID projects depending on the Estimated completion time (mill. Euro)

Total estimated amount of A non FID projects:

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
1	**7.1.2**	Development on the territory of Romania of the National Gas Transmission System on the **Bulgaria-Romania-Hungary-Austria Route** (Phase II)	74.5	2023	Ensuring a gas transmission capacity to Hungary of 4.4 billion cm/year and 1.5 billion cm/year to Bulgaria. The importance of the project at the level of the European Union is reflected by the nomination of the project Gas pipeline from Bulgaria to Austria via Romania and Hungary on both the first and the second and the third list of projects of common interest	A non FID
2	**7.7**	**Romania-Serbia Interconnection**	56.21	2023	Construction of an interconnection pipeline with Serbia to diversify sources of supply and increase energy security in the region.	A non FID
	TOTAL A non FID projects		**EUR 130.71 million**			

Chart 26 – Investment effort of Transgaz for A non FID projects depending on the Estimated completion time (mill. Euro)

The total estimated amount of the FID and A non FID projects:

No.	Status of the projects	Total estimated amount (mill. Euro)
1	FID projects	567.76
2	A non FID projects	130.71
TOTAL FID and A non FID projects		**698.47**

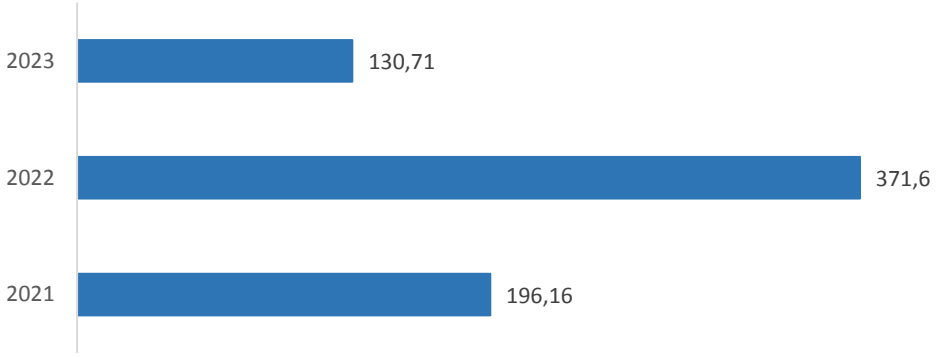


Chart 27 – Investment effort of Transgaz for FID and A non FID projects depending on the estimated completion time (mill. Euro)

For the period 2021-2030 Transgaz proposes the achievement of the following projects which are currently in an early stage **(LA non FID).**

Total estimated amount of the LA non FID projects:

No.	Project no	Project	Estimated value mill. Euro	Completion deadline	Importance of the project	Status of the project
1	**7.5**	**Extension** of the bidirectional **gas transmission corridor Bulgaria–Romania–Hungary–Austria (BRUA-Phase III)***	530	2026	Depending on the increase in offshore production, the Black Sea is considering the further development of the network: an additional route through the centre of Romania and a new interconnection with Hungary.	LA non FID
2	**7.9**	**Interconnection** of the national gas transmission system with the natural gas transmission system of **Ukraine, Gherăeşti-Siret**	150	2026	Establishing an interconnection with Ukraine in the Gherăieşti-Siret direction, completing the project on NTS developments in the North-East area of Romania, in order to improve the natural gas supply in the area.	LA non FID
3	**7.10**	Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania	405	Stage 1 2023 Stage 2 2025 Stage 3 2026	Increasing the natural gas transmission capacities in the North-West of Romania to ensure the trends of consumption growth in the region.	LA non FID
4	**7.11**	Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction	51.8	2027	Improving the natural gas supply of the area.	LA non FID

No.	Project no	Project	Estimated value mill. Euro	Completion deadline	Importance of the project	Status of the project
5	**7.12**	Eastring-Romania	Phase 1: 1,297 Romania Phase 2: 357 Romania	Phase 1: 2027 Phase 2: 2030	EASTRING will be open to well-established sources as well as alternative sources. It will bring gas from new sources from the Caspian / Mediterranean / Black Sea / Middle East regions. At the same time, it will ensure the supply of Southeast Europe from European gas hubs. Total capacity will be available to any carrier or vendor.	LA non FID
6	**7.13**	Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System	8	2023	Provides the ability to set, monitor and operate remotely and accurately the points of interest of the system, eliminates the cost of reading data, avoids situations where due to weather conditions it is not possible to read data and human errors, allow distributed control of locations, operating and maintenance costs, considerably reduces setup time.	LA non FID
7	**7.14**	Development of the SCADA system for the National Gas Transmission System	5.5	2023	Upgrading the natural gas transmission infrastructure by upgrading hardware and software architecture.	LA non FID
8	**7.15**	Upgrading GMS Isaccea 2 and GMS Negru Voda 2 for enabling bidirectional flow on the T2 pipeline	26.65	2024	Enabling bidirectional flow on the T2 pipeline, part of the Trans-Balkan Corridor.	LA non FID
9	**7.16**	Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline	26.65	2028	Enabling bidirectional flow on the T3, pipeline, part of the Trans-Balkan Corridor.	LA non FID
10	**7.17**	Interconnection between NTS and the Black Sea LNG Terminal	19.6	2028	Creating transmission capacity for taking over gas from the Black Sea LNG.	LA non FID
	TOTAL LA non FID projects		**EUR 2.877,2 mill.**			

Chart 28 – Investment effort of Transgaz for LA non FID projects depending on the estimated completion time (mill. Euro)

9.3 Planning the achievement of Transgaz's Strategic Projects for the period 2021-2030

Project name	Updated estimated amount (Mil. Euro)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Project Status
Development on the Romanian territory of the National gas Transmission System on the Bulgaria –Romania– Hungary-Austria Route (Phase II)	74.5											A non FID
Development on the Romanian territory of the Southern transmission Corridor for taking over gas from the Black sea shore	371.6											FID*
NTS developments in the North-Eastern area of Romania to improve gas supply in the area and to ensure gas transmission capacity to the Republic of Moldova	174.25											FID
Enhancement of the bi-directional gas transmission corridor Bulgaria -Romania-Hungary-Austria (BRUA Phase III)	530*											LA non FID
Project for new NTS developments for taking over Black Sea gas	9.14											FID
Romania-Serbia Interconnection	56,21											A non FID
Upgrading GMS Isaccea 1 and GMS Negru Vodă 1	26.65											FID
Interconnection of the national gas transmission system with the gas transmission system of Ukraine in the Gherăești –Siret direction	150											LA non FID
Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania	405											LA non FID
Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction	51.8											LA non FID
Eastring-Romania	1.654											LA non FID
Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System	8											LA non FID
Development of the SCADA system for the National Gas Transmission System	5.5											LA non FID
Upgrading GMS Isaccea 2 and GMS Negru Voda 2 for enabling bidirectional flow on the T2 pipeline	26.65											LA non FID
Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline	26,65											LA non FID
Interconnection between NTS and the Black Sea LNG Terminal	19.6											LA non FID

