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REPORT

on the prior approval of the "National Gas Transmission System Development Plan for 2019-2028" for submission to ANRE (Romanian Energy Regulatory Authority) for approval

SUMMARY

According to **ANRE Decision no. 1954 of 14.12.2018** for the approval of the "National Gas Transmission System Development Plan for 2018-2027" ***(TYNDP)*** until **August 1st, 2019**, SNTGN Transgaz SA has to submit to the Romanian Energy Regulatory Authority the "**National Gas Transmission System Development Plan for 2019-2028**", accompanied by the **Resolution of the General Meeting of the Shareholders on the prior approval of the *TYNDP*.**

In accordance with Directive 2009/73/EC of the European Parliament and of the Council concerning common rules for the domestic market in the field of natural gas Article 22, paragraph (1), SNTGN Transgaz SA has submitted the draft "National Gas Transmission System Development Plan for the 2019-2028 Period" to **public consultation**, in the period 21.05.2019 - 19.06.2019.

The draft "*National Gas Transmission System Development Plan for 2019-2028*" submitted to public consultation was approved by the Board of Administration through resolution of the BA no. 22 of May 20th, 2019.

PROPOSAL

Under Article 15, point (3), paragraph (a) of the Articles of Incorporation, updated on 28.11.2018, we submit for prior approval the draft "National Gas Transmission System Development Plan for 2019-2028" (attached document) completed/ updated according to the observations following the public consultation, in view of its submission to ANRE for approval.

DETAILED CONTENT

Considering the compliance with the requirements of the European Directive CE/73/2009 art. 22, regarding the obligation of an annual development of the **10-year Development Plans** for all natural gas transmission system operators in the European Union, SNTGN Transgaz SA Mediaş, as technical operator of the Romanian National Gas Transmission System has drawn up the draft **National Gas Transmission System Development Plan for 2019-2028**.

The document proposes a presentation of the development directions of the Romanian natural gas transmission system and of the major projects that the company intends to implement over the next 10 years. The aim is to achieve a maximum degree of transparency regarding the development of the National Gas Transmission System in order to give stakeholders the possibility to get informed in advance about the existing and planned transport capacities so that through public consultations, the decisions regarding the investments in the natural gas transmission system meet the market requirements.

The draft National Gas Transmission System Development Plan for 2019-2028 drawn up in accordance with the provisions of Law no.123/2012 on Electricity and Natural Gas (updated) and with the objectives proposed in the draft Romanian Energy Strategy 2019-2030 with the perspective of the year 2050, meets the requirements of the European energy policy on:

- ensuring security of gas supply;
- increasing the degree of interconnection of the national gas transmission system to the European network;
- increasing the flexibility of the national gas transmission system;
- liberalization of the natural gas market;
- the creation of an integrated natural gas market within the European Union;
- ensuring the connection of third parties to the transport system, according to specific regulations, within the limits of transport capacities and complying with the technological regimes;
- the extension of the pipeline system until December 2021, up to the entrance into the localities certified as tourist resorts of national or local interest, when these settlements are at a distance of maximum 25 km from the connection points of the transport or system operators;
- ensuring the connection to the natural gas network of new, job-generating investments.

The plan is structured in the following chapters:

1. Introduction
2. Company Profile
3. Description of the national gas transmission system
4. The natural gas market in the country and in the region
5. Consumption, production and gas storage
6. Security of gas supply
7. Directions for NTS development

8. Directions for the development of the storage system
9. Analysis of major projects
10. Upgrading and Investment Development Program 2018-2021
11. Conclusions

The draft National Gas Transmission System Development Plan includes large-scale projects aimed at reconfiguring the natural gas transmission system which, although extensive and complex, was conceived at a time when the emphasis was placed on the supply of natural gas to large industrial consumers and creating access for them to concentrated resources in the center of the country and in Oltenia as well as to the only import source.

In order to identify the necessary projects to be developed in the national gas transmission system, the main requirements that must be ensured in the current dynamics of the regional gas market have firstly been taken into account. In view of the latest developments and trends in the field of natural gas transmission routes at European level, the emergence of two new sources of natural gas supply is obvious: natural gas from the Caspian Sea regions and those recently discovered in the Black Sea.

In this context, it is important that Transgaz implements the projects described in TYNDP 2019-2028 in a very short time to connect the Central European markets to these resources and to redefine itself as an important gas transmission operator. The geostrategic position and the primary energy resources can help Romania become a significant player in the region, but only if it keeps pace with the technological progress and it if is able to attract the necessary funding.

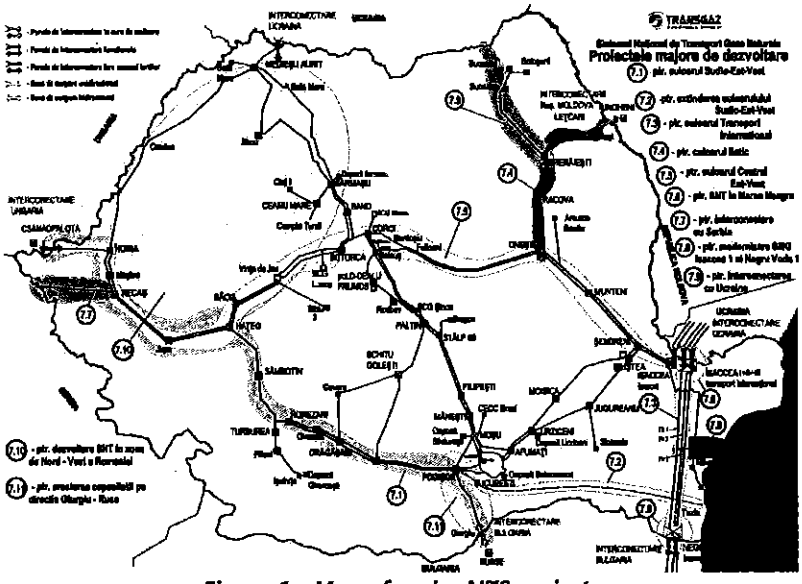


Figure 1 - Map of major NTS projects

List of Major Projects included in the Draft National Gas Transmission System Development Plan 2019-2028 compared to TYNDP ENTSOG 2018:

Ctr. No	TYNDP 2019 Project code	Name of TYNDP project	TYNDP 2018 Project Code	Name of TYNDP 2018 project
1	**7.1.1.**	Development on the Romanian territory of the National Gas Transmission System on Bulgaria – Romania – Hungary – Austria Corridor – Phase 1	TRA-F-358	Development on the Romanian territory of the NTS (BG–RO-HU-AT Corridor) (PHASE 1)
2	**7.1.2.**	Development on the Romanian territory of the National Gas Transmission System on Bulgaria – Romania – Hungary – Austria Corridor – Phase 2	TRA -N-1322	Development on the Romanian territory of the NTS (BG–RO-HU-AT Corridor) (PHASE 2)
3	**7.2.**	Development on the Romanian territory of the Southern Transmission Corridor for the take-over of natural gas from the Black Sea shore	TRA-N-362	Development on the Romanian territory of the Southern Transmission Corridor
4	**7.3.**	Interconnection of the National Gas Transmission System with the international natural gas transport pipelines and Reverse Flow Isaccea	TRA-N-139	Interconnection of the NTS with the DTS and reverse flow at Isaccea
5	**7.4.**	NTS developments in North-East Romania in order to improve the natural gas supply of the area, as well as to ensure the transport capacities to the Republic of Moldova	TRA-N-357	NTS developments in North-East Romania
6	**7.5.**	Further enlargement of the bidirectional transmission corridor Bulgaria – Romania – Hungary – Austria (BRUA Phase 3)	TRA-N-959	Further enlargement of the BG—RO—HU—AT transmission corridor (BRUA) phase 3
7	**7.6.**	New NTS developments for taking over gas from the Black Sea shore.	TRA-N-964	New NTS developments for taking over gas from the Black Sea shore
8	**7.7**	Interconnection Romania - Serbia	TRA-N-1268	
9	**7.8**	Upgrading GMS Isaccea 1 and GMS Negru Voda 1	TRA-N-1277	Upgrading GMS Isaccea 1 and GMS Negru Voda 1
10	**7.9**	Interconnection of the national gas transmission system with the natural gas transmission system from Ukraine, on the Gherăeşti – Siret direction		
11	**7.10**	Development / Upgrading of natural gas transport infrastructure in the North-West of Romania		

Ctr. No	TYNDP 2019 Project code	Name of TYNDP project	TYNDP 2018 Project Code	Name of TYNDP 2018 project
12	**7.11**	Increasing natural gas transmission capacity of Romania-Bulgaria interconnection on the Giurgiu-Ruse direction		
13	**7.12**	Eastring–Romania	TRA-N-655	
14	**7.13**	Monitoring, control and data acquisition system for cathodic protection stations related to the National Gas Transmission System		
15	**7.14**	Development of the SCADA system for the National Gas Transmission System		
16		Completed project	TRA-F- 029	Romania-Bulgaria Interconnection (EEPR-2009-INTg-RO-BG)

Table 1- TYNDP 2019 Code comparison with TYNDP 2018

Changes in TYNDP 2019-2028 versus TYNDP 2018-2027:

A. updating the estimated timetables for the implementation of the projects, values and deadlines for the completion of projects under TYNDP 2018-2027 as a result of finalizing some pre-feasibility, feasibility studies, technical projects or signing of contracts;

B. introducing five new projects as follows:

- development / upgrading of natural gas transport infrastructure in the North-West of Romania;
- increasing the natural gas transmission capacity of the Romania-Bulgaria interconnection on the Giurgiu-Ruse direction;
- Eastring-Romania;
- monitoring, control and data acquisition system for the cathodic protection stations related to the National Gas Transmission System;
- Development of the SCADA system for the National Gas Transmission System.

A. Updating the estimated timetables for the implementation of projects, values and deadlines for the completion of projects under TYNDP 2018-2027 as a result of finalizing prefeasibility, feasibility studies, technical projects or signing of contracts

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

	2014 - 2023 TYNDP	2017 - 2026 TYNDP	2018 - 2027 TYNDP	2019 – 2028 TYNDP
Project description	32" x 55 bar x 81 km Podişor-Corbu Pipeline; 32" x 55 bar x 167 km Băcia-Haţeg-Jupa- Recaş Pipeline; Three gas compressor stations (Corbu CS, Haţeg I CS and Horia I CS) with a total installed power of approximately P_{inst} = 49.5 MW; 32" x 55 bar x 250 km Corbu – Hurezani – Hateg Pipeline ; 32" x 55 bar x 47 km Recaş– Horia pipeline ; Extension of the Horia metering station.	The project was divided into two phases: **Phase I:** 32" x 63 bar Podişor – Recaş pipeline , approximately 479 km long; Three gas compressor stations (Podişor CS, Bibeşti CS and Jupa CS), each station equipped with two compressors (one in operation and one as a backup), with the possibility to ensure bidirectional gas flows. **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.	The project was divided into two projects, of which: **Phase I:** 32" x 63 bar Podişor – Recaş pipeline, approximately 479 km long; Three gas compressor stations (Podişor CS, Bibeşti CS and Jupa CS), each station equipped with two compressors (one in operation and one as a backup), with the possibility to ensure bidirectional gas flows.	There are no changes.
Estimated completion date	2019	Phase I: 2019 Phase II: 2020	Phase I: 2019	Phase I: 2020
Total estimated amount of the project (million Euro)	560	547.39	Phase I: 478.6	There are no changes.

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

	2014 – 2023 TYNDP	2017 - 2026 TYNDP	2018 - 2027 TYNDP	2019 – 2028 TYNDP
Project description	32" x 55 bar x 81 km Podişor-Corbu pipeline; 32" x 55 bar x 167 km Băcia-Haţeg-Jupa-Recaş pipeline; Three gas compressor stations (Corbu CS, Haţeg I CS and Horia I CS) with a total installed power of approximately P_{inst} = 49,5 MW; 32" x 55 bar x 250 km Corbu – Hurezani – Hateg pipeline; 32" x 55 bar x 47 km Recaş–Horia pipeline; The extension of the Horia gas metering station.	The project was divided into two phases: **Phase I:** 32" x 63 bar Podişor – Recaş pipeline , approximately 479 km long; Three gas compressor stations (Podişor CS, Bibeşti CS and Jupa CS), each station equipped with two compressors (one in operation and one as a backup), with the possibility to ensure bidirectional gas flows. **Phase II** 32" x 63 bar Recaş – Horia Pipeline , approximately 50 km long; The extension of the three gas compressor stations (CS Podisor, CS Bibesti and CS Jupa) by mounting an additional compressor in each station; The extension of the existing gas metering station - Horia GMS.	The project was divided into two projects: **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 date	2019	Phase I: 2019 Phase II: 2020	Phase II: 2022*	There are no changes.
Total estimated amount of the project (million Euro)	560	547.39	Phase II: 68.8	There are no changes.

** the completion of Phase II depends on the capacity booking procedure at IP Csanádpalota and on the timeline of such procedure*

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

Following the completion of the pre-feasibility and feasibility studies, the following changes were made:

	2014 – 2023 TYNDP	**2017 - 2026 TYNDP**	**2018 - 2027 TYNDP**	**2019 – 2028 TYNDP**
Project description	Pipeline length 285 km	Pipeline length 307 km	Pipeline length 308.2 km	Pipeline length 308.3 km
Estimated completion date	2019	2020	2020	2021*
Total estimated amount of the project (million Euro)	262.4	278.3	360.36	360.4

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

Following the completion of the pre-feasibility and feasibility studies, the following changes were made:

	2014 – 2023 TYNDP	**2017 - 2026 TYNDP**	**2018 - 2027 TYNDP**	**2019 – 2028 TYNDP**
Project description	The project consists in: -the upgrading and extension of the Siliștea compressor station; -a new compressor station at Onești - interconnection of Isaccea 1 GMS (NTS and Tranzit 1) -rehabilitation of the Cosmești – Onești (66.2 km) and Siliștea - Șendreni (11.3 km) pipeline sections.	The project consists in: the upgrading and extension of the Siliștea compressor station; -a new compressor station at Onești - interconnection of Isaccea 1 GMS (NTS and Tranzit 1) -rehabilitation of the Cosmești – Onești (66.2 km) and Siliștea - Șendreni (11.3 km) pipeline sections.	The project was broken down into two phases: Phase 1: - interconnection works between NTS and the international transmission pipeline T1 in the area of the Isaccea metering station; - Repair works to the DN 800 mm Cosmești - Onești (66,0 km) pipeline. Phase II: - upgrading and extension of the Siliștea compressor station; - upgrading and extension of the Onești compressor station;	There are no changes.

			- modification within TN Siliştea, TN Şendreni şi TN Oneşti.	
Estimated completion date	2018	2019	Phase I: 2018 Phase II:2019	Phase I: 2018 Phase II: 2020
Total estimated amount of the project (million Euro)	65	65	Phase I: 8.8 Phase II: 92.2	Phase I: 8.8 Phase II: 68.9

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

Following the completion of the pre-feasibility, feasibility studies and of the FEED the following changes were made:

	TYNDP 2014 - 2023	**TYNDP 2017 - 2026**	**TYNDP 2018 - 2027**	**TYNDP 2019-2028**
Project description	Pipeline length 163 km	Pipeline length 165 km	Pipeline length 165.15 km	No changes.
Estimated completion date	2017	2019	2019	2021
Total estimated amount of the project (million Euro)	110	131.7	174.25	No changes.

7.5 Extension of the bi-directional gas transmission corridor Bulgaria – Romania - Hungary – Austria (BRUA Phase 3)

Previous National Gas Transmission System Development Plans

Following the reconsideration of the project 7.3 *NTS Interconnection with the international gas transmission pipeline T1 and reverse flow Isaccea,* the following changes were made:

	TYNDP 2014 - 2023	**TYNDP 2017 - 2026**	**TYNDP 2018 - 2027**	**TYNDP 2019-2028**
Project description	Central corridor Isaccea - Şendreni – Oneşti – Coroi – Haţeg – Horia.	The entire project was reconsidered (the corridor starts from Oneşti to Nădlac)	the corridor starts from Oneşti to Nădlac	No changes.
Estimated completion date	2023	2023	2023	2025
Total estimated amount of the project (million Euro)	544	530	530	No changes.

7.6 New NTS developments for taking over Black Sea gas

Following the completion of the FEED, the following changes were made:

	TYNDP 2017 - 2026	TYNDP 2018 - 2027	TYNDP 2019-2028
Project description	25 km DN 500 pipeline	25 km DN 500 pipeline	No changes.
Estimated completion date	2019	2019	2021
Total estimated amount of the project (million Euro)	9	9.14	No changes.

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

Following the completion of the pre-feasibility studies, the following changes were made:

	TYNDP 2017 - 2026	TYNDP 2018 - 2027	TYNDP 2019-2028
Project description	Pipeline length 80 km (74 km Romania)	Pipeline length 97 km (85 km Romania)	No changes.
Estimated completion date	2026	2020	No changes.
Total estimated amount of the project (mil. Euro)	43 (40 Romania)	50.7 (42.4 Romania)	53,76 Romania

7.8 Upgrading GMS Isaccea 1 and GMS Negru Vodă 1

Following the completion of the pre-feasibility and feasibility studies, the following changes were made:

	TYNDP 2017 - 2026	TYNDP 2018 - 2027	TYNDP 2019-2028
Project description	Construction of two new gas metering stations in the existing facilities	Construction of two new gas metering stations in the existing facilities	No changes.
Estimated completion date	2019	2019	2020-GSM Isaccea 1 2021-GSM Negru Vodă1
Total estimated amount of the project (mil. Euro)	13.9	13.9	26,65

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

	NTSDP 2018-2027	NTSDP 2019-2028
Project description	– construction of a gas transmission pipeline (130 km long) and of the related equipment in the direction Gherăești–Siret; – construction of a cross-border gas metering station; – expansion of the compressor stations Onești and Gherăești.	No changes.
Estimated completion deadline	2025	No changes.
Total estimated value (mil. Euro)	125	No changes.

B. New projects introduced in the TYNDP 2019-2028 (detailed in the annex):

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

Estimated project implementation schedule:

Milestones	Status / Estimated completion deadline
Stage 1	**2022**
Pre-feasibility study	Completed
Feasibility study	2019-2020
FEED	2020-2021
Public procurement	2021
Construction	2021-2022
Commissioning/start up	2022
Stage 2	**2025**
Pre-feasibility study	Completed
Feasibility study	2019-2020
FEED	2021-2022
Public procurement	2022
Construction	2023-2025

Milestones	Status / Estimated completion deadline
Commissioning/start up	2025
Stage 3	**2026**
Pre-feasibility study	Completed
Feasibility study	2019-2020
FEED	2022-2023
Public procurement	2023
Construction	2024-2026
Commissioning/start up	2026

Estimated completion deadline: 2022 Stage 1, 2025 Stage 2 and 2026 Stage 3

Estimated value: Euro 405 million

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

Estimate project development schedule:

Milestones	Status / Estimated completion deadline
Pre-feasibility study	2019-2020
Feasibility study	2020-2021
FEED	2022-2024
Public procurement	2024
Construction	2025-2027
Commissioning/start up	2027

Estimated completion deadline: 2027

Estimated investment value: Euro 51.8 million

7.12 Eastring-Romania

Estimated project implementation schedule:

Milestones	Status / Estimated completion deadline
Stage 1	**2025**

Pre-feasibility study	Completed
Feasibility study	Completed
FEED	2019-2023
Public procurement	2022-2023
Construction	2023-2025
Commissioning/start up	2025
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 deadline: 2025 Stage 1, 2030 Stage 2

Estimated investment value:

- **Stage 1 - Euro 1,297 mil. for Romania (2.600 mil. Euro–total);**
- **Stage 2 - Euro 357 mil. for Romania (739 mil. Euro–total).**

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

Indicative project development timeline:

Development stages	Status/Estimated completion date
Feasibility study	2019
FEED	2019-2020
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	2020
Construction	2020-2023
Commissioning/start up	2021-2023

Estimated completion deadline: 2023

Estimated investment amount: EURO 8 million

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

Indicative project development timeline:

Development stages	Status/Estimated completion date
Feasibility study	2019 - 2020
FEED	2020 - 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	2020
Construction	2020 - 2023
Commissioning/start up	2023

Estimated completion deadline: 2023

Estimated investment amount: EURO 5.5 million

Please find below a summary of the major projects:

Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
7.1.1	Development on the territory of Romania of the National Gas Transmission System on the **Bulgaria-Romania-Hungary-Austria Route (Phase I)**	478,6	2020	Ensuring a natural gas transmission capacity to Hungary of 1.75 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 third list of projects of common interest.	FID
7.1.2	Development on the territory of Romania of the National Gas Transmission System on the **Bulgaria-Romania-Hungary-Austria Route** (Phase II)	68,8	2022	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	A non FID

Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
				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	
7.2	Development of the **Southern Trasmission Corridor** on the territory of Romania for taking over natural gas from the Black Sea shore	360,4	2021	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.	A non FID
7.3	**Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow Isaccea**	**77,7** Phase 1: 8,8 Phase 2: 68,9	Phase 1: 2018 Phase 2: 2020	Transgaz has a great interest in implementing this project for the following reasons: *to eliminate the possibility of European Commission imposing extremely costly financial penalties.* We mention that this project is part of the first, second and third list of projects of common interest at EU level and will be carried out in two Phases.	FID
7.4	**Developments of the NTS in the Northeast 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
7.5	**Extension** of the bidirectional **gas transmission corridor Bulgaria–Romania–Hungary–Austria (BRUA-Phase III)***	530	2025	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

Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
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
7.7	**Romania-Serbia Interconnection**	53,76	2020	Construction of an interconnection pipeline with Serbia to diversify sources of supply and increase energy security in the region.	A non FID
7.8	**Upgrading GMS Isaccea 1 and Negru Vodă 1**	26,65	2021	Upgrading the gas metering stations at interconnection points to increase the level of energy security in the region.	FID
7.9	**Interconnection** of the national gas transmission system with the natural gas transmission system of **Ukraine, Gherăeşti-Siret**	125	2025	Establishing an interconnection with Ukraine in the direction of Gherăieşti-Siret, 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
7.10	Development /Upgrading of the natural gas transmission infrastructure in the North-West of Romania	405	Stage 1 2022 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
7.11	Increasing the natural gas transmission capacity of the Romania-Bulgaria interconnection in the Giurgiu-Ruse direction	51,8	2027	Improving the natural gas supply of the area.	LA non FID

Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
7.12	Eastring–Romania	Phase 1: 1.297 Romania Phase 2: 357 Romania	Phase 1: 2025 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
7.13	Monitoring, control and data acquisition system for 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
7.14	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
TOTAL (2019-2028) of each:		**~ 4.03 billion Euro (4,028.60. Euro)**			
TOTAL FID and A non FID Projects		**~ 1.25billion Euro (1,249.30 mill. Euro)**			

According to the Final Investment Decision (FID) in the TYNDP 2015 projects were classified in two categories:

- FID projects – projects for which the Final Investment Decision was taken and
- non-FID projects - projects for which the Final Investment Decision was not taken.

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

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

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	766,34
2	A non FID projects	482,96
TOTAL FID and A non FID projects		**1.249,30**

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

Chart 1 – Investment effort of Transgaz for FID and A non FID projects depending on the estimated completion deadline (mill. Euro)

The annual investment effort of SNTGN Transgaz SA by FID and A non FID projects completion date is as follows:

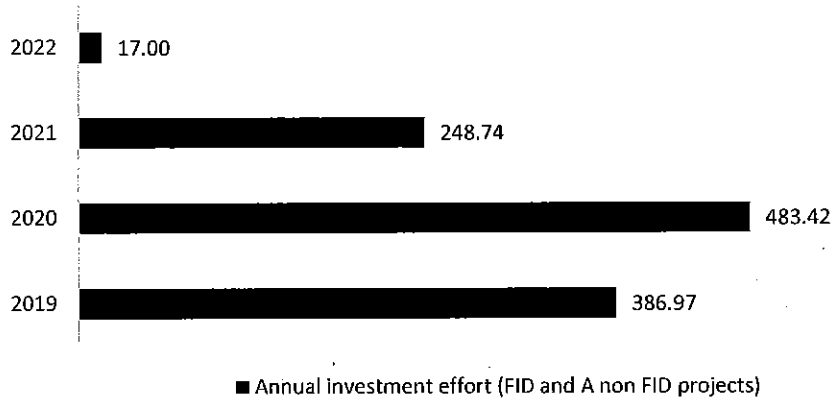


Chart 2- Annual Investment effort for the achievement of FID and A non FID projects -mil. Euro

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.

Within the PMDI for 2019 and estimates for the period 2020-2021, investments in NTS developments were included in accordance with the provisions of Law 123/2012, investments to ensure the expansion of the National Transmission System in areas with newly established distribution systems. According to art. 151 of the Law 123/2012, the transmission system operator

has the obligation to finance the expansion works under economic efficiency conditions. 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 GAS TRANSMISSION SYSTEM DEVELOPMENT IN ACCORDANCE WITH LAW 123/2012 (UPDATED), ART.130, AL. E^1 and E^2, as follows***:

Lei thousand

	REB 2019	**Estimated 2020**	**Estimated 2021**
NTS Development in line with law 123/2012	**150.000**	**350.000**	**400.000**

Public consultation

A. Following the public consultation from May 21st, 2019 - June 19th, 2019, **the draft** "National Gas Transmission System Development Plan for 2019-2018 period" **endorsed by the Board of Directors through decision of board of director no. 22/20 May 2019**, was **completed/updated** in accordance with the points of view received, if deemed necessary.

The synthesis of these points of view with the reasoned acceptance or rejection and the changes made in TYNDP are presented in the following table:

Ctr. No.	**OBSERVATIONS AND PROPOSALS**	**Responses from TRANSGAZ departments**
ENGIE		
The "International Transmission of Natural Gas" section,		
1.	According to the chapter 2.1, section "International transmission of natural gas", the transport via T2 and T3 pipelines" is currently not subject to European third-party access rules" but "the company aims to address these issues and to comply with the provisions of the European regulatory framework". At the same time, Transgaz has subjected to public consultation on June 11th, 2019 a "Document on the Commercial Rules of the Interconnection Agreement for PIV Negru Voda 2.3 / Kardam". Under these circumstances, please indicate when and how you estimate the transmission capacities on the T2 and T3 pipelines will be made available to the market as well as the	Capacities on the T2 and T3 pipelines will be made available to the market after the interconnection agreements for the virtual interconnection points located on the T2 and T3 pipelines (gas day, elimination of the condition for the conclusion of an interconnection agreement with all adjacent TSOs, etc.) will be concluded. In this respect, Transgaz is in the process of negotiating these agreements with the transmission operators from Ukraine and Bulgaria. Given that the conclusion of the interconnection agreements is not a Transgaz unilateral action, stakeholders will be

Ctr. No.	OBSERVATIONS AND PROPOSALS	Responses from TRANSGAZ departments
	planning of the activities to be undertaken by Transgaz in this regard.	informed in due time of the completion of this action.
2.	According to chapter 2.1, Section "International Gas Transmission", "at the end of 2018, the interconnection between the T1-DN1000 and NTS pipelines that allows the natural flow of gas from the international transmission pipeline to the NTS (not vice versa) was completed". This interconnection is foreseen in project 7.3 "Interconnection of the national gas transmission system with the T1 natural gas international transmission pipeline and Isaccea reverse flow". So, please specify: ▪ If at this moment, due to the interconnection made, is it possible to supply natural gas from the NTS to the T1 pipeline and further to the localities of Mangalia and Negru Voda, including export to Bulgaria. If not, please specify which other activities, possibly covered by projects 7.3 and/or 7.8, are necessary to this effect.	- No, at this moment it is not possible to supply natural gas from the NTS to the T1 pipeline. To this effect, it is necessary to complete Phase 2 of Project 7.3 and to complete the project 7.8.
	▪ To what extent the existence or not of a natural gas flow from Ukraine towards Bulgaria via T1 pipeline, or even a firm capacity reservation on this route, affects or not the possibility of using the interconnection made to NTS-T1.	- Natural gas flows are associated with the capacity products offered by Transgaz. At this time, Transgaz offers only capacity products with implicit allocation (according to ANRE Order No 34/2016), which imply a physical flow only on the direction of Ukraine-Romania-Bulgaria. Upon completion of projects 7.3 and 7.8, and amendments to Interconnection Agreements with Ukrtransgaz and Bulgartransgaz other capacity products will be offered that imply physical flow from NTS to T1.
	▪ To what extent does the reservation of firm capacity in Isaccea or Negru-Voda affects or not the possibility of using the NTS-T1 interconnection to bring natural gas from Bulgaria. This question comes in the context of the publication, on June 14th 2019, of the Draft Order amending and supplementing the Orders of the President of the Romanian Energy Regulatory Authority no.	- According to the Draft Order, the interruptible capacity could only be offered in backhaul regime provided that the principle of equality between the interruptible capacity allocated at the Negru Voda 1 entry point and the interruptible capacity allocated to the Isaccea 1 exit point is complied with, and only after the Interconnection Agreement with Ukrtransgaz will become applicable.

Ctr. No.	OBSERVATIONS AND PROPOSALS	Responses from TRANSGAZ departments
	88/2016 and no. 34/2016, which states in Article 5 that: "The interruptible capacity at the Bulgaria-Romania and respectively Romania-Ukraine interconnection points will be offered within the firmly reserved capacity on the direction Romania-Bulgaria and respectively, Ukraine-Romania, under the terms agreed under the interconnection agreements concluded with the operators of adjacent transport systems."	
	▪ How would Isaccea Point be treated in terms of capacity reservation, as long as, through the interconnection made through this point, both NTS and T1 pipeline can be fed, but at this moment there are different capacity reservation procedures for the two Isaccea points (NTS and T1). Since, through the Network Code, the Isaccea NTS point is currently virtualized along with the one from Medieşu Aurit, we would like to know if this virtualization will be maintained for the current physical point, and for the NTS-T1 interconnection the capacity reservation will be made according to the CAM NC.	- Since the capacity of Isaccea 1 Gas Measuring Station (GMS) is greater than GMS Negru Voda 1 / Kardam's capacity, the additional technical capacity of PI Isaccea 1 could be added to the capacity of the Virtual Entry Point in NTS - VPM05 Medieu Aurit-Isaccea and offered on the basis of the "first come, first served" allocation principle. This is allowed, taking into account the provisions of the Art. 13[1] letter d): *„If there are several physical points of entry into the NTS from the same natural gas transmission system in a neighboring state of Romania that is not a member of the European Union, it can be created a virtual entry point by grouping the physical entry points inti the NTS or parts of the physical points of entry into the NTS from the same transport system of that state"*
	▪ What would be the meaning of the Isaccea-Mangalia "paired" capacity reservation, if, through the interconnection made, Mangalia could be supplied with gas from the NTS.	- As we have mentioned above, the gas flow from NTS into T1 is not yet possible. Under these conditions, the capacity reservation for Mangalia will be as it is today.
	▪ If at this moment, as a result of the interconnection, it is possible to supply NTS with natural gas coming from the T1 pipeline either as a result of a North-South flow or of a South-North flow on T1.	-The supply of NTS with gases coming from T1 pipelines could be possible as a result of a North-South flow, if the additional capacity of GMS Isaccea 1 is added to VPM05 Medieşu Aurit-Isaccea.
	▪ If, at the time of completion of project 7.3, will be possible to include physical	

<table>
<tr><th>Ctr. No.</th><th>OBSERVATIONS AND PROPOSALS</th><th>Responses from TRANSGAZ departments</th></tr>
<tr><td></td><td>export through T1 to Ukraine, including natural gas from NTS.</td><td>-Transgaz is to define the offer regarding the capacity products at the Isaccea 1 interconnection point taking into account the possible gas flows to be transported from NTS to T1 following the completion of the mentioned project. The capacity offer will be made public, within the deadlines set in the tender calendar published by ENTSOG.</td></tr>
<tr><td colspan="3">Eastring – Romania Project</td></tr>
<tr><td>3.</td><td>Considering Project 7.12 Eastring-Romania, please clearly specify what is the route planned for this project in Romania, as well as the necessary developments. The TYNDP states that the project has two phases (2025 and 2030 terms), but the presented map is unclear and contains three route variants, ignoring other projects from TYNDP on the same routes (namely projects 7.1, 7.5 and 7.10).</td><td>The Feasibility Study for the Eastring Project was completed in 2018. In this study, all three route variants were analyzed, presenting the advantages and disadvantages of each variant. Until this date no decision has been made on the chosen route variant. The preparation of the Feasibility Study took into account the major projects on the same routes. Transgaz supports the choice of route variant Arad - Horia - Haţeg - Podişor - Giurgiu.</td></tr>
<tr><td colspan="3">BRUA Project (phase I)</td></tr>
<tr><td>4.</td><td>Acording to chapter 7.1.1 (BRUA Phase I):
"The implementation of BRUA-Phase I project results in the provision of a permanent bidirectional physical flow potential between the interconnections with Bulgaria and Hungary, ensuring the following natural gas transport capacities: transport capacity to Hungary of 1.75 billion Smc / year, respectively of 1.5 billion Smc / year to Bulgaria."
However, in the RBP platform, for the annual capacity tender for the 2019-2020 gas year for those points, the following capacities were made available to the market:
<table>
<tr><th></th><th>Grouped</th><th>Ungrouped</th><th>TOTAL</th></tr>
<tr><th></th><th>MWh/day</th><th>MWh/day</th><th>MWh/day</th></tr>
<tr><td>Export</td><td>1.461,935</td><td>15,585</td><td>1.477,520</td></tr>
<tr><td>Import</td><td>7.067,293</td><td>19.981,792</td><td>27.049,085</td></tr>
<tr><td>Import</td><td>6.187,608</td><td>40.028,976</td><td>46.216,584</td></tr>
<tr><td>ort</td><td>19.368,240</td><td>0,000</td><td>19.368,240</td></tr>
</table>
(Values in cubic meters are approximate, being obtained using a PCS = 10.67 kWh / m3.)</td><td>The annual capacity offers (billion Scm / year) on the RBP platform for 2019-2020 gas year at the Csanádpalota interconnection point were at the level of 0.75 on export and 1.75 per import and on the interconnection point Ruse-Giurgiu at the level of 0.05 per export and 0.9 per import. Of these offers, a 10% share was retained for short-term offers according to CAM NC.
Transgaz will provide export capacities at these points at the level of 1.75 billion cm / year towards Hungary and 1.5 billion Scm / year towards Bulgaria at the completion of the BRUA Phase 1 project,
Please note that the data in the adjoining table, the first two rows correspond to the Transgaz offer on Ruse-Giurgiu, and the others do not correspond to the Transgaz offer on Csanádpalota on the public RBP platform site.</td></tr>
</table>