**** On certain sections, existing capacities will be used by upgrading the National Transmission System***

Table 9 – Planning of 2021-2030 key projects

9.4 Project benefits

By ensuring the link between different sources of gas supply and the European market, these investment projects contribute to the meeting of the European goals, the main benefits of which being as follows:

- Integration of the gas market and interoperability of the gas transmission systems in the region;
- Gas price convergence in the region;
- Increasing the flexibility of the European gas transmission system by making bidirectional gas flow interconnections;
- Ensuring access for Romania and the European Union to a new gas supply source by the interconnection of the BULGARIA - ROMANIA - HUNGARY – AUSTRIA corridor with the Black Sea;
- Increasing competition on the European gas market by diversifying sources, transmission routes and the companies active in the region;
- Increasing the security of gas supply;
- Reducing dependence on Russian gas imports;
- Stimulating the production development of renewable energy in the region (especially wind and solar energy) considering the possibility of using natural gas as a renewable option for renewable energies, which leads to a significant increase in the sustainability of the proposed projects.

9.5 Comparison draft 2020 ENTSOG TYNDP / 2021 – 2030 Development Plan for the National Gas Transmission System (PDSNT)

No.	Project code 2020 PDSNT	PDSNT project name	Project code 2020 TYNDP	2020 TYNDP project name
1	**7.1.2.**	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – (Phase II)	TRA -A-1322	Development on the Romanian territory of the NTS (BG–RO-HU-AT) - Phase II
3	**7.2.**	Development on the Romanian territory of the Southern Corridor for taking over Black Sea shore gas	TRA-A-362	Development on the Romanian territory of the Southern Transmission Corridor
3	**7.4.**	Project regarding the NTS development in the North-Eastern part of Romania for improving the security of gas supply in the area and to ensure the transmission capacities towards the Republic of Moldova	TRA-F-357	NTS developments in North-East Romania
4	**7.5.**	Extension of the bidirectional gas transmission corridor Bulgaria – Romania – Hungary – Austria (BRUA Phase III)	TRA-N-959	Further enlargement of the BG—RO—HU—AT transmission corridor (BRUA) phase 3

No.	Project code 2020 PDSNT	PDSNT project name	Project code 2020 TYNDP	2020 TYNDP project name
5	**7.6.**	Project on the new NTS developments for taking over Black Sea shore gas	TRA-F-964	New NTS developments for taking over gas from the Black Sea shore
6	**7.7**	Romania - Serbia Interconnection	TRA-A-1268	Romania-Serbia Interconnection
7	**7.8**	Upgrading GMS Isaccea 1 and Negru Vodă 1	TRA-F-1277	Upgrading GMS Isaccea 1 and GMS Negru Voda 1
	7.8.2	Upgrading GMS Negru Vodă 1		
8	**7.9**	Interconnection between the gas transmission systems of Romania and in Ukraine in the Gherăești – Siret direction	TRA-N-596	Interconnection between the RO and the UA gas transmission systems
9.	**7.10**	Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania	TRA-N-598	NTS developments in North-East Romania
10.	**7.11**	Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction		
11.	**7.12**	Eastring-Romania	TRA-A-655	Eastring - Romania
12.	**7.13**	Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System		
13.	**7.14**	Development of the SCADA system for the National Gas Transmission System		
14	**7.15**	Upgrading GMS Isaccea 2 and GMS Negru Voda 2 for enabling bidirectional flow on the T2 pipeline		
15.	**7.16**	Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline		
16.	**7.17**	Interconnection between NTS and the Black Sea LNG Terminal		
Completed projects				
17.	**7.8**	Upgrading GMS Isaccea 1 and Negru Vodă 1	TRA-F- 1277	Upgrading GMS Isaccea 1 and Negru Vodă 1
	7.8.1	Upgrading GMS Negru Vodă 1		
18.	**7.1.1.**	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – (Phase I)	TRA-F-358	Development on the Romanian territory of the NTS (BG–RO-HU-AT) - Phase I
19.	**7.3.**	Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow at Isaccea	TRA-F-139	Interconnection of the NTS with the DTS and reverse flow at Isaccea

Table 10 - 2021 PDSNT/ 2020 TYNDP code comparison

10. MAJOR PROJECTS COMPLETED

1. Development on the Romanian territory of the NTS on the Bulgaria – Romania – Hungary – Austria Corridor (BRUA) – Phase I – project completed

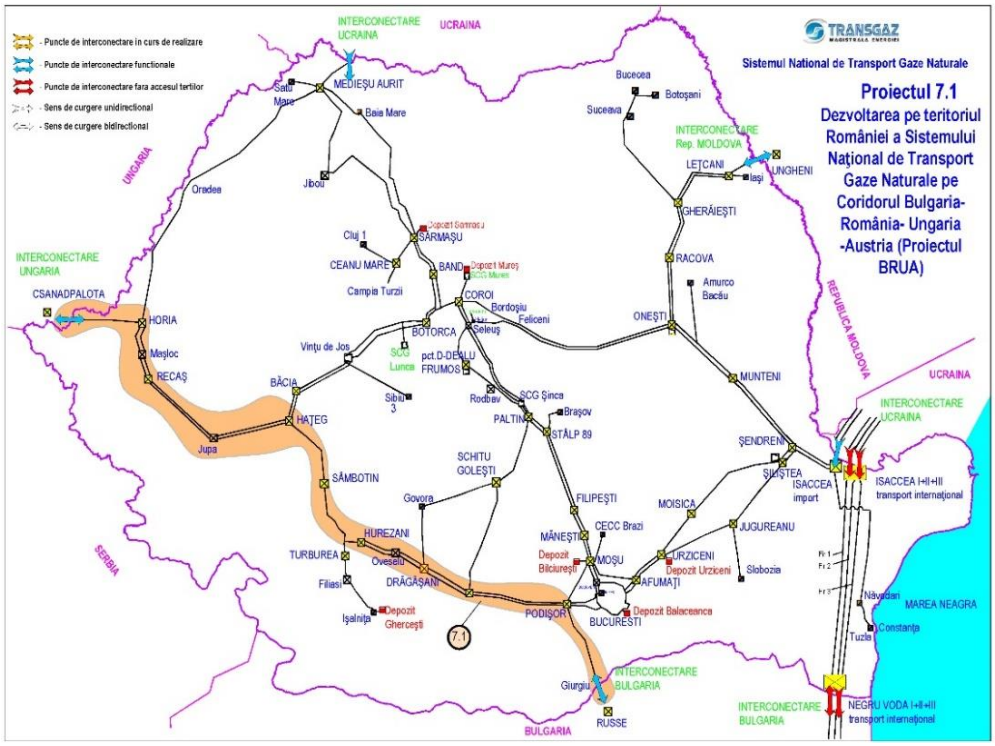


Figure 25– Map of the major project for the development of the Bulgaria-Romania-Hungary-Austria Corridor – Phase 1