Ctr. No.	OBSERVATIONS AND PROPOSALS	Responses from TRANSGAZ departments
	In view of these offers, since the values in chap. 7.1.1 are the capacities expected to be available at the end of this year (December 2019), please state the reason for the differences between planned and offered (0.16 billion Scm / yr, on Csanádpalota respectively 0.57 billion CBC per year on Giurgiu-Ruse), as well as the differences, at each point, between the import and the export capacity.	
Romania - Serbia Interconnection Project		
5.	The project 7.7, which provides for the Romania-Serbia interconnection, mentions: "*If natural gas will be taken from Serbia and delivered to Romania, it can be directed to consumption in the Timisoara-Arad area via DN 600 Horia-Masloc-Recaş (25 bar), at lower pressures than in the BRUA pipeline.*" Please clarify if the "Timişoara-Arad area" is just a guideline specification and the respective natural gas can be delivered to PVT, or it is a "closed circuit" dedicated to this project.	"Timişoara-Arad area" is an indicative explanation, in the case of the take-over of natural gases from Serbia to Romania, these can be delivered to PVT.
Romania - Ukraine Interconnection Project		
6.	Project 7.9 envisages the interconnection with the Ukrainian system through a new pipeline, on the Gherãesti-Siret direction. Please indicate if there is a similar plan on the Ukrainian side.	There is also a plan on the Ukrainian side to develop additional capabilities in this direction. Analyses and discussions with Ukrainian partners are in their early stages.
7.	Considering the "*Joint Statement on the outcome of the public consultation on Business Rules and Communication Procedures for Exceptional Events in the Draft Interconnection Agreement for PI Mediesu Aurit / Tekovo*", when SNTGN Transgaz SA announces that "it will initiate in the forthcoming period a market survey process to quantify capacity demand and, depending on the outcome, will assess investment needs in order to remove current technical restrictions", please indicate when this consultation will take place, and whether TYNDP projects which are being publicly debated affect in any way the technical capabilities of PI Medieşu Aurit.	Transgaz will initiate, in the period following the completion of the annual capacity tenders on July 1st, 2019, a market survey process to quantify the capacity demand level, (EU) No. 459/2017 (CAM NC) and will, depending on the outcome, assess the investment needed to remove current technical restrictions.
8	Also, in the context of the reverse flow plan in Isaccea (7.3), we would like to know whether and	According to (EU) Reg. No. 459/2017 (CAM NC), interested parties can express their

Ctr. No.	OBSERVATIONS AND PROPOSALS	Responses from TRANSGAZ departments
	how the reverse flow could be made at Mediesu Aurit, where, unlike Isaccea, the gas would not transit through other countries (Republic of Moldova) before it can be taken over by the Ukrainian network users.	transport capacity requests at the interconnection points within the process mentioned in the previous point.
9	In the context of the gas supply safety, detailed in Chapter 6 of the TYNDP, we are asking you to specify how the development of the NTS and, implicitly, the natural gas supply at national level will be influenced by the interruption of natural gas transit originating from the Russian Federation through Ukraine, a potential scenario starting from January 1st, 2020. For example, we would like to know: ▪ How would T1 (Isaccea-Negru Voda) pipeline integration into the NTS would evolve, as well as the connections with the T2 and T3 pipelines in the situation where the flow through them will be considerably reduce or even completely reduced? ▪ How would the extension plan of NTS in the North-East towards Suceava / Siret (project 7.9) would change? ▪ In the event of a long-term transit interruption in Ukraine, which are the alternatives to the development of the NTS in order to allow additional gas imports from neighboring countries, sources that could prove to be essential during periods of high consumption.	So far SNTGN Transgaz has not been informed by its partners about the interruption of natural gas transit from the Russian Federation through Ukraine. - T1 is interconnected to NTS and in the absence of flow on T1 it is possible to inject gas from NTS at a lower pressure. T2 and T3 are not interconnected with NTS The plan to expand the NTS in the N-E area towards Siret would be modified to allow the creation of a new interconnection with Ukraine on the Gherăesti-Siret direction by using the infrastructure to be developed in the area, amplifying and building other objectives. NTS development projects included in this Plan, involving interconnections with neighboring countries and operating in a bidirectional manner, thus the current and future interconnections with Hungary (7.1.1 and 7.1.2), Serbia (7.7) and Bulgaria (7.1 .1, 7.1.2, 7.8 and 7.11) may allow additional imports of natural gas.
OMV PETROM		
1	a new section in Chapter 5 - demand, production and underground storage related to forecasted supply and demand, necessary for a better outlook on future NTS developments.	A study is underway in DEPOGAZ Ploiesti on this subject
2	replacing the information on page 26 regarding	Updated in TYNDP 2019-2028.

Ctr. No.	OBSERVATIONS AND PROPOSALS	Responses from TRANSGAZ departments
	the Chart 15 - namely the term Exxon Mobil with the term Neptun Deep, due to the fact that both Exxon Mobil and OMV Petrom are the shareholders of this concession.	
3	the capacity planned to be provided for each phase of each project, ensuring third-party access to the entire transport infrastructure, not restricted as soon as possible by removing existing restrictions.	The information can be found in the project sheets.
7.1.1 BRUA Project		
4	7.1.1 BRUA Project - Stage 1 proposes the alignment of the commissioning dates mentioned in the TYNDP project with those mentioned in the project roadmap presented by INEA so that all stakeholders have a clear perspective on the project.	It was updated in TYNDP 2019-2028 – at BRUA 7.1.1. Project
Project nr 7.3 Interconnection of the national gas transmission system with the international natural gas pipeline		
5	Given that this project is essential for the release of the transmission capacity of the Trans-Balkan system (transit pipelines) that is currently unavailable for all network users and for the elimination of the "equality principle" in capacity allocation, which currently prevents network users from reserving capacity unconditionally in the Negru Voda and Isaccea points in both directions, we propose that Transgaz assess the possibility of finalizing and putting into operation this project as soon as possible (in the previous version of TYNDP, completion was foreseen in 2019, the current version refers to 2020, without other specifications).	Transgaz has made and continues to make substantial efforts to complete this project as soon as possible. The reasons leading to the update of the deadline were some objective reasons (resumption of the tender procedure), independent of Transgaz' will.
Project 7.4 "Development of NTS in the Northeastern Region of Romania..."		
6	Under the current version of the system development plan, the release date of this project is postponed by 2 years, by 2021 (assuming reference is made to the end of the year). Considering that the completion of the Ungheni-Chisinau pipeline is expected for the end of 2019, we would like to understand if and what is the level of capacity that can be offered to market participants before the completion of this project.	Transgaz has made and continues to make substantial efforts to complete this project as soon as possible. The reasons for updating the deadline were some objective reasons (extension and resumption of certain tender procedures), independent of Transgaz' will. The capacity available at the Ungheni interconnection point is published on the Transgaz website under the section *Customer-Transport Services-Physical Output Points of the NTS.*

B. Other Changes to the **National Gas Transmission System Development Plan for the 2019-2028 Period**

a) Despite all efforts made by Transgaz for the implementation of the BRUA Phase I project on time, in the course of project implementation, we have encountered problems which cumulatively affected the full implementation of the project within the undertaken deadline. In particular, the causes that led to delays are due to the unreel of tender procedures, the completion and improvement of the legal framework, the identification of archaeological sites, adverse weather conditions that occurred over long periods of time, the extension of negotiations with some land owners / users, as well as a large number of changes occurred during the execution of the works.
Given these conditions, following the analysis carried out in the first part of June 2019 with the builders, it was found that the recovery of delays and compliance with the deadline of December 31st, 2019 is no longer possible. Although some parts of the project will be completed within the initial deadline, **it is currently estimated that the whole project will be completed by the end of 2020.**

b) Starting with the gas year 2019-2020, following the connection of the Isaccea 1-Negru Voda 1 Natural Gas Transmission Pipeline to the National Gas Transmission System, Negru Voda 1 becomes an interconnection point and the provisions of the same pricing methodology (approved through ANRE Order 41/2019) applicable to both the interconnection points with the EU member countries (Csanádpalota, Giurgiu Ruse) and the internal points of the National Transmission System, will be applied. Connecting the Isaccea 1-Negru Voda 1 (T1) natural gas pipeline to the National Gas Transmission System was a requirement of the European Commission and one of the commitments requested by DG Competition.

Therefore, the main components of the National Gas Transmission System on **31.12.2018** were the following:

Name of the NTS objective / component	M.U.	Value
Main pipelines and gas supply connections, of which international transmission pipelines	km	13.381 370
Measuring control stations (MCS) in service	pcs	1.130 (1.237 measuring directions)
Valve control stations (VCS, NT)	pcs	58
Import gas measuring stations(GMS)	pcs	7
Measuring stations located on international gas pipelines (GMS)	pcs	4
Gas compression stations(GCS)	pcs	3
Cathodic protection stations (CPS)	pcs	1.039
Gas Odor Stations (GOS)	pcs	902

c) Following the Resolution of the BA no 26 of 24 June 2019 the National Gas Transmission System Development Plan for 2019-2028 was supplemented at Chapter 10 with the following paragraph:

"The amounts comprised in the National Gas Transmission System Development Plan for 2019-2028 related to NTS extension and development ensure the possibility to connect to the NTS all of the localities in Romania, in line with the provisions of Law no 123/2012 and of ANRE Order no 82/2017."

The moment the investment decision is made, regardless of its nature and scale, it is of great importance for 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.**

As regards the financing modalities taken into account for the accomplishment of the major projects for the development of the National Gas Transmission System during 2019 – 2028, they consist of:

- Own sources;
- Attracted sources.

The value of Transgaz' Major Projects for the period 2019-2028, with FID and A non FID status, estimated at approx. **€ 1.25 billion**, will be covered **35% by own sources** and **65% by attracted sources.**

SNTGN Transgaz SA is striving, through sustained efforts, to obtain non-reimbursable financial assistance to finance investment projects with an impact on the modernization, upgrading and development of the NTS infrastructure, in order to obtain a financing mix that would provide the lowest cost to the financing of the development program.

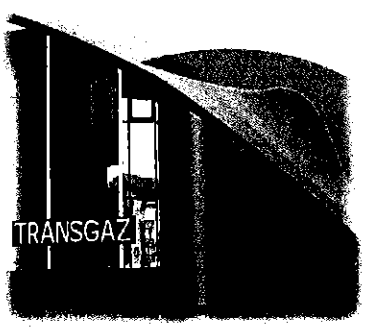
Under Article 15, point (3), paragraph (a) of the Articles of Incorporation, updated on 28.11.2018, we submit for prior approval the draft "National Gas Transmission System Development Plan for 2019-2028" (document attached hereby) supplemented/updated according to the comments from the public consultation, for submission to ANRE for approval.

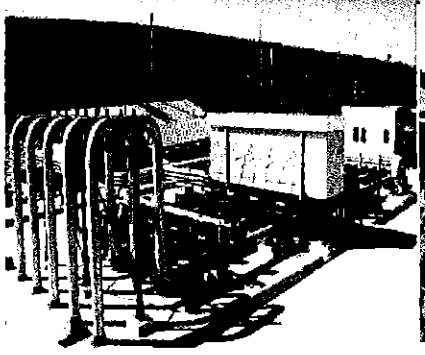
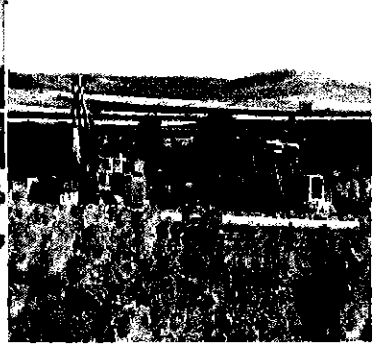
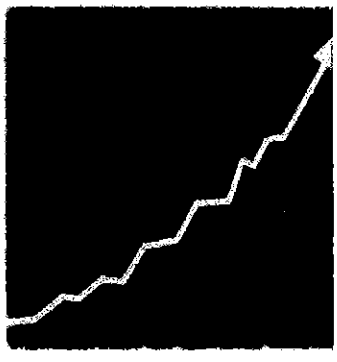
Chairman of the Board of Administration
Lăpușan Remus Gabriel

SNTGN TRANSGAZ SA MEDIAŞ

DEVELOPMENT PLAN FOR THE NATIONAL GAS TRANSMISSION SYSTEM

2019 - 2028



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 2019-2028.**

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 2019-2028, prepared according to **Electricity and Gas Law no. 123/2012,** with the objectives proposed in Romania`s 2019-2030 Energy Strategy with the 2050 outlook, is compliant with the European energy policy for:

- ensuring the connection of third parties to the transmission system, according to specific regulations, within the limits of transmission capacities and compliant with the technological regimes;
- the extension of the pipeline network until December 2021, 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 development strategy and vision at European level, meant to achieve an integrated energy market.

In this context, while preparing The Development Plan for the National Gas Transmission System for 2019–2028, we aimed at coordinating the TYNDP and GRIP with the development plans of the other 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 gas transmission infrastructure.

A sustainable development of the gas transmission infrastructure in Romania involves an ample investment programme that would allow for the NTS to be in line with the transmission and operating demands in line with the European regulations for environmental protection.

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.

Through **the 10-year Development Plan for the National Gas Transmission System,** Transgaz proposes major investments for the strategic and sustainable development of the Romanian gas transmission infrastructure monitoring at the same time its compliance with the requirements of relevant European regulations.

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 2018-2027, approved by ANRE by Decision 1954 / 14.12.2018.

1.1. Update and completion of the 2018-2027 TYNDP

- Updating the estimated schedules of the projects, the values and deadlines for completion of the 2018-2027 TYNDP projects as a result of the completion of pre-feasibility and feasibility studies, of FEEDS or contracts signing;
- The introduction by Transgaz of five new projects:
  - Development/modernisation of gas transmission infrastructure in North-West Romania;
  - Increasing gas transmission capacity of the Romania-bulgaria interconnection in the Giurgiu-Ruse direction;
  - Eastring–Romania;
  - Supervisory, control and data acquisition system for the cathodic protection stations of the National Gas Transmission System;
  - Development of SCADA system for the National Gas Transmission System.

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 former 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 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 13,381 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.

Year	MU	2010	2011	2012	2013	2014	2015	2016	2017	2018
Gas transmitted, including the amounts for underground storage (without international gas transmission)	bcm	14.74	15.48	14.94	13.70	13.08	12.38	12.20	12.97	13.07
Gas transmitted for internal consumption	bcm	12.31	12.82	12.27	11.26	11.88	12.29	12.07	12.87	12.99
Technological consumption	bcm	0.284	0.278	0.239	0.160	0.097	0.088	0.109	0.095	0.081
The share of the technological consumption in the total amount of gas transmitted, including gas for underground storage	%	1.93	1.80	1.60	1.17	0.74	0.71	0.89	0.73	0.62

Table 1 – The share of the technological consumption in the total amount of transmitted gas, including gas for underground storage in the period 2010-2017

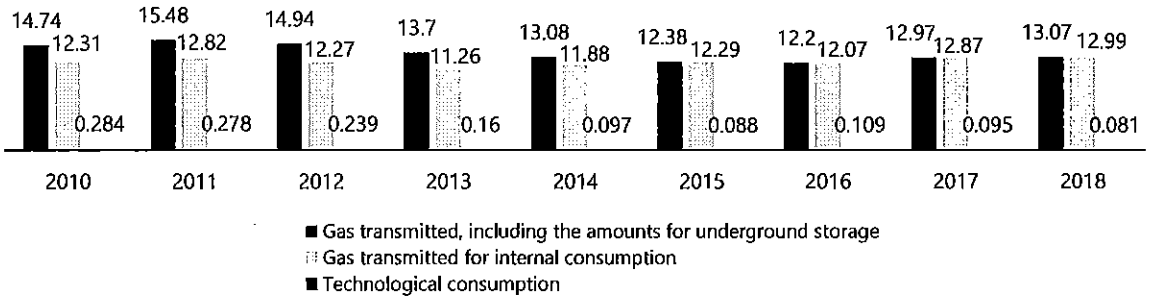


Chart 1 2010 – 2018 transmitted gas including underground storage and technological consumption gas

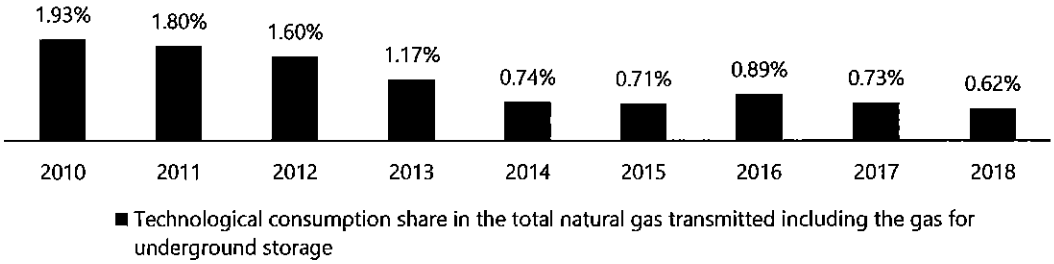


Chart 2 –The share of the technological consumption in the total transmitted gas including those meant for underground storage in the period 2010-2018

Forecasts of the transmitted gas quantities *including the ones meant for underground storage* ***and of the technological consumption for the period 2019–2028:***

Year	mu	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
The transmitted natural gas including gas for underground storage (without international gas transmission)	bcm	13.205	13.337	13.471	13.605	20.775	20.775	20.775	20.775	20.775	20.775
Transmitted gas	bcm	13.123	13.254	13.387	13.521	20.691	20.691	20.691	20.691	20.691	20.691
Technological consumption	bcm	0.082	0.083	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084
Technological consumption share in the total circulated gas.	%	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62

Table 2- Forecasts of the transmitted gas quantities including underground storage gas (without international gas transmission) and technological consumption gas for the period 2019–2028

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

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.

At present, 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 the Russian Federation to Bulgaria, Turkey, Greece and Macedonia.

On the above mentioned route, North of Isaccea, there are 3 interconnections with the similar international gas transmission system of Ukraine, undercrossing the Danube with 5 pipelines and south of the Negru Voda locality there are 3 interconnections with the similar international gas transmission system from Bulgaria.

The international gas transmission activity is carried out through the following pipelines:

- One gas transmission pipeline in the UA-RO-BG direction (T1) with the following characteristics: DN 1000, L = 183.5 km and technical capacity = 6.1 billion Scm /year, for which in December 2018 Transgaz completed the gas transmission pipeline Isaccea 1–Negru Voda 1 / National Gas Transmission System physical connection works;
- 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 = 9.6 billion Scm/year (T2) and DN 1200, L = 183.5 km and 9.7 billion Scm/year (T3), which are not connected to the National Transmission System.

Starting from the gas year 2016-2017 the transmission capacity of the T1 pipeline is traded by auctions, according to the European code on capacity allocation mechanisms in the cross border interconnection points and to ANRE Order no 34/2016.

The gas transmission pipeline Isaccea 1–Negru Voda 1 (T1) / National Gas Transmission System connection was a requirement of the European Commission and one of the commitments requested by DG Competition.

Starting with gas year 2019-2020, following the gas transmission pipeline Isaccea 1–Negru Voda 1 / National Gas Transmission System connection, Negru Voda 1 becomes an 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.

As for the transmission through the pipelines T2 and T3 it 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' competence. However, the company aims to solve these issues and to comply with the provisions of the European regulatory framework.

At the end of 2018 the T1-DN1000 / NTS interconnection was completed enabling physical flow of gas from the international transmission pipeline to the NTS (and not vice versa).

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.

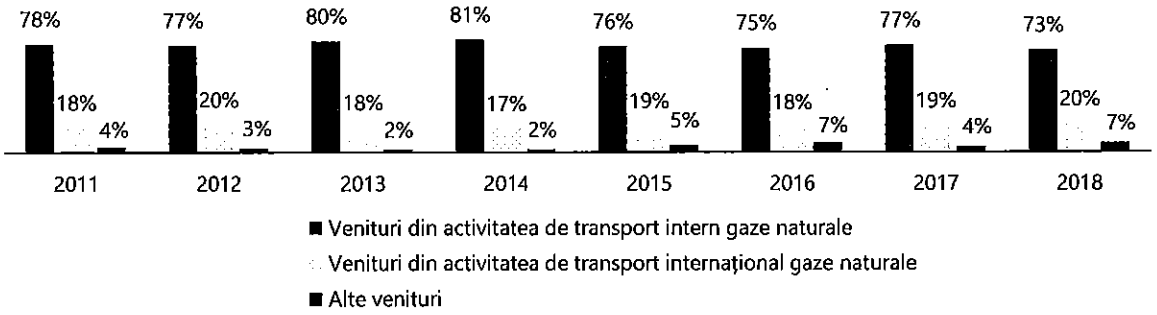


Chart 3- The structure of the operating revenues

The quality of the transmission services represents a constant preoccupation both for Transgaz and for ANRE.

For the purpose of monitoring the gas transmission services, based on specific indicators and minimal performance levels, starting with 1 October 2016, the **Performance Standard**

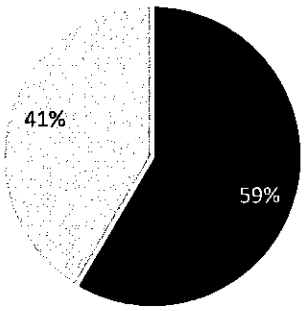
for the gas transmission services entered into force, **approved by ANRE Order 161/26.11.2015.**

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.

	Number of shares	Percentage
The Romanian state represented by the Ministry of Economy	6,888,840	58,51%
Free-float - Other shareholders (natural and legal persons)	4,885,004	41,49%
Total	**11,773,844**	**100.0000%**

Table 3 –Transgaz Shareholding



■ The Romanian State represented by the Ministry of Economy

▫ Free float - Other shareholders (natural and legal persons)

Chart 4 – The current Transgaz shareholding structure

The National Gas Transmission Company TRANSGAZ SA Mediaş, by an efficient use of the management instruments and the responsible actions undertaken in front of the shareholders, investors and business environment and community succeeded **ranking 6th in the top 10 trading on the Bucharest Stock Exchange for the entire year 2017**. In December 2018 Transgaz **ranked 7th in top 15 by market capitalization**.

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.

The National gas transmission company 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;
- VTP Operation 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;
- Transgaz Representative Office – Chișinău, the Republic of Moldova;
- EU Funds and International Relations Division: 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., of.506, Chisinau, the Republic of Moldova;
- Secondary office of Transgaz: Mediaș, 3 I.C. Brătianu, building 3, flat 75,. Sibiu County.

3. DESCRIPTION OF THE NATIONAL GAS TRANSMISSION SYSTEM

The first pipeline of the National Gas Transmission System was commissioned in 1914.

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, OMV-Petrom, 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 40 bar, except for the international transmission pipelines (up to 49 bar for the T1-DN1000 pipeline, and 54 bar for T2, T3-DN1200) 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 31.12.2016 are:

NTS facility/component	MU	Value
Main transmission pipelines and connections for gas supply, of which pipelines for international gas transmission	km	13,381 370
Operating gas regulating - metering stations (MRS)	pcs	1,130 (1,237 metering directions)
Valve control stations (VCS, TN)	pcs	58
Import gas metering stations (GMS)	pcs	7
Gas metering stations located on the on the international gas transmission pipelines (GMS)	pcs	4
Gas compressor stations (GCS)	pcs	3
Cathodic protection stations (CPS)	pcs	1,039
Gas odorisation stations (GOS)	pcs	902

The technical analysis of the National Transmission System on 31.12.2018

From the perspective of the service life, the main objectives of the NTS are summarized below:

Service life	Pipelines (km)	Connections (km)	No. of MRSs	No. of GMSs on tranzit pipelines	No. of import GMS	No. of CPS	No. of VCSs (VCS-TN)	No. of gas compressor stations (GCS)
>40 years	6,628	338	144	2		70	14	1
30<D≤40	1,768	161	65			26	2	1
20<D≤30	818	273	191	2	2	36	1	
10<D≤20	1,590	850	570	2		431	12	
5<D≤10	522	143	212		1	425	5	
≤ 5 years	260	29	55		2	51	24	1
TOTAL	**11,586**	**1,795**	**1,237**	**6**	**5**	**1,039**	**58**	**3**

It is noted that regarding transmission pipelines and supply connections, **74.63%** have a 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.

In order to be able to operate the NTS, which is state-owned, Transgaz pays a royalty fee every trimester, representing 10% of the income from gas domestic and international transmission.

The total technical capacity of the NTS entry/exit points on 31.12.2018 is 147,749 thousand cm/day (53.93 bcm/y) at the entry and 237,139 thousand cm/day (86.56 bcm/y) at the exit.

The total technical capacity of the interconnection points located on the international gas transmission pipelines is approximately 70,000 thousand cm/day (25.55 bcm/a) 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 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 compression capacity is ensured by 3 gas compressor stations (Şinca, Oneşti and Siliștea), located on the main transmission routes, which have an installed power of approximately 28.94 MW, with a maximum compressor capacity of 650,000 Nmc/h namely 15,600,000 Nmc/day..

On 31.12.2018 the NTS is equipped with **1,039 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 **1,130 regulating and metering stations** (1,237 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 2013-2018:

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
Gas year	2016-2017	11	58	2	174
	2017-2018	0	5	7	138

For compliance with Order 115/2018 on the approval of the methodology for the calculation of the gas transmission system technological consumption, SNTGN Transgaz SA launched the procedure for the procurement of technical assessment services for the National Gas Transmission System for the estimation of the non-localised technological consumption, generated by the wear and tear of natural gas transmission pipelines.

The aim of the assessment is the establishing of the percent of the transmitted gas quantity allocated to the non-localised technological consumption, generated by the wear and tear of natural gas transmission pipelines and leaks of the dismountable joints.

Another aim of the abovementioned assessment is obtaining relevant information enabling a better correlation between the achievements of the maintenance plans and the evolution of technological consumption in time.

Cross-border interconnection pipelines

At present, the gas imports/exports to/from Romania are ensured through 5 cross-border interconnection pipelines:

Interconnection with **UKRAINE**

1. **Orlovka (UA) – Isaccea (RO)** interconnection pipeline with the following characteristics: DN = 1,000 mm, capacity = 8.6 bcm/year and P_{max} = 55 bar;
2. **Tekovo (UA) – Medieşu Aurit (RO)** interconnection pipeline with the following characteristics: DN = 700 mm, capacity = 4.0 bcm/year and P_{max} = 70 bar

Interconnection with **HUNGARY**

3. **Szeged (HU) – Arad (RO)- Csanadpalota** interconnection pipeline with the following characteristics: DN = 700 mm, capacity = 1.75 bcm/year, P_{max} = 63 bar

Interconnection with **the REPUBLIC OF MOLDOVA**:

4. **Ungheni (MO) – Iași (RO)** interconnection pipeline with the following characteristics: DN 500, capacity = 1.5 bcm/a and P_{max} = 50 bar.

Interconnection with **BULGARIA**:

5. **Ruse (BG) – Giurgiu (RO)** interconnection pipeline with the following characteristics: DN 500, capacity = 1,5 bcm/a and P_{max} = 40 bar

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.

The current structure of the Romanian gas market [1] includes:

- 1 operator of the National Transmission System – SNTGN TRANSGAZ SA MEDIAȘ;

[1] *The 2013-2017 Plan of Administration of 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, Mazarine Energy România SRL, Serinus Energy România;
- 2 underground storage facilities operators: SNGN Romgaz - the Underground Gas Storage Facility Depogaz Ploiesti, SC Depomureș Târgu Mureș;
- 36 gas supply and distribution companies– the largest being Distrigaz Sud Retele Srl and SC Delgaz Grid;
- 151 licences gas suppliers 138 of which operating on the gas market.

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.

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

THE REPUBLIC OF BULGARIA

Transmission operator	**Bulgartransgaz**
Transmission system length	2,765 km
Compressor stations power	Transmission: 274 MW Storage: 10MW
Interconnections	Negru Vodă I, II și III – Transgaz RO Kulata/Sidirokastron – DESFA GR Strandja/Malkoclar – BOTAS TR Kyustendil/Zidilovo – GA-MA MK Ruse/Giurgiu - Transgaz RO
Storage	Chiren – Bulgartransgaz Total capacity 550 mil.cm
Gas consumption (bcm) (2017)	3.313
Gas Import (bcm) (2017)	3.256
Domestic production (bcm) (2017)	0.079
Future projects	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) 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

Transmission operator	**SRBIJAGAS and YUGOROSGAZ**
Transmission system length	2,265 km
Compressor stations power	4 MW
Interconnections	SRBIJAGAS Kiskundorozsma – FGSZ HU Zvornik – BH-gas-BA Pojate – YUGOROSGAZ YUGOROSGAZ Pojate – SRBUAGAS RS
Storage	Banatski Dvor SRBIJAGAS Total capacity 450 mil. cm
Gas consumption (bcm) (2017)	2.718
Gas Import (bcm) (2017)	2.01
Domestic production (bcm) (2017)	0.509
Future Projects	Interconnection with Romania in the direction of Mokrin - Arad; Interconnections with Bosnia and Herzegovina on the Novo Selo-Bijeljina direction; Interconnection with Bulgaria on the Nis-Dimitrovgrad direction; Achievement of the Banatski Dvor storage (capacity between 450 million m^3 and 750 million m^3 with a maximum capacity of up to 10 m^3 per day); Achievement of the Itebej storage (capacity between 800 million and 1 billion cubic meters of gas).

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

HUNGARY

Transmission operator	FGSZ
Transmission system length	5,873 km
Compressor stations power	240 MW
Interconnections	Beregdaroc – Ukrtransgas (UA) Mosonmagyarovar – OMV Gas (AT) Kiskundarozsma – Srbijagas (RS) Csanadpalota – Transgaz (RO) Dravaszerdahely – Plincro (HR) Balassagyarmat - Eustream Slovacia (SK) Vecses 4/MGT
Storage	Zsana Magyar Foldgaztarolo Hajuszoboszlo Magyar Foldgaztarolo Pusztaederics Magyar Foldgaztarolo Kardosku Magyar Foldgaztarolo Szoreg -1 MMBF Foldgaztarolo Total capacity bmc
Gas consumption (bcm) (2017)	10.39
Gas Import (bcm) (2017)	13.37
Domestic production (bcm) (2017)	1.812
Future Projects	Reverse flow Romania – Hungary, the Hungarian section, phase 1 Interconnection Slovenia – Hungary Hungarian section of the Tesla project Reverse flow HU – UA Eastring – Hungary Construction of a pipeline Varosfold – Ercsi – Gyor Construction of a pipeline Ercsi – Szazhalombatta Construction of another compressor station at Varosfold Reverse flow Romania – Hungary , Hungarian section, phase 2 The transmission corridor BG-RO-HU-AT Construction of another compressor station at Hajduszoboszlo Construction of a transit pipeline Vecses – Varosfold

	Development of Hungarian section of the Tesla project

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 – Polonia/UA Budince- Slovacia/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

Transmission operator	Moldovagaz and Vestomodtransgaz
Transmission system length	~ 1,600 km
Compressor stations power	Moldovatransgaz 3 compressor stations (75.5 mW) + a gas metering station (with a capacity of 80.0 ml./24h) Vestmoldtransgaz 1 gas metering station
Interconnections	Moldovatransgaz Ungheni (IUC) RO-MD GSM Alexeevca (ACB) UA-MD GSM Grebeniki (ATI) UA-MD GSM Grebeniki (RI, SDKRI) UA-MD GSM intermediare Ananiev/Orlovca (ACB) UA-MD GPMS Limanscoe (TO 3) UA-MD Căuşeni (ATI) MD-UA Căuşeni (RI, SDKRI) MD-UA Vestmoldtransgaz
Gas consumption (bcm) (2017)	2.52
Gas Import (bcm) (2017)	2.52
Domestic production (bcm) (2017)	0.011
Future Projects	Extension of the Iași–Ungheni–Chișinău interconnector (Phase II). The construction of the gas transmission network DN 500 Ungheni-Balti section, connected to the gas transmission network in the North of the Republic Ananiev-Cernăuți- Bogorodiceni.