Project description

BRUA Phase I consisted in the achievement of the following objectives:

- pipeline Podişor-Recaş 32" x 63 bar approximately 479 km long:
  - **LOT 1** from km 0 (in the vicinity of Podisor, Giurgiu county) to km 180 (in the vicinity of Valeni village, Zatreni locality, Valcea county)
  - **LOT 2** from km 180 in the vicinity of Valeni village, Zatreni locality, Valcea county) to km 320 (in the vicinity of Pui, Hunedoara county)
  - **LOT 3** from km 320 (in the vicinity of Pui, Hunedoara County) to km 479 (in the vicinity of Recas, Timis County).
- three gas compressor stations (Podișor CS, Bibești CS and Jupa CS) each station being equipped with two compressor units (one in operation and one back-up), with the possibility to ensure bidirectional gas flow.

The implementation of BRUA Phase I results in enabling permanent bidirectional gas flows between the interconnections with Bulgaria and Hungary, the following gas transmission capacities being ensured: gas transmission capacity to Hungary of 1.75 bcm/y and of 1.5 bcm/y to Bulgaria.

Indicative project implementation schedule:

Development stages	Status/Indicative completion date
Pre-feasibility study	Completed
Feasibility study	Completed
Environmental Impact Assessment (including also the Appropriate Environmental Assessment Study)	Completed
FEED	Completed
FID	Obtained in 2016
Environmental Permit	Obtained in December 2016
Construction Permit	Obtained in February 2017
Comprehensive Decision	Obtained in March 2018
Conclusion of contracts for the construction of the pipeline	November 2017
Issue of the order for the commencement of the pipeline construction works	Issued on 4 June 2018
Delivery of the pipeline site and public consultation in the related TAUs	May – June 2018
Conclusion of the contract for the construction of the compressor stations	March 2018
Delivery to the constructor of the sites of the compressor stations and public consultations in the relevant territorial – administrative units	11-13 April 2018
Issue of the order for the commencement of the works related to the three compressor stations	Issued on 16 April 2018
Conclusion of contracts for pipeline automation and security	July 2018
Construction of pipeline – Phase I	2018 – 2020
- the Jupa – Recaș section (part of Lot 3)	Completed
- Lot 1, Lot 2 and the Pui-Jupa section	2020
Construction of compressor stations – Phase I	2018 – 2020
- Jupa CS	Completed in 2019
- Podișor CS	Completed in 2019
- Bibești CS	Completed in 2020

Estimated investment value: **EUR 478.6 million**

Considering that it is a project of common interest, Transgaz obtained a EUR 1.54 million grant through the Connecting Europe Facility for the design of the three compressor stations.
In October 2015, Transgaz filed an application within the grant application session to obtain a grant for the BRUA Phase I execution works.

On 19 January 2016, the CEF-Energy Coordination Committee Meeting (responsible for the management of the procedures for the granting of European financial assistance to Projects of Common Interest in Energy) took place in Brussels and the list of projects of common

interest was validated by vote, projects proposed to receive European grant under the Connecting Europe Facility 2015.

In September 2016 SNTGN Transgaz SA signed the **Grant Contract** with INEA (Innovation and Networks Executive Agency) in the amount of approximately **EUR 179.3 million**.

The pipeline automation and securing works were executed over the entire route, from km 0 (in the Podișor area, Giurgiu County) to km 479 (in the Recaș area, Timiș County). The contract was signed on 24 July 2018, and the works commencement order was issued on 30 August 2018.

The gas compressor stations execution works commencement order for the **Podișor CS, Jupa CS and Bibești CS** was issued on 16 April 2018. The construction and mounting works were completed at **Podisor CS and Jupa CS in 2019 and at Bibești CS in 2020**.

Inclusion in international plans

- **PCI project (first list):** 7.1.5;
- **PCI project (second list):** Phase I: 6.24.2;
- **PCI project (third list):** Phase I: 6.24.1–2;
- **PCI project (fourth list):** Phase I: 6.24.1 within ***Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor (currently known as ROHUAT/BRUA) to enable 1.75 bcm/y in the 1st phase, 4.4 bcm/y in the 2nd phase, and including new resources from the Black Sea in the 2nd phase***;
- **2020 ENTSOG TYNDP**: TRA-F-358.

Priority corridor: Gas interconnections on the North-South corridor of Central Europe and South-Eastern Europe («NSI East Gas»). Cluster number EAST 12a and 12b.

2. The interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow Isaccea – project completed

This project was very important because:

- By its implementation a transmission corridor was created between the markets of Bulgaria, Romania and Ukraine, in the conditions in which the new interconnection between Greece and Bulgaria is achieved;
- The transmission contract for the capacity of Transit 1 pipeline expired on 1 October 2016. Starting with gas year 2016-2017, the transmission capacity of Transit 1 pipeline is auctioned according to the European Code on capacity allocation mechanisms at the cross-border interconnection points and to ANRE Order no. 34/2016;
- Physical reverse flows are ensured at the Negru Voda 1 point in accordance with Regulation (EU) 1938/2017.;
- Its implementation enables the taking over of the newly discovered Black Sea gas by the Romanian gas transmission system for selling on the Romanian market and on the regional markets.