	Construction of a gas compressor station located in the county of Ungheni.

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 the gas transmission capacities between the Eastern and Western parts of the country, but is also planning to implement a North-South corridor which would link Slovakia and Croatia.
- **Serbia** will benefit from the interconnection with Bosnia, Herzegovina, 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 2008 – 2018 gas consumption

The total gas consumption on the Romanian market in 2008-2018, expressed in GWh is as follows:

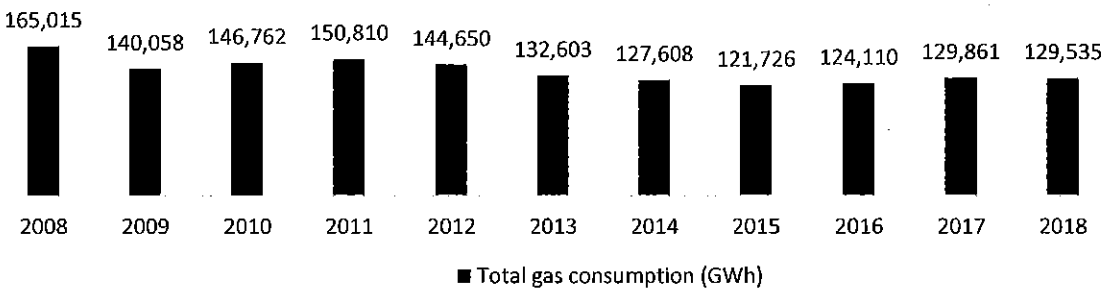


Chart 5 - The total gas consumption on the Romanian market in the period 2008-2018 (GWh)
Source: ANRE annual reports

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 2008 – 2018 is represented in the following chart:

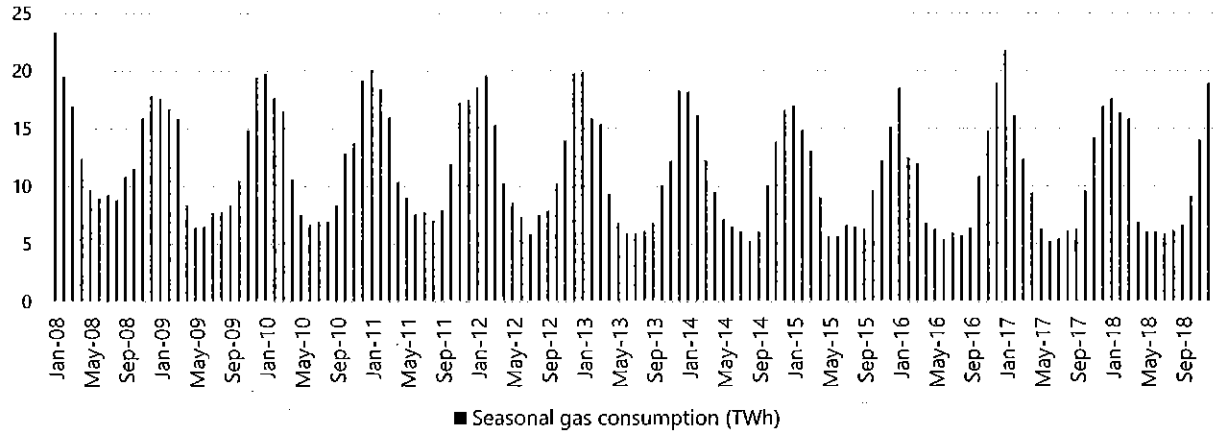


Chart 6 – Seasonal gas consumption in 2008 -2018
Source: ANRE reports

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**
2008	797.7	5 January	10,859.8	2-15 January
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	698.1	26 February	9.061,0	20 February – 5 March

Table 4– PEAK and maximum consumption 14 days

5.1.3 Gas consumption forecasts 2019-2030

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

1. *Forecast of the electricity mix*

Romania's electricity mix, according to the Romania's draft Energy Strategy for 2019-2030 with the 2050 outlook, is and will remain balanced and diversified:

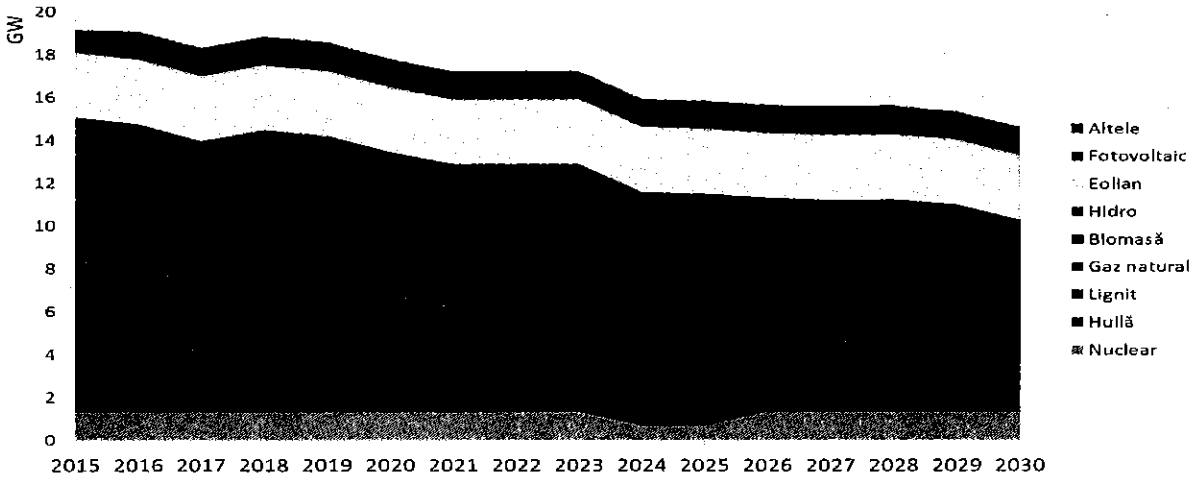


Chart 7–Evolution of the available electricity production capacity without investments in new capacities

Source: Romania's Energy strategy 2019 – 2030 with the 2050 outlook

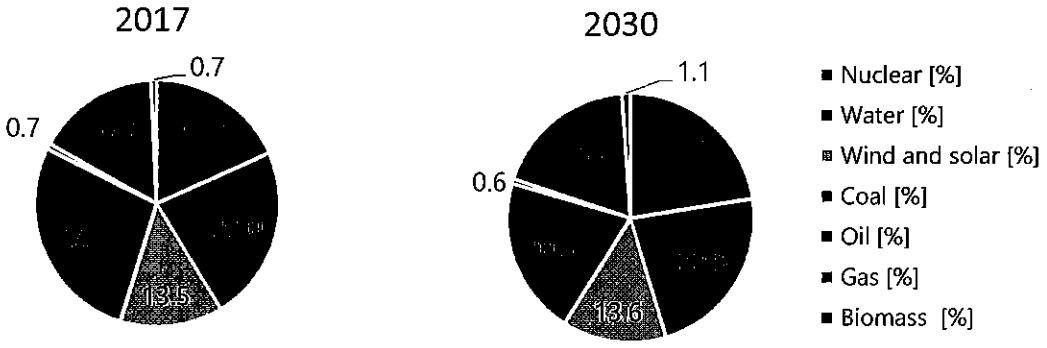


Chart 8 – The structure of the primary energy mix in 2017 and 2030

Source: Romania's Energy Strategy 2019 – 2030 with the 2050 outlook

In 2017, the share of primary resources in the power production has the following structure: power from coal lignite and coal) 27.5% (17.3 TWh); power produced in 23% hydro power plants (14.4TWh); power produced in the Cernavoda nuclear power plant 18.3% (11.5 TWh); power produced from hydrocarbons (oil and gas) 16.3% (10.7TWh); power produced by wind and solar installations 13.5% (8.5TWh), power from biomass 0.7% (0.4 TWh).

For 2030, the results of the modelling in the Best Case Scenario show a 2.5% increase in the share of hydrocarbons in power production, from 16.3% in 2017 to 18.8% in 2030. Natural gas has an important share of the domestic primary energy consumption because of the relatively high availability of indigenous resources, the low impact on the environment and the ability to balance the electricity produced by intermittent renewable sources (wind and photovoltaic), given the flexibility of gas generating plants.

2. *Energy demand forecast per energy sectors*

Romania's gross energy consumption decreased significantly recently, reaching 377 TWh in 2015 with the final consumption of 254 TWh.

The modelling results from Romania's 2019-2030 Energy Strategy with the 2050 outlook estimate the 2030 gross energy consumption to 394 TWh (increase by 4% as compared to 2015). Consumption of energy resources as raw material will decrease by 35%, while consumption and loss in the energy sector will decrease by 4 TWh.

The sectoral structure of the final energy demand in 2017 and 2030 is presented in Chart 11. A slight **decrease of the household consumption as an effect of the energy efficiency increase,** as well as the **increase in gas consumption in transmission and industry** due to the low impact of gas upon the environment.

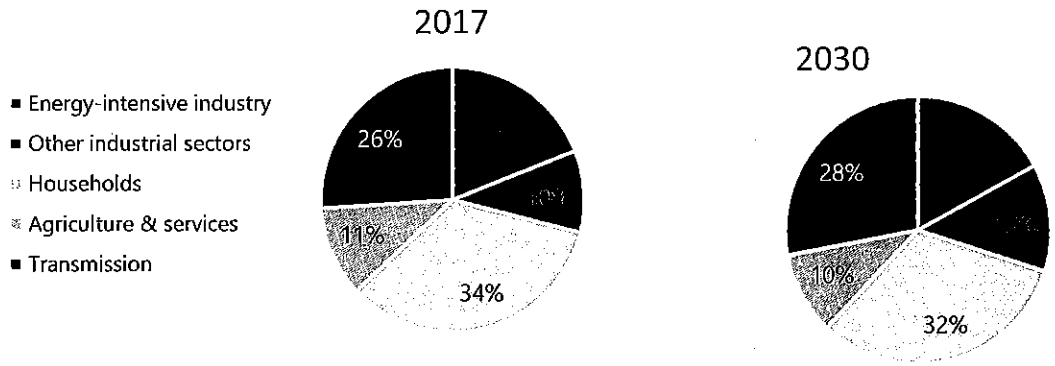


Chart 9 –Final energy demand per activity sectors in 2017 and 2030
Source: Romania's Energy Strategy 2019 – 2030 with the 2050 outlook

3. *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:

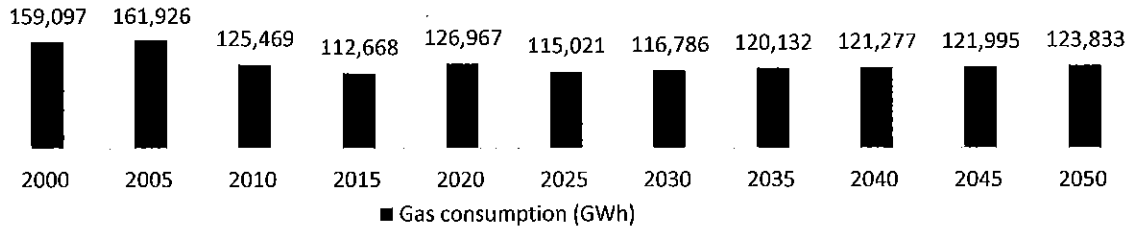


Chart 10 –Gas consumption in 2000 -2050 according to the reference scenario of the European Commission
Source: Reference scenario of the European Commission

Following these 3 considerations taken into account in the forecast of domestic consumption of natural gas in the period 2020 - 2035, we estimate:

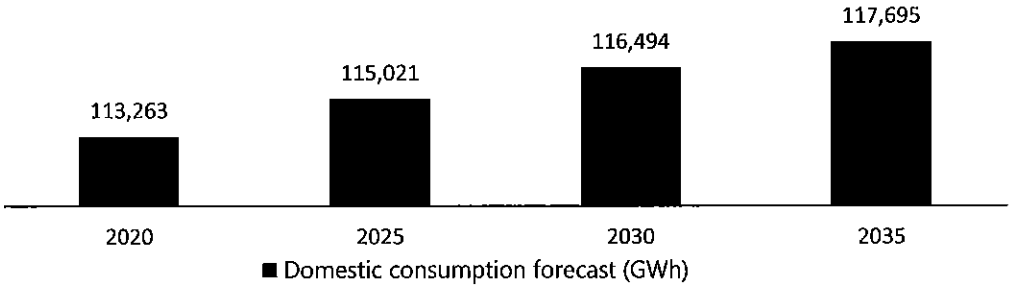


Chart 11 – The domestic gas consumption forecast during 2020 – 2035
Source: Internal analysis

5.2. Gas production

5.2.1 History of the gas production during 2008– 2018

The domestic gas production (bcm) in 2008 –2018 by the main producers was as follows:

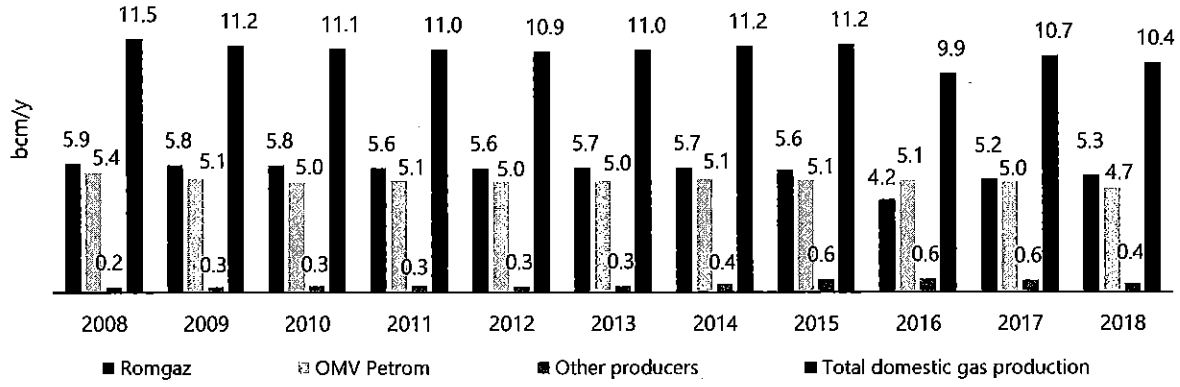


Chart 12 – The domestic gas production depending on the main producers in the period 2008–2018 (bcm/y)
Source: Internal – Dispatching Centre

The gas supply sources in 2008 – 2018 were as follows:

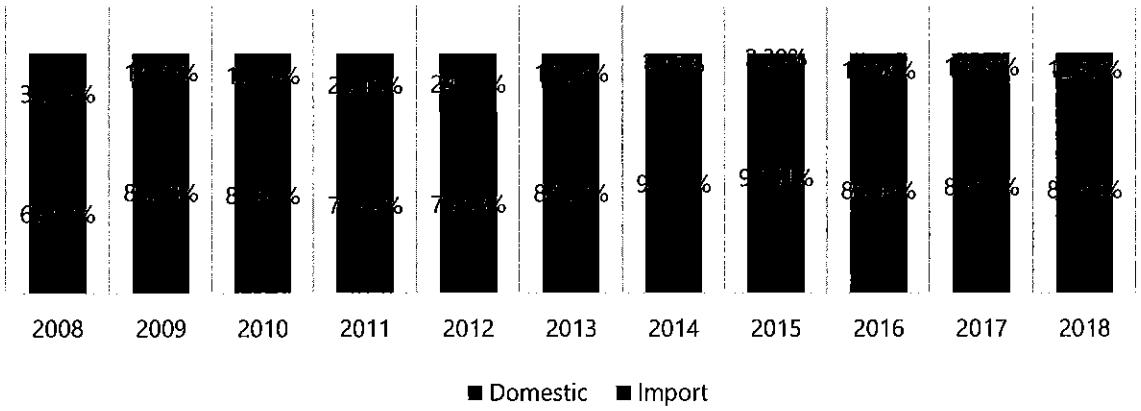


Chart 13- The gas supply sources in the period 2008 – 2018
Source: Annual ANRE reports for 2008 – 2015 and domestic sources in 2017 and 2018

Relatively steady domestic production and declining consumption have reduced the annual share of gas imports from 15% in 2013 to 7.5% in 2014 and to only 2.5% in 2015. In 2016, on the background of declining oil prices, imports under long-term contracts reached prices equal to or lower than those for domestic production. 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 2019 – 2030

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

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

According to Romania's 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 -2050 is as follows:

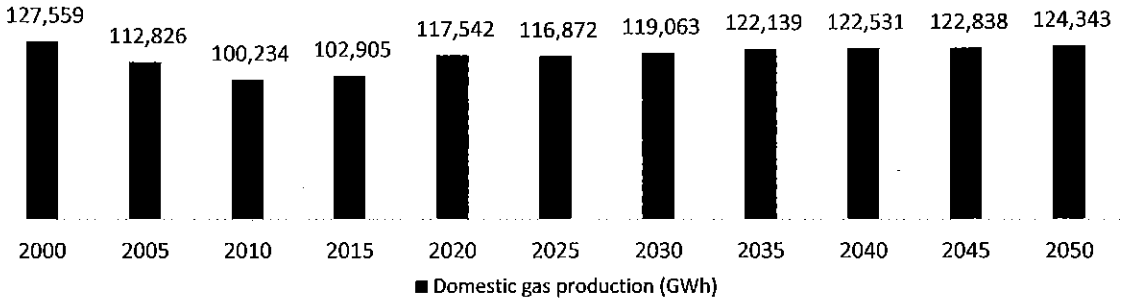


Chart 14 –2000 – 2050 gas production forecast according to the reference scenario of the European Commission

3. *Forecasts of the main gas producers for 2020-2030*

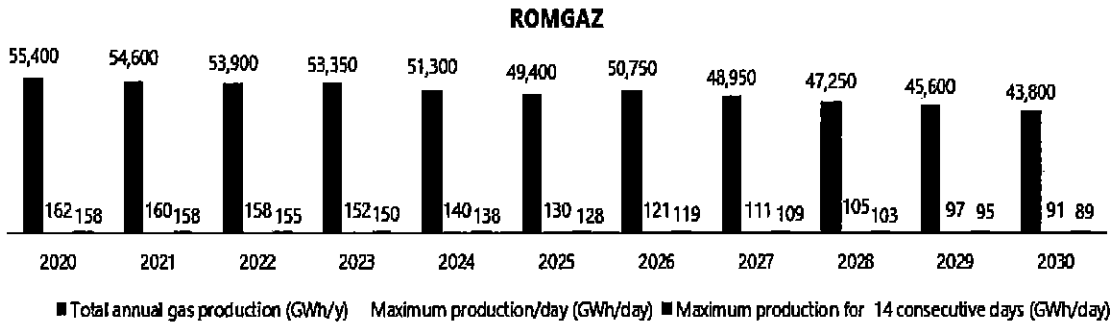


Chart 15– ROMGAZ gas production forecast for 2020–2030

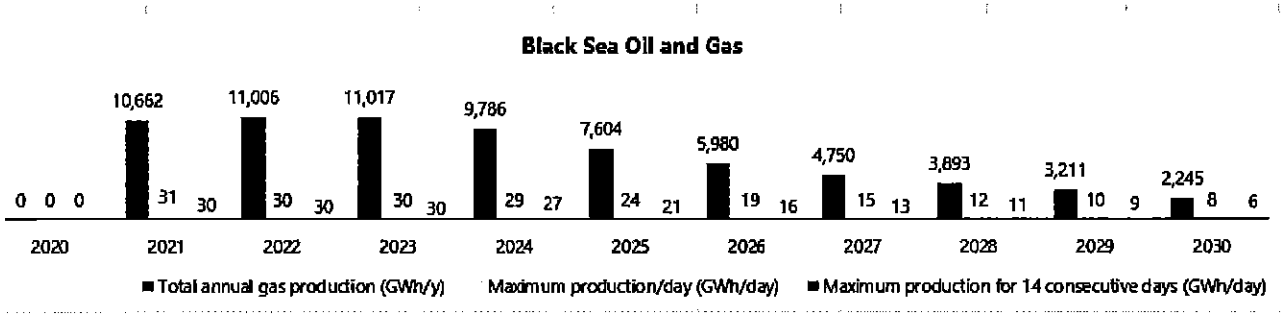


Chart 16– Black Sea Oil and Gas gas production forecast for 2020–2030

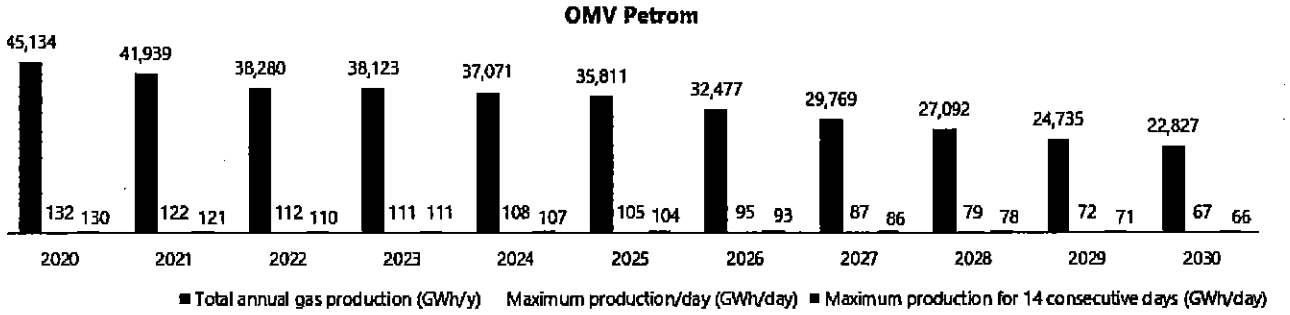


Chart 17–OMV Petrom gas production forecast for 2020–2030

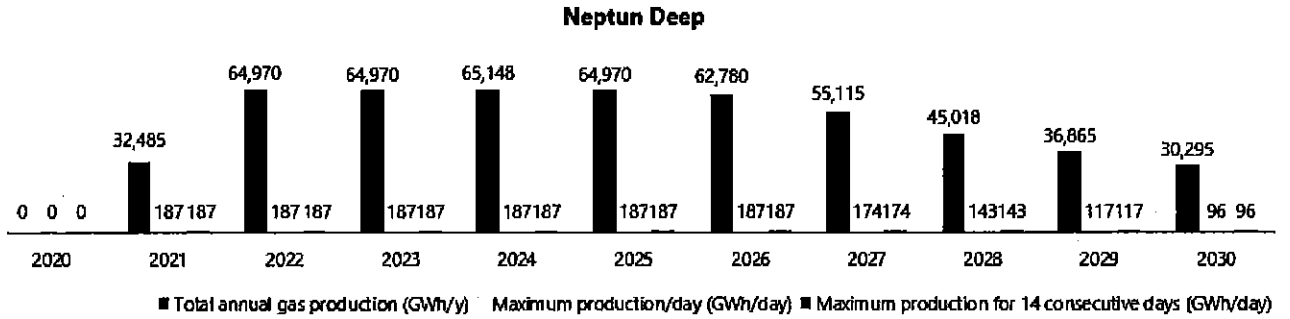


Chart 18 – Exxon Mobil gas production forecast for 2020–2030

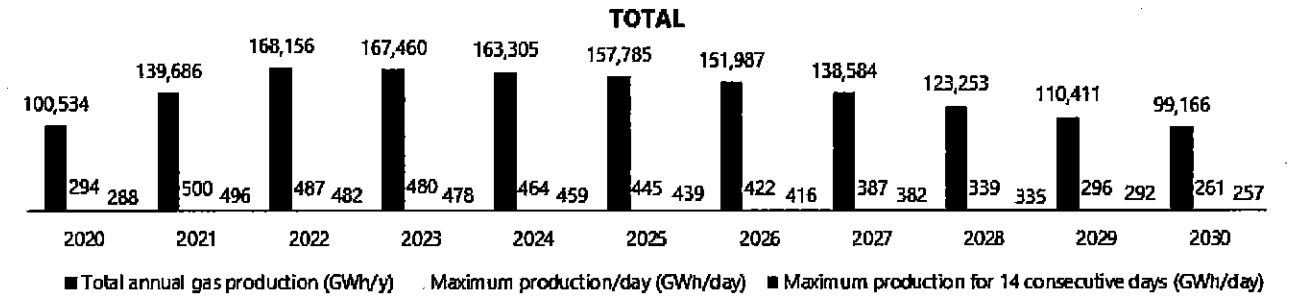


Chart 19 – Gas production forecast for 2000–2030 according to the gas producers
Source: ROMGAZ, Black Sea Oil and Gas, OMV Petrom, Exxon Mobil

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).

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 especially to protected clients in case of adverse weather conditions or of gas supply interruption.

A new European regulation on the security of gas supply was introduced in 2017 contributing to meeting several objectives:

- The achievement by ENTSOG of a simulation at EU level for the situations of gas supply interruptions or system failure in order to identify the main risks at EU level related to gas supply;
- Cooperation between Member States within the regional groups with the purpose to evaluate common risks related to gas supply and to prepare and agree on the joint preventive and response measures;
- Introduction of the solidarity principle according to which Member States have to assist each other so as to guarantee uninterruptible gas supply to vulnerable customers even during the most severe crisis situations;
- Improving transparency: gas companies have to notify officially the national authority on long term contracts which may be relevant for safety of supply;
- Setting a framework according to which the decision on the permanent bidirectional gas flow takes into account the opinions of all EU countries to which such project conveys a benefit.

Underground gas storage is a regulated activity and can be carried out only by operators licensed by ANRE for this purpose. Tariffs for underground storage are regulated tariffs approved by ANRE.

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 347.5500 GWh/day.

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

As of 1 April 2018 based on EC Directive 73/2009 taken over in Energy and Gas Law 123/2012 at Art. 141, the storage activity was separated from SNGN Romgaz SA and is

performed by a storage operator, the Gas Storage Subsidiary DEPOGAZ Ploieşti SRL, to which SNGN Romgaz is a sole associate.

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

- Depogaz, 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

To ensure security of supply, the current national laws regulate the minimum stock of natural gas to be set by each supplier and each segment of the market.

In terms of capacity booking history, the situation in 2009-2018 is described in the chart below:

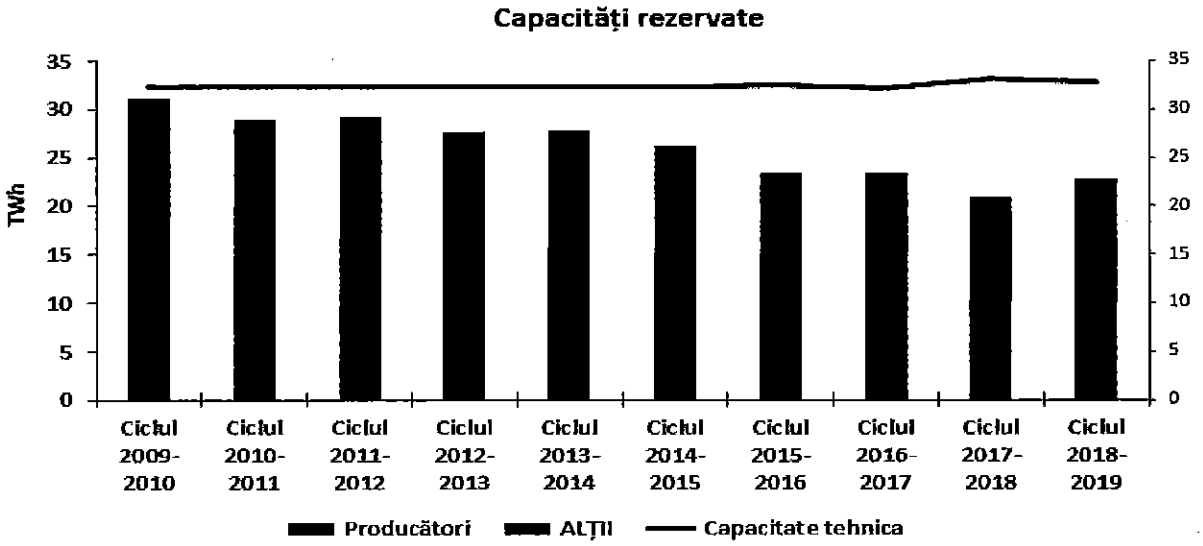


Chart 20 – Capacities booked in 2008-2018

Source: information from SNGN ROMGAZ SA internal sources

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.

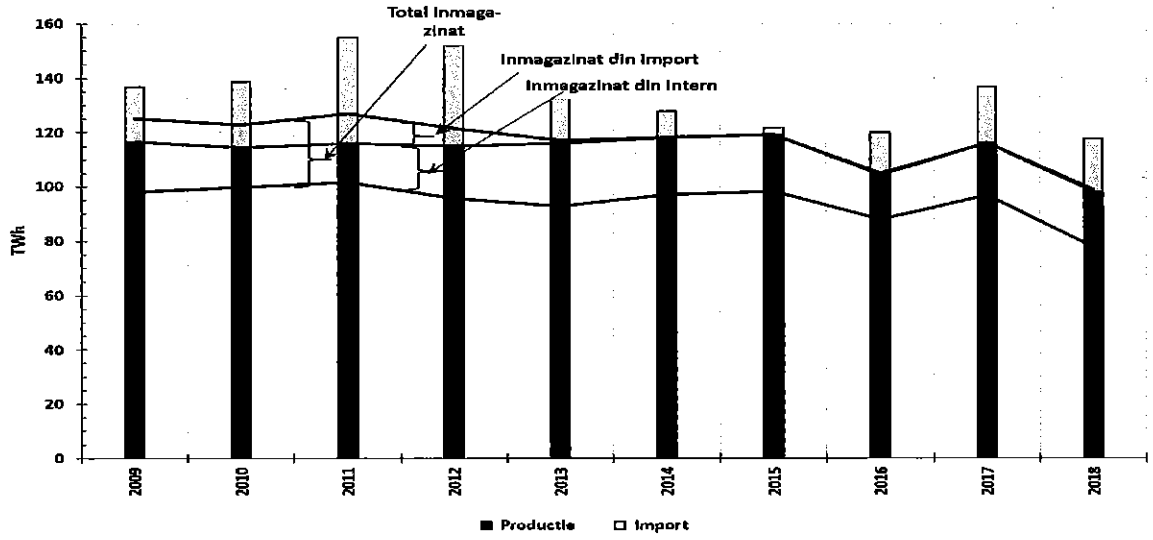


Chart 21 – Storage capacity between 2009-2018

5.3.2 Forecasts for underground gas storage 2019 – 2030

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 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, storage investment projects are promoted by SNGN Romgaz S.A.

The Gas Storage Subsidiary DEPOGAZ Ploiești SRL for the period 2019-2028 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 the promotion of the projects as projects of common interest;
- Assessment of the possibilities of transformation of a storage facility into a storage facility with an alternative injection/withdrawal operation;

6. SECURITY OF GAS SUPPLY

In 2017 a new European regulation was introduced concerning measures to safeguard the security of gas supply Regulation (EU) 2017/1938 dated 25 October 2017 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[2] 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:

[2] 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.

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

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.

The result of the N-1 formula calculated for Romania in 2018 is as follows:

$$N-1[\%]=\frac{42{,}4+27{,}0+29{,}5+0-23{,}6}{72}\times 100$$

$$N-1[\%]=104{,}6\%$$

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

Explanations regarding the used values

a) Terms regarding demand:

Terms regarding demand [mil. cm/day]		**Explanations**
D_{max}	72.0	On gas day 09.01.2017 there was a peak winter consumption of 69.58 million Sm^3/day, lower than the historical one in the last 20 years.

b) Terms regarding offer (capacity):

Terms regarding offer [mil. cm/day]		**Explanations**
EP_m	**42.4**	The total capacity of import points (Isaccea, Mediesu Aurit, Csanadpalota, Ruse-Giurgiu).
P_m	**27.0**	Domestic gas production entered into the NTS (without extraction from storage).
S_m	**29.5**	The sum of the maximum flows extracted from each storage facility.
LNG_m	**0**	There are no LNG terminals.
I_m	**23.6**	The capacity of the Isaccea Import point.

For P_m it was considered the production potential and not the technical capacity (70.6 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 duet o 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 (2014-2018), namely:

Storage facility	Technological capacity (mil Scm/day)	Maximum flow (mil S m³/day)
Urziceni	4.6	4.5
Bălăceanca	1.3	1.1
Butimanu	16.8	13.5
Sărmașel	7.0	6.0
Târgu Mureș	3.4	3.0
Ghercești	1.5	1.4
Total	**34.6**	**29.5**
Maximum daily flow withdrawn simultaneously from all the storage facilities	*25.8*	

At EP_m value determination, the Isaccea Import, Medieșu Aurit, Csanadpalota and Giurgiu-Ruse entry points were considered as follows:

Entry point	Entry point capacity [mil. Scm/day]
Isaccea Import entry point	23.6
Medieșu Aurit Import entry point	11.0
Csanadpalota entry point	4.8
Ruse –Giurgiu entry point	3.0
Total	**42.4**

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) 2017/1938 of 25 October 2017.

Forecast of the value of the N-1 formula for 10 years for the Russian gas supply interruptions

Year	N-1
2018	104.6
2019	102.5
2020	102.5
2021	127.6
2022	127.1
2023	123.2
2024	121.4
2025	131.5
2026	116.5
2027	112.5
2028	106.9

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.

The Romanian gas transmission system consists mainly of the following transmission corridors (Figure 16 of Annex).

Southern Corridor 1– East-West

At present, the pipelines related to this interconnection corridor ensure:

- gas import through the Csanadpalota interconnection point with Hungary, at a capacity of 1.75 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 compressor stations in certain locations (Podisor, Bibesti, Jupa).

Central Corridor 2 East-West

The pipelines related to this interconnection corridor are currently ensuring:

- gas import through the Csanadpalota interconnection point with Hungary, at a capacity of 1.75 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 Ardeal;
- 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 are currently ensuring:

- 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 Ardeal;
- 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 are currently ensuring:

- gas supply for the consumption of the Western-Oradea area.
- interconnection of the 1, 2 and 3 corridors (see Figure 16).

Interconnection 5 South-East

The pipelines related to this interconnection corridor are currently ensuring:

- transmission of imported gas from the Isaccea interconnection point with Ukraine to the Bucharest consumption area and the related underground storage facilities (Bilciureşti, Urziceni, Bălăceanca);
- gas supply for the consumption of the South-Eastern area.
- interconnection of the 1, 2, 3 and 6 corridors (see Figure 16).

Eastern Corridor 6

At present, 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 Isaccea I+II+III interconnection point, towards Bulgaria, Greece and Turkey, through the Negru Vodă I+II+III interconnection point.

The development of this gas transmission corridor aims at ensuring physical interconnection with the Romanian gas transmission system and bidirectional flows at the Isaccea and Negru Vodă cross-border interconnection points by upgrading the das metering stations GMS Isaccea I and GMS Negru Voda I.

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.

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).

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 needs 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).

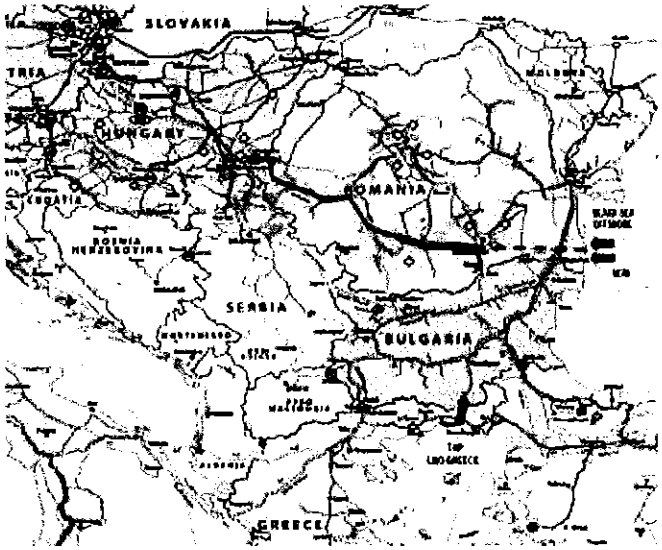


Figure 1– The interconnection points of the Romanian gas transmission system with the similar Bulgarian and Hungarian systems

The NTS entry-exit points Giurgiu and Nădlac are linked through a system of pipelines with a long service life, with diameters of maximum 24" and design pressures of maximum 40 bar. The existing gas transmission capacities do 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", concerns **developments of the gas transmission system capacities** between the interconnections between the Romanian gas transmission system and the similar systems of Bulgaria and Hungary consisting in construction a new transmission pipeline to connect the Podișor Technological Node to the Horia GMS.

This project imposed itself as a necessity in the second half of 2013 based on the following:

- the deselecting of the Nabucco project as the route preferred for Caspian gas transmission to the Central European markets;
- ensuring adequate gas transmission capacities at the cross-border interconnection points between Romania and Bulgaria and between Romania and Hungary for increasing the degree of interconnectivity at the European level;

- ensuring gas transmission capacities for the use of Black Sea gas on the Central European markets.

The project was included in the updated list of projects of common interest published in November 2017 as an Annex to Regulation 347/2013.

Thus, the updated Union List of Projects of Common Interest (List 3/2017) includes the BRUA Project, with both of its phases, in section 6.24.1-2 and section 6.24.4-4 within `Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor (currently known as "ROHUAT/BRUA") to enable 1.75 bcm/a in the 1stphase, 4.4 bcm/a in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase.`

The BRUA Project implmentation stages according to List 3 of PCIs/2017 are as follows:

- Development of the transmission capacity in Romania from Podișor to Recas, including, a new pipeline, metering station andthree new compressor stations in Podisor, Bibesti and Jupa – BRUA Phase I - 6.24.1-2 in List 3 PCI/2017- BRUA Phase 1;
- Expansion of the transmission capacity in Romania from Recas to Horia towards Hungary up to 4.4 bcm/a and expansion of the compressor stations in Podisor, Bibesti and Jupa - BRUA Phase II - 6.24.4-4 in List 3 PCI/2017- 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 2018 ENTSOG TYNDP identified with the code TRA–F–358 (Phase I), and TRA-N-1322 (Phase II).

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

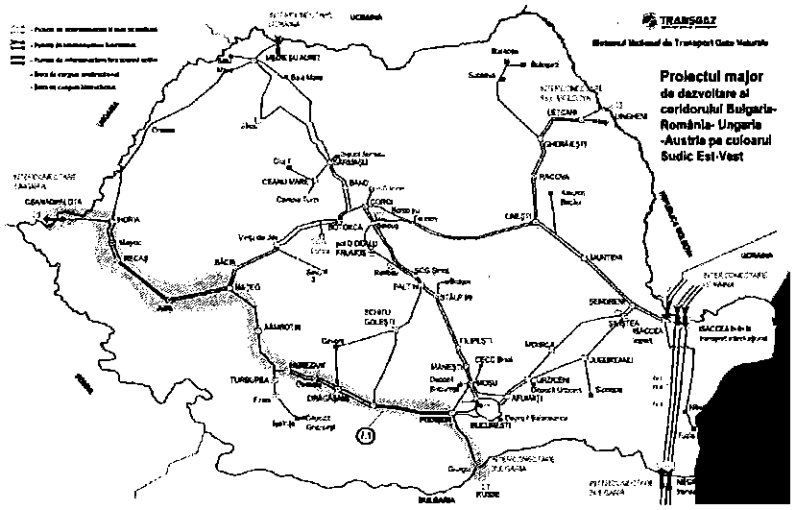


Figure 2– The interconnection points of the Romanian gas transmission system with the similar Bulgarian and Hungarian systems

Project description

BRUA Phase I consists 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 (Podişor CS, Bibeşti 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/a and of 1.5 bcm/a 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 a amplasamentelor Stațiilor de comprimare și Consultări publice in UAT-urile aferente	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)	2019
- Lot 1, Lot 2 and the Pui-Jupa section	2020
Construction of compressor stations – Phase I	2018 – 2020
- Jupa CS	2019
- Podișor CS	2019
- Bibești CS	2020
Start of operation – Phase I	December 2020

Estimated completion date: 2020

Total investment value: **Euro 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 environmental impact assessment procedure for the BRUA project was completed and in December 2016 the National Environmental Protection Agency issued the Environmental Agreement.

The works commencement order for LOT 1, LOT 2 and LOT 3 pipeline was issued on 4 June 2018. The construction and mounting works are in progress.

The pipeline automation and securing works are 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 are in progress at the three compressor stations.

Changes compared to previous TYNDPs

Following the completion of the pre-feasibility and feasibility studies and of the FEED, the following changes were made:

	2014 - 2023 TYNDP	**2017 - 2026 TYNDP**	**2018 - 2027 TYNDP**	**2019 – 2028 TYNDP**
Project description	32" x 55 bar x 81 km Podişor-Corbu Pipeline; 32" x 55 bar x 167 km Băcia-Haţeg-Jupa-Recaş Pipeline; Three gas compressor stations (Corbu CS, Haţeg I CS and Horia I CS) with a total	The project was divided into two phases: **Phase I:** 32" x 63 bar Podişor – Recaş pipeline , approximately 479 km long; Three gas compressor stations (Podişor CS, Bibeşti CS	The project was divided into two projects, of which: **Phase I:** 32" x 63 bar Podişor – Recaş pipeline, approximately 479 km long;	There are no changes.

	2014 - 2023 TYNDP	2017 - 2026 TYNDP	2018 - 2027 TYNDP	2019 – 2028 TYNDP
	installed power of approximately P_{inst} = 49.5 MW; 32" x 55 bar x 250 km Corbu – Hurezani – Hateg Pipeline ; 32" x 55 bar x 47 km Recaş–Horia pipeline ; Extension of the Horia metering station.	and Jupa CS), each station equipped with two compressors (one in operation and one as a backup), with the possibility to ensure bidirectional gas flows. **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.	Three gas compressor stations (Podişor CS, Bibeşti CS and Jupa CS), each station equipped with two compressors (one in operation and one as a backup), with the possibility to ensure bidirectional gas flows.	
Estimated completion date	2019	Phase I: 2019 Phase II: 2020	Phase I: 2019	Phase I: 2020
Total estimated amount of the project (million Euro)	560	547.39	Phase I: 478.6	There are no changes.

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.

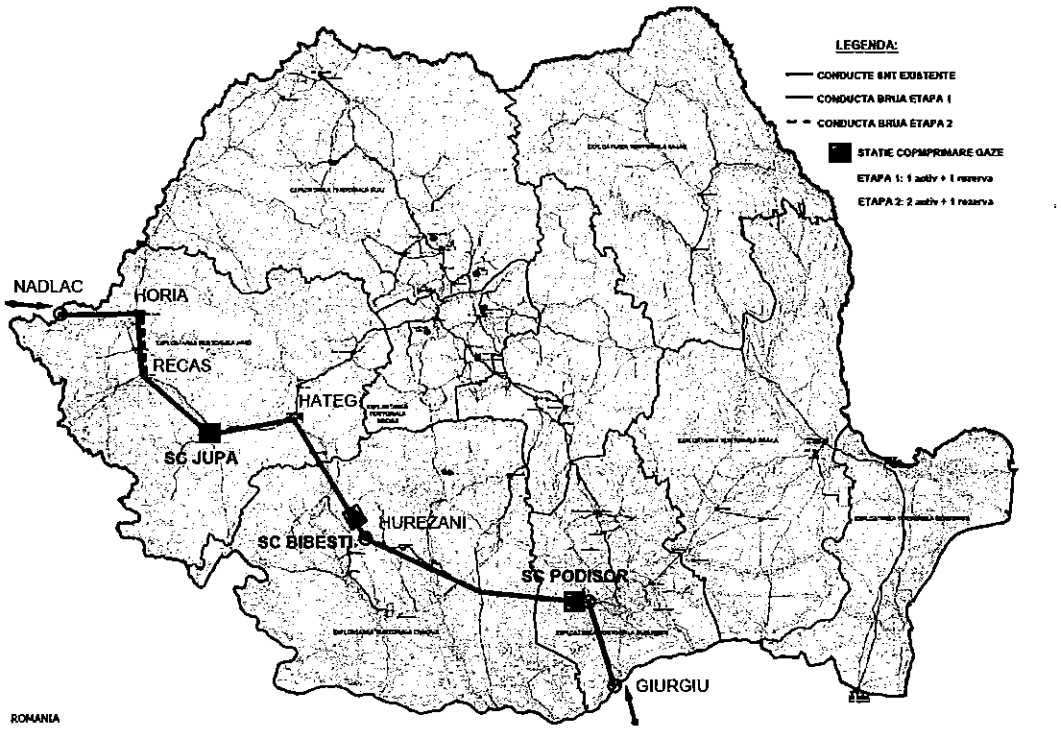


Figure 3 - Map of the key development project of the Bulgaria-Romania-Hungary-Austria Corridor – Phase 2

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/a and of 1.5 bcm/a 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	2019*
Construction Phase II	2022*
Commissioning Phase II	2022*
Start of operation Phase II	2022*

** The completion of Phase II depends on the capacity booking procedure at Csanadpalota IP and on the timeline of this procedure.*

Estimated completion date: 2022

Total investment value: Euro 68.8 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). The procedure is in progress.

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 continue with Bid Window III, according to the RO-HU Binding Open Season Rulebook.

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 within ***Cluster phased capacity increase on the Bulgaria — Romania — Hungary — Austria bidirectional transmission corridor (currently known as ROHUAT/BRUA) to enable 1.75 bcm/a in the 1st***

phase, 4.4 bcm/a in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase;

- **2018 ENTSOG TYNDP**: TRA-N-358.

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

Changes compared to previous TYNDPs

	2014 – 2023 TYNDP	**2017 - 2026 TYNDP**	**2018 - 2027 TYNDP**	**2019 – 2028 TYNDP**
Project description	32" x 55 bar x 81 km Podişor-Corbu pipeline; 32" x 55 bar x 167 km Băcia-Haţeg-Jupa-Recaş pipeline; Three gas compressor stations (Corbu CS, Haţeg I CS and Horia I CS) with a total installed power of approximately P_{inst} = 49,5 MW; 32" x 55 bar x 250 km Corbu – Hurezani – Hateg pipeline; 32" x 55 bar x 47 km Recaş–Horia pipeline; The extension of the Horia gas	The project was divided into two phases: **Phase I:** 32" x 63 bar Podişor – Recaş pipeline , approximately 479 km long; Three gas compressor stations (Podişor CS, Bibeşti CS and Jupa CS), each station equipped with two compressors (one in operation and one as a backup), with the possibility to ensure bidirectional gas flows. **Phase II** 32" x 63 bar Recaş – Horia Pipeline , approximately 50 km long; The extension of the three gas compressor	The project was divided into two projects: **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.

	2014 – 2023 TYNDP	2017 - 2026 TYNDP	2018 - 2027 TYNDP	2019 – 2028 TYNDP
	metering station.	stations (CS Podisor, CS Bibesti and CS Jupa) by mounting an additional compressor in each station; The extension of the existing gas metering station - Horia GMS.		
Estimated completion date	2019	Phase I: 2019 Phase II: 2020	Phase II: 2022	There are no changes.
Total estimated amount of the project (million Euro)	560	547.39	Phase II: 68.8	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.

The studies and evaluations have shown important gas reserves in the Black Sea.

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.

The project became a priority for Transgaz in the second half of 2013, based on the necessity to ensure adequate transmission capacities to bring Black Sea gas on the Central European markets.

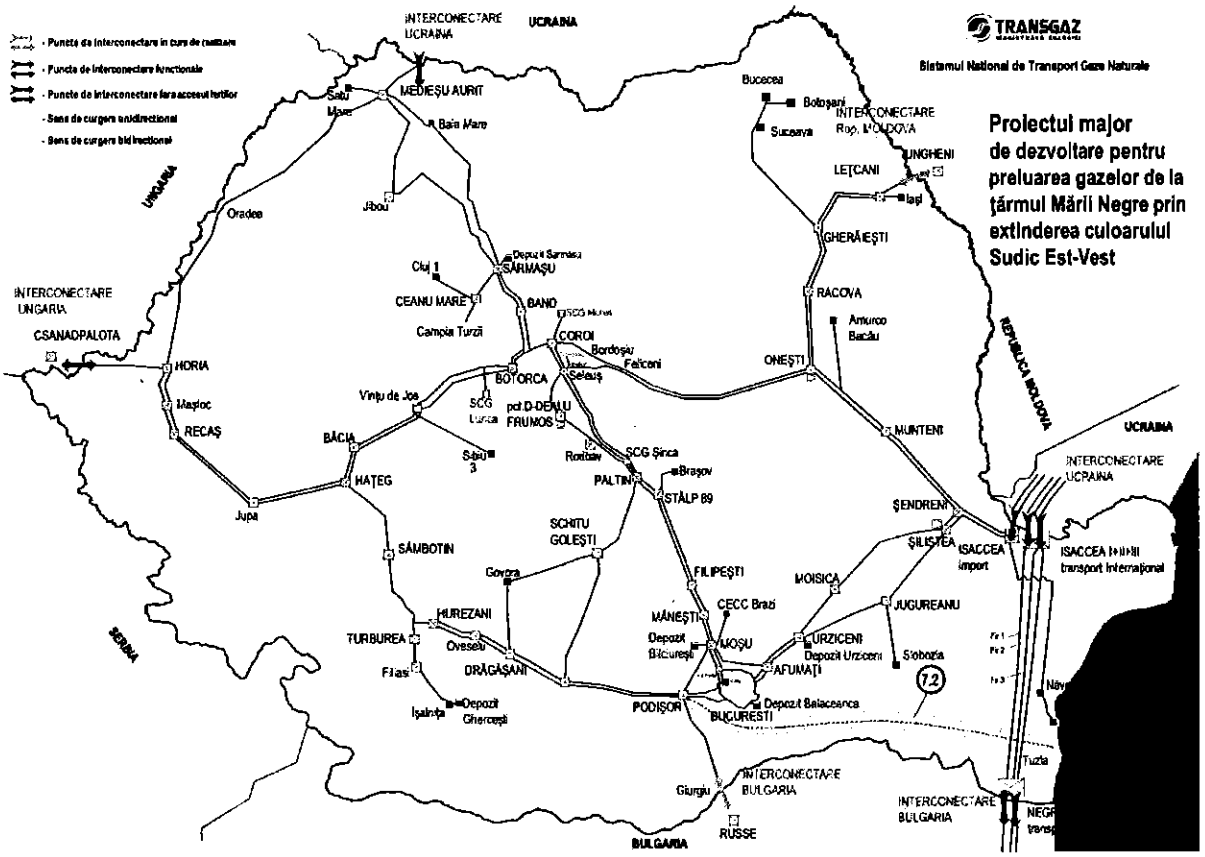


Figure 4 – Map of the major development project for taking over the gas from the Black Sea shore by extending the Southern East-West corridor

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 also interconnected with the current T1international transmission pipeline.