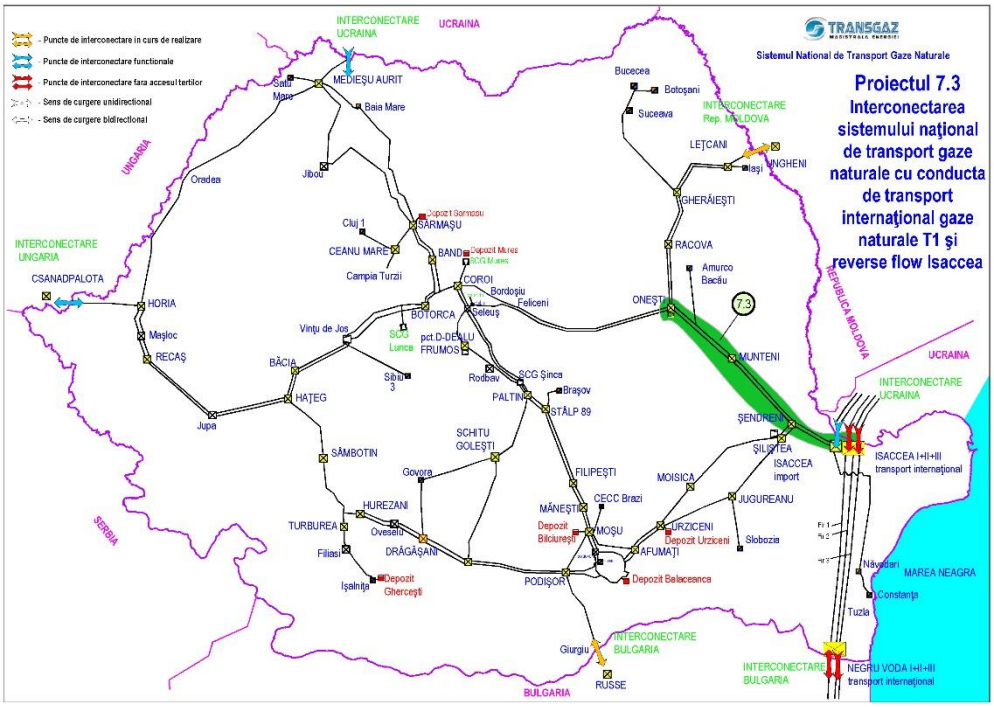


Figure 26 – Map of the major project for the development of the NTS interconnection with the international transmission pipeline Transit 1 and reverse flow Isaccea

Project description:

The project consisted of the following:

Phase 1 – category of energy infrastructure *Gas and biogas transmission pipelines which are part of a network mainly comprising mainly high-pressure pipelines, with the exception of high-pressure pipelines used for upstream or downstream gas distribution*, with the following investment objectives:

- Isaccea Interconnection, location: Isaccea territorial administrative unit;
- Rehabilitation of the DN 800 Onești – Cosmești pipeline.

Phase 2 – category of energy infrastructure *Any equipment or installations essential to the secure, efficient and safe operation of the system or to provide bidirectional capacity, including compressor stations*, with the following investment objectives:

- Upgrading the Siliștea Gas Compressor Station and the Siliștea Technological Node (TN), located within the Siliștea territorial administrative unit, Brăila County;
- Works within the Șendreni Technological Node, located within the Vădeni territorial administrative unit, Brăila County;
- Upgrading the Onești Gas Compressor Station and the Onești Technological Node, located within the Onești territorial administrative unit, Bacău County.

The project did not develop additional capacities at the Negru Vodă NTS entry/exit point.

Indicative project implementation schedule:

Development stages	Status/ Estimated completion time
Phase 1	**2018**
Pre-feasibility study	completed
Feasibility study	completed
Environmental impact assessment	completed
Authority engineering for the issuance of construction permits	completed
Issuance of construction permits	completed
Comprehensive decision	obtained
Construction	completed
Commissioning/start up	completed
Phase 2	**2020**
Pre-feasibility study	completed
Feasibility study	completed
Technical specifications for the design and execution	completed
Procurement of design and execution works	completed
Comprehensive decision	completed
Completion of basic design and execution details/ issuance of construction permits	completed
Construction	completed 2020
Commissioning/start up	01.01.2021

Inclusion in international plans

- **PCI project (second list)**: 6.15;
- **PCI project (third list)**: 6.24.10-1 **Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor (currently known as ROHUAT/BRUA) to enable 1.75 bcm/y in the 1st phase, 4.4 bcm/y in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase;**
- **2020 ENTSOG TYNDP:** TRA-F-139.

Priority corridor: Gas interconnections on the North-South corridor of Central Europe and South-Eastern Europe («NSI East Gas»).

3. Upgrading GMS Isaccea 1 and GMS Negru Vodă 1

In order to increase the level of energy security in the region, the following interconnection agreements were signed:

- **Interconnection Agreement for the Interconnection Point Isaccea 1**, concluded with PJSC Ukrtransgaz, Ukraine, on 19.07.2016;
- **Interconnection Agreement for the Interconnection Point Negru Vodă 1**, concluded with Bulgartransgaz, Bulgaria, on 19.05.2016.

The actions comprised in these agreements include the upgrading of the gas metering stations at the two interconnection points.

The project *Upgrading GMS Isaccea 1 and GMS Negru Vodă 1* consists in the construction of two new gas metering stations to replace the existing ones. For GMS Isaccea 1 the station was built within the current station and for GMS Negru Voda 1 the station was located close to the location of the existing station.

3.1. Upgrading GMS Isaccea 1 – project completed

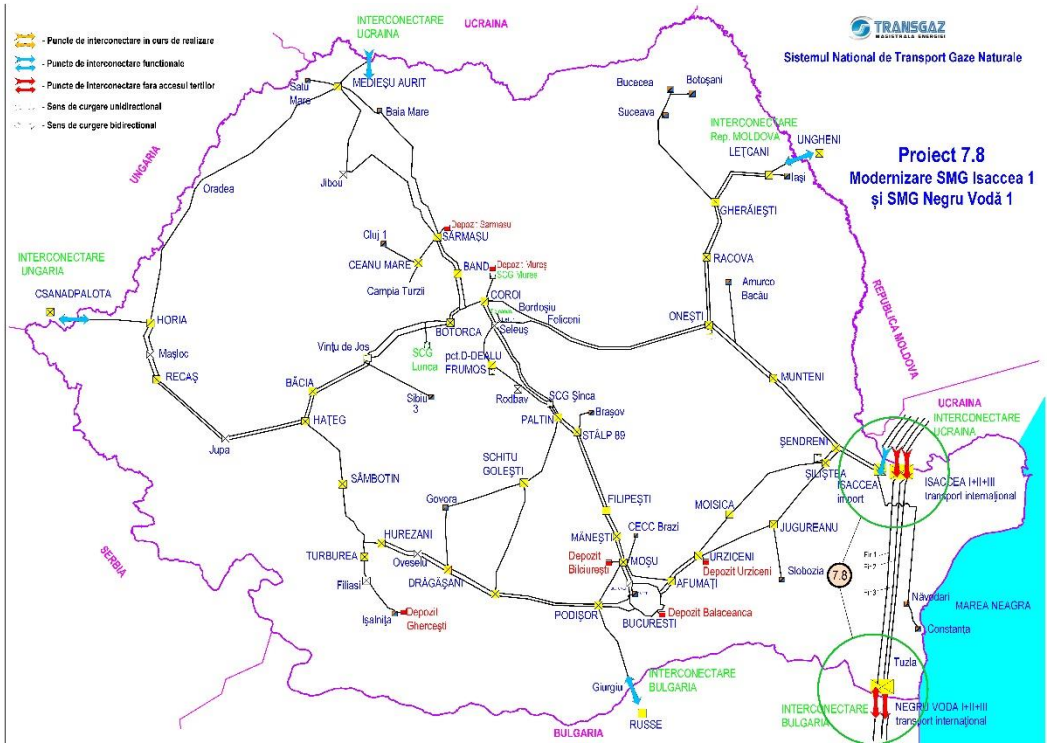


Figure 27 - Upgrading GMS Isaccea 1 and Negru Vodă 1

Project description:

Gas Metering Station GMS Isaccea 1

The upgraded Metering Station is equipped with a separating/filtering installation and a metering installation:

- Separation/filtering is ensured by a separating/filtering battery.
- The metering installation consists of several parallel metering lines (in operation and backup) equipped with ultrasonic meters for metering the delivered gas quantities, each line having three identical independent metering systems (Pay, Check and Verification). The Pay and Check independent systems use dual ultrasonic meters and the Verification systems a simple ultrasonic meter.

The number of the metering lines is sufficient to allow for the metering of the gas quantities to be delivered through the GMS.

The volumes resulting from the independent metering of the Pay, Check and Verification systems will be monitored continuously.

Project implementation schedule

Development stages	Status/ Estimated completion time
Feasibility study	Completed
Design	Completed
FEED and permitting documentation for the construction permit	Completed
Construction	2019 – 2020 Completed
Commissioning /Start-up	2020

Estimated investment value for SMS Isaccea 1:

- EUR 13.88 million

Inclusion in international plans

- **2020 ENTSOG TYNDP**: TRA-F-1277

11. FINANCING OPTIONS

Every organization is required to adapt to the environment in which it operates, while maintaining its internal cohesion and minimizing the uncertainty that characterizes the transformations of the internal and external environment.

In order for the organization to retain its identity as a result of adaptation efforts, its development must be planned with the utmost care, and this plan should be reviewed periodically.

The moment when the decision to make an investment is made, regardless of its nature and scale, is of great importance in the life of the organization.

The Investment Decision **is one of the most accountable managerial decisions because the investment targets the long-term strategic objectives of the company and its sustainable development.**

At the analysis of the financial resources only the necessary for covering the FID and A non FID project was considered.
The financing for the implementation of the major projects for the development of the National Gas Transmission System in the period 2021 – 2030 are from:

- own sources;
- attracted sources.

The Company envisages the need to ensure the sources necessary to finance FID projects. The value of Transgaz's major FID projects for 2021-2030 estimated to Euro 567.76 million will be 26% covered by equity, 66% by loans and 8% by grants.

SNTGN Transgaz SA endeavours, through sustained efforts, to obtain non-reimbursable financial assistance for the financing of investment projects with an impact on the modernization, upgrading and development of the NTS infrastructure, in order to obtain a financing mix that ensures the lowest cost in financing the development plan.

12. DO MINIMUM AND DO MAXIMUM SCENARIOS

The major projects were grouped by their status into two scenarios: *do minimum* (FID and A non FID projects) and *do maximum* (all of the projects). This classification is necessary for the environmental assessment purposes.

Variant 1 – DO MINIMUM

Project no.	Project name	Status
Gas transmission		
7.1.1.	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – **Phase I**	COMPLETED
7.1.2	Development on the Romanian territory of the National Gas Transmission System on the Bulgaria – Romania – Hungary – Austria Corridor – **Phase II**	A non FID
7.2	Development on the Romanian territory of the Southern Transmission Corridor for taking over the Black Sea gas	FID
7.3	Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow at Isaccea	COMPLETED
7.4	NTS developments in North-East Romania for enhancing gas supply to the area and for ensuring transmission capacities to the Republic of Moldova	FID
7.6	New NTS developments for taking over Black Sea gas	FID
7.7	Romania – Serbia Interconnection	A non FID
7.8	Upgrading GMS Isaccea 1 and Negru Vodă 1	
7.8.1	Upgrading GMS Isaccea 1	COMPLETED
7.8.2	Upgrading GMS Negru Vodă 1	FID
Storage		
8.1	Modernization of Bilciurești underground gas storage system infrastructure	FID
8.4	Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)	A non FID
8.5	Retrofitting and development of the underground gas storage facility Târgu Mureș	A non FID

Table 11 – List of major projects – Base scenario DO MINIMUM

Variant 2 – DO MAXIMUM

Project no.	Project name	Status
Gas transmission		
7.1.1.	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – **Phase I**	COMPLETED
7.1.2	Development on the Romanian territory of the National Gas Transmission System on the Bulgaria – Romania – Hungary – Austria Corridor – **Phase II**	A non FID
7.2	Development on the Romanian territory of the Southern Transmission Corridor for taking over the Black Sea gas	FID
7.3	Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow at Isaccea	COMPLETED
7.4	NTS developments in North-East Romania for enhancing gas supply to the area and for ensuring transmission capacities to the Republic of Moldova	FID
7.5	Extension of the bi-directional gas transmission corridor Bulgaria – Romania - Hungary – Austria (BRUA Phase III)	LA non FID
7.6	New NTS developments for taking over Black Sea gas	FID
7.7	Romania – Serbia Interconnection	A non FID
7.8	Upgrading GMS Isaccea 1 and Negru Vodă 1	
7.8.1	Upgrading GMS Isaccea 1	COMPLETED
7.8.2	Upgrading GMS Negru Vodă 1	FID
7.9	Interconnection between the gas transmission systems of Romania and Ukraine in the Gherăești – Siret direction	LA non FID
7.10	Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania	LA non FID
7.11	Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction	LA non FID
7.12	Eastring–Romania	LA non FID
7.13	Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System	LA non FID
7.14	Development of the SCADA system for the National Gas Transmission System	LA non FID
7.15	Upgrading GMS Isaccea 2 and GMS Negru Voda 2 for enabling bidirectional flow on the T2 pipeline	LA non FID
7.16	Upgrading GMS Isaccea 3 and GMS Negru Voda 3 for enabling bidirectional flow on the T3 pipeline	LA non FID
7.17	Interconnection between NTS and the Black Sea LNG Terminal	LA non FID
Storage		
8.1	Modernization of Bilciurești underground gas storage system infrastructure	FID
8.2	Increasing underground gas storage capacity at the Ghercești Underground Gas Storage Facility	LA non FID
8.3	New underground storage facility in Falticeni (Moldova)	LA non FID
8.4	Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)	A non FID
8.5	Retrofitting and development of the underground gas storage facility Târgu Mureș	A non FID

Table 12 List of major projects – Base scenario DO MAXIMUM

13. THE 2020 – 2023 UPGRADING AND INVESTMENT PLAN

No.	Type of work	2020	2021	2022	2023
1	UPGRADING AND RETECHNOLOGISATION OF THE NATIONAL GAS TRANSMISSION SYSTEM				
1.1.	UPGRADING OF TECHNOLOGICAL INSTALLATIONS OF THE NATIONAL GAS STRANSMISSION SYSTEM (MRS, VCS, MP,NNT)				
1.1.1	ADAPTATION TO FIELD OF THE METERING LINES TO BE INSTALLED UNDER THE PROGRAMME SCADA AND TECHNOLOGICAL NODES AUTOMATIONS (Annex 1)				
1.1.2	UPGRADING OF THE MEDIEȘUL AURIT TECHNOLOGICAL NODE - stage 1				
1.1.4	REPLACEMENT OF THE GAS METERING STATION AT GMS NEGRU VODĂ 1				
1.2	DATA ACQUISITION CONTROL SYSTEM (Annex 2)				
2	DEVELOPMENT OF THE GAS TRANSMISSION SYSTEM AND RELATED FACILITIES				
2.1.	GAS TRANSMISSION PIPELINES				
2.1.1	Ø 10" CÂMPULUNG MOLDOVENESC - VATRA DORNEI GAS TRANSMISSION PIPELINE (Pojorata - Vatra Dornei pipeline section)				
2.1.2	RESTORATION OF THE UNDERCROSSING OF THE STREI RIVER BY THE WEST 2 AND WEST 3 PIPELINES, Totia area				
2.1.3	INSTALLATION OF THE FLOW REGULATOR AT GMS NEGRU VODA 1 – automation and construction				
2.1.4	Ø 20" PLĂTĂREȘTI – BĂLĂCEANCA GAS TRANSMISSION PIPEPLINE				
2.1.5	NADES – SIGHISOARA GAS TRANSMISSION PIPELINE				
2.1.6	SECURING DN 80 RACOR SUPPLY PIPELINE TO UCEA DE JOS AND FIELD ADJUSTMENT MRS UCEA DE JOS				
2.1.7	SECURING PIPELINE DN800 MOGHIOROS - ONESTI and DN700 MOGHIOROS - ONESTI, Oituz (Calcai) area				
2.1.8	REPLACEMENT OF A SECTION OF THE GAS CONNECTION PIPELINE DN 200 MRS POIANA BRASOV				
2.1.9	GAS TRANSMISSION PIPELINE MRS Timișoara I and Timișoara II (including power supply, fibre optics and archaeology)				
2.1.10	INSTALLATION OF THE PIG RECEIVING TRAP AT POSADA FOR THE DN 500 STALP 89 - POSADA AND DN 500 POSADA – MOȘU PIPELINES (the part remaining to be executed)				
2.1.11	SECURING WORKS TO THE CORMOS RIVER ABOVE-GROUND CROSSINGS BY THE DN700 IASU-DEAL MAGHIOROS and DN800 IASU-BATANI PIPELINES, Doboseni village area, Covasna county				
2.1.12	SECURING WORKS TO THE MOLDOVITA RIVER UNDERCROSSING BY THE DN300 FRASIN -				

No.	Type of work	2020	2021	2022	2023
	CAMPULUNG MOLDOVENESC GAS TRANSMISSION PIPELINE, in Vama area				
2.1.13	*SECURITY OF THE DN 500 MEDIEȘU AURIT - ABRAMUT PIPELINE, Culciu Mare AREA*				
2.1.14	*TECHIRGHIOL – OVIDIU GAS TRANSMISSION PIPELINE*				
2.1.15	*REPLACEMENT OF UNDERCROSSING OF COUNTY ROAD, RAILWAY BUCHAREST BYPASS ROAD AND RAILWAY PROGRESU OF THE DN 700 BUCHAREST RING GAS TRANSMISSION PIPELINE, MOARA DOMNEASCĂ – MĂGURELE SECTION*				
2.1.16	*ADAPTATION TO THE GROUND AND INSTALLATION OF DN 700 PIG RECEIVING STATION ON THE DN 700 BUCHAREST RING GAS TRANSMISSION PIPELINE*				
2.1.17	*SECURING THE BISTRIȚA RIVER ABOVECROSSING WITH THE DN300 PIATRA NEAMȚ - BICAZ PIPELINE, IN THE PANGĂRAŢI AREA*				
2.1.18	*SECURING THE BISTRIȚA RIVER ABOVECROSSING WITH THE DN300 PIATRA NEAMȚ - BICAZ PIPELINE, IN THE BICAZ AREA*				
2.1.19	*UPGRADING OF A GAS CONNECTION PIPELINE AND MRS VLADIMIRESCU, VLADIMIRESCU locality, ARAD county*				
2.1.20	*SECURING UNPIGGABLE DN 500 HUREZANI – CORBU – BUCUREȘTI LINE 1 PIPELINE, OPORELU – TEU ALBENI SECTION ÎN THE BARLA AREA, ARGEȘ COUNTY*				
2.1.21	*SECURING TGN 28" TAUTII MAGHERUS-ULMENI PIPELINE AT THE UNDERCROSSING OF THE LĂPUȘ RIVER, THE BUSAG AREA,MARAMURES COUNTY*				
2.1.22	*SECURING HYDROTECHNICAL WORKS RELATED TO THE TGN DN 500 HATEG - PAROSENI PIPELINE IN THE BARU MARE AREA, HUNEDOARA COUNTY*				
2.1.23	*WORKS FOR SECURING GAS TRANSMISSION PIPELINE DN 500 HATEG - PAROSENI in BARU MARE area, HUNEDOARA county*				
2.1.24	*SECURING MOLDOVA RIVER UNDERCROSSING BY THE DN 250 CRISTESTI-TG. NEAMT PIPELINE, TIMISESTEI area, NEAMT county*				
2.1.25	*PROTECTION OF THE TRANSIT PIPELINES UNDERCROSSING THE DANUBE IN THE AREA OF THE DAM AND SIGNALS REPAIR WORKS*				
2.1.26	*SECURING THE DN 700 MOGHIOROSI - ONESTI and THE DN 800 MOGHIOROSI – ONESTI PIPELINES, HÂRJA (PISTOIA) area, OITUZ, BACĂU county*				
2.1.27	*SECURING CASIN RIVER ABOVECROSSING BY THE DN 700 IAȘU - DEAL MOGHIROȘI AND DN 800 SÂNZIENI PIPELINES, COVASNA county*				
2.1.28	*SECURING SIRET UNDERCROSSING BY THE DN 500 ONESTI - ADJUDUL VECHI PIPELINE, ADJUDUL VECHI area, VRANCEA county*				

No.	Type of work	2020	2021	2022	2023
2.1.29	SECURING THE DN 300 CORMENIS-APA GAS TRANSMISSION PIPELINE, Buciumi area				
2.2.	INCREASING NTS TRANSMISSION CAPACITY				
2.2.1	NTS DEVELOPMENTS IN NORTH-EAST ROMANIA FOR ENHANCING GAS SUPPLY TO THE AREA AND FOR ENSURING TRANSMISSION CAPACITIES TO THE REPUBLIC OF MOLDOVA				
2.2.1.1	Ø 28" ONEȘTI - GHERAIEȘTI – LEȚCANI GAS TRANSMISSION PIPELINE				
2.2.1.2	ONESTI AND GHERAIESTI COMPRESSOR STATIONS AUTOMATION AND SECURING				
2.2.1.3	PROCUREMENT OF COMPRESSOR UNITS				
2.2.1.4	Other WORKS				
2.2.2	DEVELOPMENT ON THE ROMANIAN TERRITORY OF THE NTS ON THE BULGARIA – ROMANIA – HUNGARY – AUSTRIA CORRIDOR (BRUA) – PHASE I				
2.2.2.1	PIPELINE EXECUTION WORKS (Phase I)				
2.2.2.2	COMPRESSOR STATIONS EXECUTION WORKS (Podișor, Bibești, Jupa)				
2.2.2.3	PIPELINE AUTOMATION AND SECURING WORKS				
2.2.2.4	CENTRIFUGAL GAS TURBINE COMPRESSORS PROCUREMENT				
2.2.2.5	IDENTIFICATION AND MAPPING BIODIVERSITY SENSITIVE ZONESIN THE PRE-CONSTRUCTION, EXECUTION AND POST-CONSTRUCTION STAGES OF TRANSGAS PROJECTS				
2.2.2.6	THE FINANCIAL AUDIT				
2.2.2.7	EXCAVATIONS FOR INTRUSIVE ARCHEOLOGICAL DIAGNOSIS				
2.2.3	DEVELOPMENT ON THE ROMANIAN TERRITORY OF THE SOUTHERN CORRIDOR FOR TAKING OVER BLACK SEA SHORE GAS (Black Sea shore – Podișor)				
2.2.4	NEW NTS DEVELOPMENTS FOR TAKING OVER BLACK SEA GAS (VADU -T1)				
2.2.5	BRUA Phase II				
2.2.6	Serbia Interconnection				
2.3	ABOVEGROUND CONSTRUCTION AND INSTALLATION WORKS FOR MRS (Annex 3)				
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3	ELECTRIC INSTALLATIONS AND NETWORKS				
4	LAND PROCUREMENT				
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No.	Type of work	2020	2021	2022	2023
6	*NTS DEVELOPMENT ACCORDING TO LAW 123/2012 (UPDATED) ART 130, AL. E[1] AND E[2]*				
6.1	*TG. NEAMT – BALTASESTI GAS TRANSMISSION PIPELINE, NEAMT COUNTY*				
6.2	*DETA - MORAVITA GAS TRANSMISSION PIPELINE, TIMIS COUNTY*				
6.3	*VERNESTI - MARACINENI - POSTA CALNAU GAS TRANSMISSION PIPELINE, BUZAU COUNTY, PHASE I = VERNESTI-MARACINENI*				
6.4	*VERNESTI - MARACINENI - POSTA CALNAU GAS TRANSMISSION PIPELINE, BUZAU COUNTY, PHASE II = MARACINENI - POSTA CALNAU*				
6.5	*SIGHETUL MARMATIEI - BORSA GAS TRANSMISSION PIPELINE*				
6.6	*MOROIENI - PADINA GAS TRANSMISSION PIPELINE*				
	** Potential NTS investment projects, depending on requests, the results of the technical and economic studies and the completion of the FEEDs.*				

*PMDI – Annex 1 – LAND ADAPTATION OF THE METERING LINES TO BE INSTALLED BY **THE PROGRAMME SCADA AND TECHNOLOGICAL NODES AUTOMATIONS***

No.	Type of work	2020	2021	2022	2023
1.	Racova Technological Node				
2.	Gheraesti Technological Node– power supply of the actuation, automation and surveillance components				
3.	Drăgășani Technological Node				
4.	Upgrading TN Schitu Golesti – mounting pig station				
5.	Băcia Technological Node - power supply of the actuation, automation and surveillance components				
6.	power supply of the actuation, automation and surveillance components at the Dealul Frumos Technological Node				

*PMDI – Annex 2 – **DATA ACQUISITION CONTROL SYSTEM***

No.	Type of work	2020	2021	2022	2023
1	***SCADA SYSTEM***				
1.1	Works and services for the upgrading of SCADA Transgaz				
1.2	Upgrading and refurbishment of the National Gas Transmission System – Daily data acquisition system (138 locations)				
2.	***SCADA VALVE ENCLOSURE***				
3.	***TECHNOLOGICAL NODES ENCLOSURE***				

PMDI – Annex 3 – ***SURFACE CONSTRUCTION AND INSTALLATION WORKS FOR METERING-REGULATING STATIONS***

No.	Type of work	2020	2021	2022	2023
1.	MRS Clinceni - increase in the effectiveness of the metering system by adding proper equipment/elements to the technological installation				
2.	Relocation and field adjustment of the MRS Poroterom Orastie technological equipment on the location of MRS Baru				
3.	Upgrading and replacement of the technological equipment within MRS Miercurea Ciuc				
4.	Upgrading of MRS Sighișoara				
5.	Replacement of MRS Măgurele București				
6.	Capacity increase PMRS Brașov IV, Brașov County				
7.	Electricity supply - voltaic panels solution and installations for electricity use at MRS SDE Belciugatele				
8.	Atmospheric discharge protection system, with lightning rod for the MRS Manastirea Cernica facility				
9.	Atmospheric discharge protection system, with lightning rod and restoration of electrical installation for use for MRS Fulger Bragadiru facility				
10.	Protection system against atmospheric discharges, with lightning rod and restoration of earthing installation for the protection of mechanical and electrical installations belonging to the faciltiy of the Comasca valve asembly, Giurgiu county				
	Adaptation to field:				
11	PMRS Băbeni				

PMDI – Annex 4 – ***CATHODIC PROTECTION STATIONS***

No.	Type of work	2020	2021	2022	2023
1.	Marsa Cathodic Protection Station, Giurgiu county				
2.	Frătești Cathodic Protection Station				
3.	Sibiu 2 Cathodic Protection Station				
4.	Replacement of the Oporelu 2 Cathodic Protection Station, Olt county				
5.	Ilimbav Cathodic Protection Station in PM area				
6.	Sascut Cathodic Protection Station				

PMDI – Annex 5 – ***SURFACE INSTALLATION AND CONSTRUCTION WORKS FOR ODORIZATION***

No.	Type of work	2020	2021	2022	2023
1.	Adaptation to field of the odorization installations				

PMDI – Annex 6 – ***WORKS AT GAS TRANSMISSION PIPELINES LOCATED IN RISK-BEARING AREAS***

No.	Type of work	2020	2021	2022	2023
1.	*WORKS FOR SECURING Ø20" HATEG - DEALUL BABII - PAROSENI GAS TRANSMISSION PIPELINE, Dealul Babii area, Hunedoara county*				
2.	*WORKS FOR SECURING Ø 10" FRASIN – SPĂTĂREȘTI GAS TRANSMISSION PIPELINE, Spătărești area*				
3.	*WORKS FOR SECURING Ø8² CORNATEL - AVRIG GAS TRANSMISSION PIPELINE, Avrig area*				
4.	*WORKS FOR SECURING MRS RĂCĂCIUNI GAS SUPPLY CONNECTON PIPELINE, Dumbrava tourist halt area*				
5.	*DN 500 SARMASEL - BAIA MARE - SATU MARE GAS TRANSMISSION PIPELINE, Sucutard area*				
6.	*WORKS FOR SECURING DN 350 LUNA - AIUD, DN250 LUNA – OCNA MUREȘ (Line I) and DN250 LUNA -OCNA MUREȘ (Line II) GAS TRANSMISSION PIPELINES, Razboieni area*				
7.	*WORKS FOR SECURING DN 300 AGARBICIU - SIBIU GAS TRANSMISSION PIPELINE, Seica Mare area*				

Note*: The 2021 Modernization and Investment Plan was approved based on Resolution 43/17 December 2020 of the Board of Administration.*

Works completed in 2020.

Works which were not completed in the year estimated initially and are in progress.

Works in progress, according to the initial estimation.

Within the PMDI for 2021 and estimates for the period 2022-2023, investments in NTS developments were included in accordance with Law 123/2012, investments to ensure the expansion of the National Transmission System in areas with newly established distribution systems. According to Art. 130, e1 and e2, the transmission system operator has the obligation to extend the NTS to supply the national and local tourist resorts at a distance of maximum 25 km from the NTS connection point. Estimated values for the development of the transmission network in Romania are contained in the PMDI in Chapter 6 ***NATIONAL TRANSMISSION SYSTEM DEVELOPMENT IN ACCORDANCE WITH LAW 123/2012 (UPDATED), ART.130 (E^1) and (E^2), as follows***:

- Thousand lei -

	REB 2021	Estimated 2022	Estimated 2023
NTS development in line with Law 123/2012	**37,200**	**155,850**	**126,000**

The amounts included in the NTS Development Plan 2021-2030 on the extension, NTS development ensures the possibility to connect the NTS to all the localities in Romania in line with the provisions of Law 123/2012 and ANRE Order 82/2017.

14. CONCLUSIONS

Romania seeks to become an energy turntable in Eastern Europe, both from the perspective of achieving a gas transmission network strongly interconnected with similar gas transmission networks in the region, and form the perspective of gas supplying.
The three major directions of action in order for Romania to gain this position are presented in the ***Energy Pact***, concluded in May 2013, namely:

- the interconnection of the gas and electricity networks and the creation of the physical and institutional infrastructures necessary to operate a liquid energy market;
- the development of new internal gas sources and the integration on the regional power markets;
- the consistency with the European energy policies, boosting the negotiation ability in the EU institutions and cooperating with other member states in sustaining common strategic objectives.

The energy sector can become a real **`engine for economic growth`**. With its important resources and opportunities offered by the geographical positioning, Romania can secure for itself a high degree of energy security and regional integration.

The cross-border interconnection of networks is nowadays a priority in the Romanian energy policy.

Any development scenario for gas and electric energy production, or for the diversification of the external sources on import, needs a **proper transmission infrastructure.**

In order to ensure the compliance with the requirements of the European Union policy in the energy sector, based on three fundamental objectives: **energy security, sustainable development and competitiveness, Transgaz** established in its 2017-2021 administration plan the increasing of the level of NTS reliability to ensure the interoperability with the neighbouring systems, the development, upgrading and modernization of the gas transmission infrastructure, the improvement of the efficiency and the interconnection with the gas transmission systems of the neighbouring countries.

By achieving the objectives set in **the 2021-2030 TYNDP Transgaz** wishes to become an important gas transmission operator on the international gas market, with a national gas transmission system that is modern, intelligent, integrated at the European level and with a modern management system, in line with the international performance standards and regulations.

Given the important dependence of the European energy market on the Russian and Middle East energy imports, the discovered gas deposits in the Black Sea play a crucial role in terms of the Romanian energy security, the consolidation of Romania's position as an important player in the EU as a producer and exporter of energy, the integration of the country on the major gas transmission European routes and the increase in the country's economic welfare for the future decades.

On the 2030 horizon, with the necessary interconnections, Romania will have several options for gas imports:

- through the regional terminals for liquefied gas (LNG) from Greece, Croatia and Poland, the Romanian market will be able to purchase gas from the Levantine Basin (East Mediterranean);
- through the interconnection Bulgaria – Romania, Caspian gas will be imported from the Southern Gas Corridor;

Aware of this responsibility, Transgaz management is continuing one of the largest and most important plans for the development of the Romanian gas transmission infrastructure over the last 20 years, with investment projects estimated at approximately EUR 3.55 billion (of which EUR 698 million for FID and non-FID projects) and meant to create new gas transmission routes, essential to efficient transmitting of the discovered Black Sea gas on the internal and regional markets, but also in order to have Romania integrated into the major cross-border routes of the European South-Eastern/North-South Corridor.

The capability of the company to adapt and to respond to the requirements of the Romanian gas resources, in the following years, is one of the biggest challenges for a Romanian company (not only state - owned) over the last two decades. The ability of the company to implement this investment plan will not only ensure the use of essential economic resources for the welfare of Romania but it will also be a litmus test to prove the foreign investors that Romania is able to create favourable conditions for developing and attracting foreign investments.

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Definitions and abbreviations

ENTSO-G	European Network of Transmission System Operators for Gas
TYNDP	Ten Year Network Development Plan
CE	The European Commission
CEF-Energie	Connecting Europe Facility
CESEC	Central East South Europe Gas Connectivity
ROHUAT/BRUA	Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor
NSI-EAST	North South Corridor - East
PCI	Projects of Common Interest
POIM	Large Infrastructure Operational Program
AP	Priority Axis (POIM)
OS	Strategic Objective (POIM)
TANAP	The Trans-Anatolian Pipeline (TANAP);
TAP	The Trans Adriatic Pipeline
IGB	The Interconnector Greece – Bulgaria
AGRI	The Azerbaijan-Georgia-Romania-Hungary interconnector
BRUA	The Bulgaria – Romania – Hungary – Austria pipeline
SNTGN	The National Gas Transmission Company
ANRE	National Energy Regulatory Authority
ANRM	National Agency of Mineral Resources
BVB	Bucharest Stock Exchange
SNT	National Gas Transmission System
SRM	Gas metering regulating station
SCV	Valve control station
NT	Technological Node
SMG	International transmission pipeline metering station
SCG, SC	Gas compressor station
SPC	Cathodic protection station
SOG	Gas odorization station
SCADA	Supervisory control and data acquisition system
BG	Bulgaria
UA	Ukraine
HU	Hungary
RO	Romania
DN	Nominal Diameter
L	Length
Pn	Nominal pressure

List of figures, charts and tables

CHARTS

TABLES