The pipeline is located in the south-eastern part of the country, and its route goes from south-east to the west, crossing Constanța, Călărași and Giurgiu counties.

The pipeline is telescopic and consists of two sections, as follows:

- Section I, Black Sea shore – 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 deadline acc. to 2018-2027 TYNDP	Updated status/ estimated completion deadline
Pre-feasibility study	Completed	Completed
Feasibility study	Completed	Completed
FEED	Completed	Completed
Environmental impact assessment study	Completed	Completed
Obtaining the Environmental Agreement	Completed	Completed
Authority engineering	Completed	Completed
Obtaining the construction permit	Completed	Completed
Obtaining the comprehensive decision	2018	Obtained in 2019
Taking the final investment decision	2018	2019
Construction	2019-2020	2019-2021*
Commissioning	2020	2021*

**Conditional on the taking of the final investment decision.*

Estimated completion date: 2021

Estimated investment value: EUR 360.4 million.

If the project complies with all the eligibility criteria established by Regulation (EU) 347/2013, Transgaz intends to submit an investment request for accessing a non-refundable grant for the works under the Connecting Europe Facility.

Inclusion in international plans

- **PCI project (second list):** 6.24.8;
- **PCI project (third list):** 6.24.4–5 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/a in the 1st phase, 4.4 bcm/a 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;

- **2018 ENTSOG TYNDP**: TRA-N-362.

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

Changes compared to previous TYNDPs

Following the completion of the pre-feasibility and feasibility studies, the following changes were made:

	2014 – 2023 TYNDP	**2017 - 2026 TYNDP**	**2018 - 2027 TYNDP**	**2019 – 2028 TYNDP**
Project description	Pipeline length 285 km	Pipeline length 307 km	Pipeline length 308.2 km	Pipeline length 308.3 km
Estimated completion date	2019	2020	2020	2021*
Total estimated amount of the project (million Euro)	262.4	278.3	360.36	360.4

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

This project is very important because:

- By its implementation a transmission corridor is 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 could be 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, in order to sell them on the Romanian market and on the regional markets.

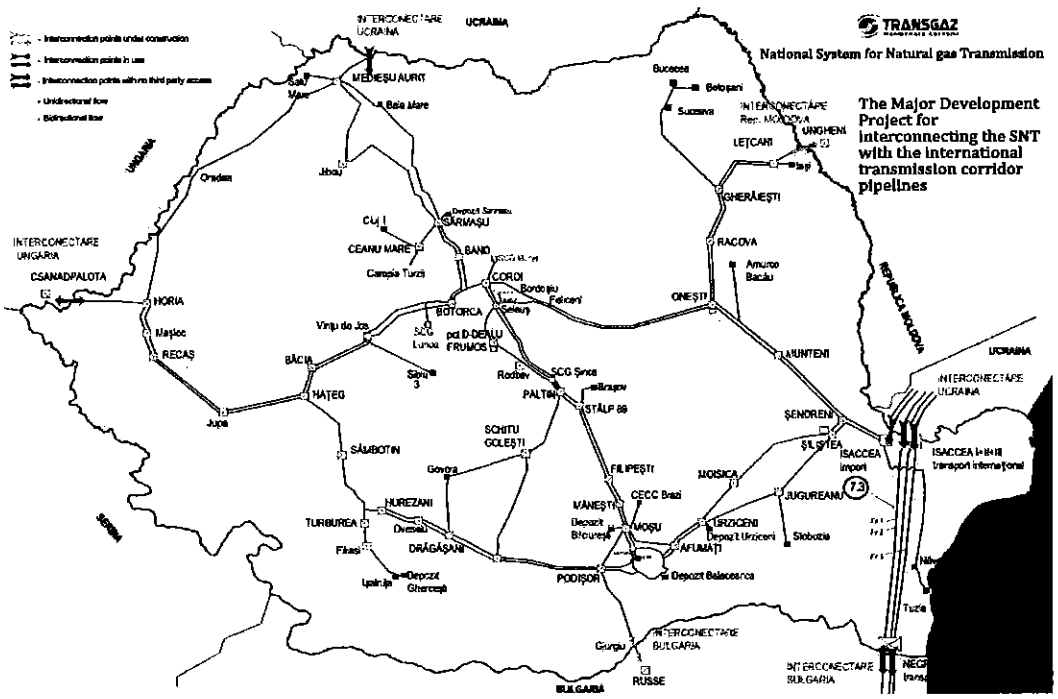


Figure 5 – Map of the major project for the development of the NTS interconnection with the international transmission pipeline Transit 1 and reverse flow Isaccea

Project description:

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

Indicative project development calendar:

Development stages	Status/ Estimated completion deadline acc. to 2018-2027 TYNDP	Updated status/ estimated completion deadline
Phase 1	**2018**	**2018**
Pre-feasibility study	completed	completed
Feasibility study	completed	completed
Environmental impact assessment	completed	completed
Authority engineering	completed	completed
Issuance of construction permits	completed	completed
Comprehensive decision	2018	obtained
Construction	2018	completed
Commissioning/start up	2018	completed
Phase 2	**2019**	**2020**
Pre-feasibility study	completed	completed
Feasibility study	completed	completed
Technical specifications for the design and execution	December 2018	completed
Procurement of design and execution works	January 2019	2019
Comprehensive decision	January 2019	2019
Completion of basic design and execution details	January 2019	2020
Construction	2019	2020
Commissioning/start up	2019	2020

Estimated completion date: 2018 for Phase 1 and 2020 for Phase 2

Estimated investment amount: EUR 77.7 million.

Breakdown of costs:

Phase 1	EUR 8.8 million
Phase 2	EUR 68.9 million.
TOTAL	**EUR 77.7** million

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/a in the 1st phase, 4.4 bcm/a in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase;**
- **2018 ENTSOG TYNDP:** TRA-N-139.

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

Changes compared to previous TYNDPs

Following the completion of the pre-feasibility and feasibility studies, the following changes were made:

	2014 – 2023 TYNDP	2017 - 2026 TYNDP	2018 - 2027 TYNDP	2019 – 2028 TYNDP
Project description	The project consists in: -the upgrading and extension of the Siliștea compressor station; -a new compressor station at Onești - interconnection of Isaccea 1 GMS (NTS and Tranzit 1) -rehabilitation of the Cosmești – Onești (66.2 km) and Siliștea - Șendreni (11.3 km) pipeline sections.	The project consists in: the upgrading and extension of the Siliștea compressor station; -a new compressor station at Onești - interconnection of Isaccea 1 GMS (NTS and Tranzit 1) -rehabilitation of the Cosmești – Onești (66.2 km) and Siliștea - Șendreni (11.3 km) pipeline sections.	The project was broken down into two phases: Phase 1: - interconnection works between NTS and the international transmission pipeline T1 in the area of the Isaccea metering station; - Repair works to the DN 800 mm Cosmești - Onești (66,0 km) pipeline. Phase 2: - upgrading and extension of the Siliștea compressor station; - upgrading and extension of the Onești	There are no changes.

			compressor station; - modification within TN Siliștea, TN Șendreni și TN Onești.	
Estimated completion date	2018	2019	Phase 1: 2018 Phase 2:2019	Phase 1: 2018 Phase 2: 2020
Total estimated amount of the project (million Euro)	65	65	Phase 1: 8.8 Phase 2: 92.2	Phase 1: 8.8 Phase 2: 68.9

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.

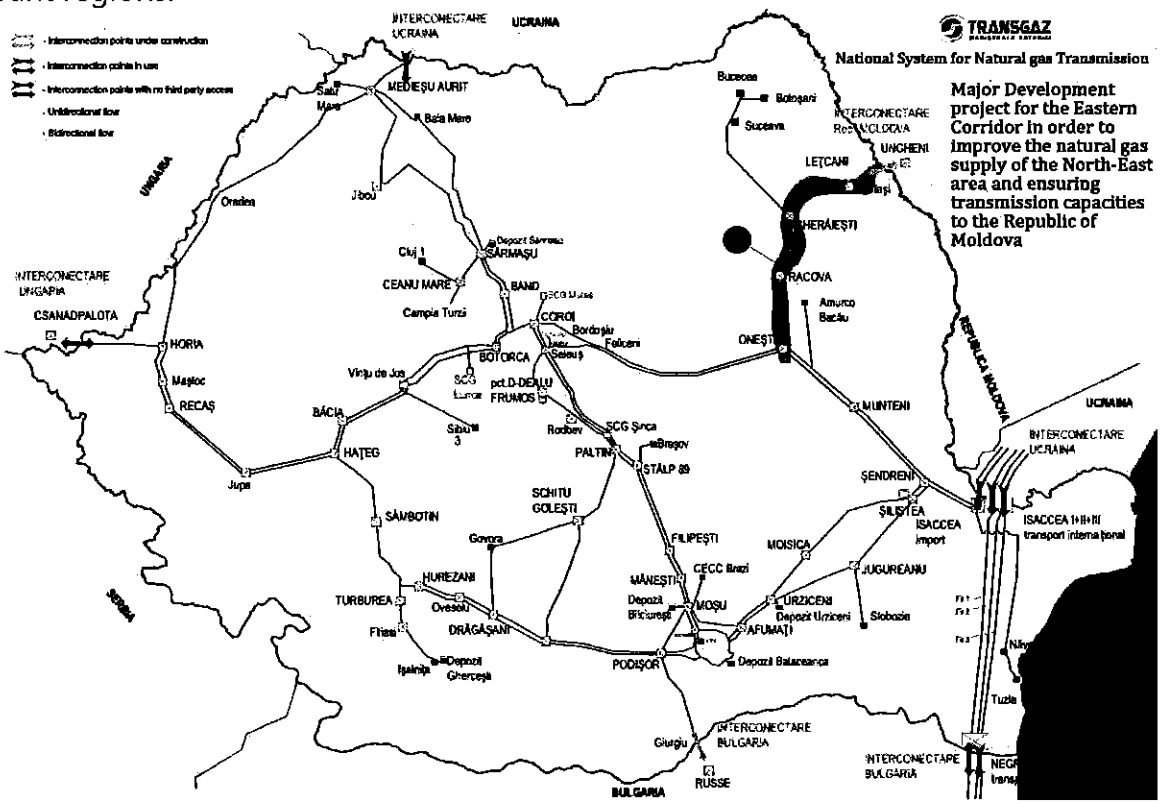


Figure 6 – NTS developments in the North-Eastern area of Romania

Project description:

For enhancing the implementation process and obtaining EU regional development funds under the existing 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 – Letcani direction, 61.05 km long. This pipeline will replace the existing DN 400 pipeline Gherăești – Iaşi on the Gherăești – Letcani 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 development calendar:

Development stages	**Status/ Estimated completion deadline acc. to 2018-2027 TYNDP**	**Updated status/ estimated completion deadline**
Concept study	completed	completed
Feasibility study	completed	completed
FEED for the pipelines	completed	completed
FEED for the compressor stations	completed	completed
Issuance of construction permits for the pipelines	completed	completed
Issuance of construction permits for the compressor stations	completed	completed
Construction	2018-2019	2019-2021
Commissioning/start up	2019	2021

Estimated completion date: 2021

The total estimated value of the investment is of **EUR 174.25 million**.

The estimated value of the investment	Acc. to the 2018-2027 TYNDP	Update
Estimated value for procurement of materials		EUR 64.95 million
Onești–Gherăești gas transmission pipeline	EUR 51.01 million	EUR 17.32 million
Gherăești–Letcani gas transmission pipeline	EUR 36.06 million	EUR 15.19 million
Onești Compressor Station	EUR 41.75 million	EUR 48.46 million
Gherăești Compressor Station	EUR 37.06 million	
Pipeline securing and automation	EUR 8.37 million	
Other activities (procurement of land, design, technical consultancy, audit and technical assistance		EUR 28.32 million
TOTAL	EUR **174.25** million	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).

For this purpose on 22.11.2018 Grant Agreement 226 was signed with the Ministry of European Funds.

Inclusion in international plans

- **2018 ENTSOG TYNDP :** TRA-N-357

Changes compared to previous TYNDPs

Following the completion of the pre-feasibility and feasibility studies, the following changes were made:

	2014 – 2023 TYNDP	2017 - 2026 TYNDP	2018 - 2027 TYNDP	2019 – 2028 TYNDP
Project description	Pipeline length 163 km	Pipeline length 165 km	Pipeline length 165.15 km	There are no changes.
Estimated completion date	2017	2019	2019	2021
Total estimated amount of the project (million Euro)	110	131.7	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.

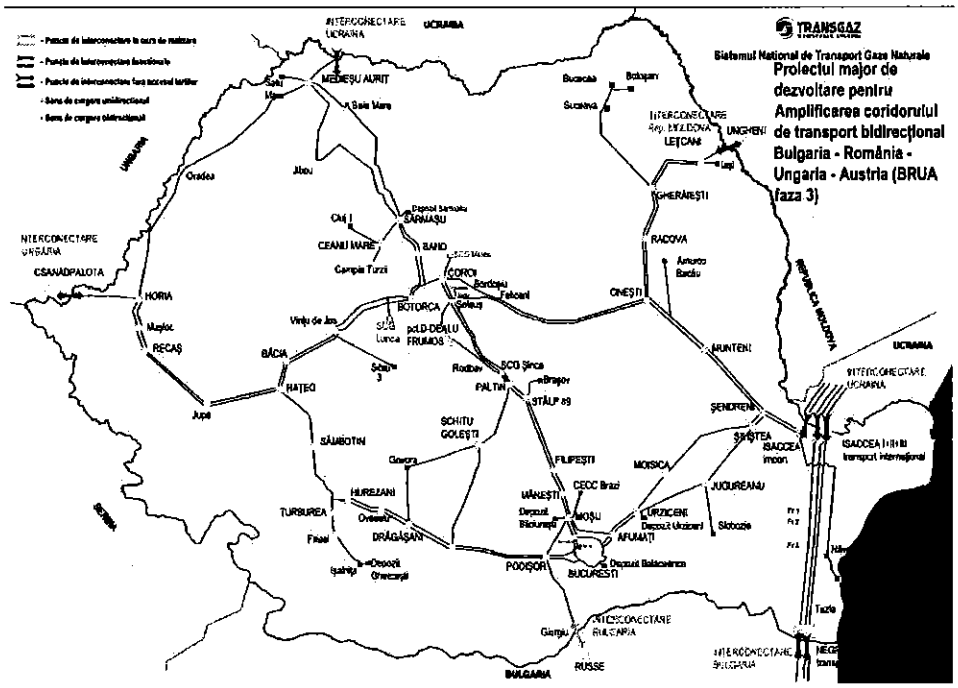


Figure 7 - BRUA 3 development

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/a.

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;
   - **2018 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;
- **2018 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 the updated list (List 3/2017) **of projects of common interest** published as annex to Regulation 347/2013 being included at position 6.24 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/a in the 1st phase, 4.4 bcm/a 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: 2025

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 TYNDPs

Following the reconsideration of the project 7.3 *NTS Interconnection with the international gas transmission pipeline T1 and reverse flow Isaccea,* the following changes were made:

	2014 – 2023 TYNDP	**2017 - 2026 TYNDP**	**2018 - 2027 TYNDP**	**2019 – 2028 TYNDP**
Project description	Central corridor Isaccea -	The entire project was reconsidered	the corridor starts from	There are no changes.

	Şendreni – Oneşti – Coroi – Haţeg – Horia.	(the corridor starts from Onești to Nădlac)	Onești to Nădlac	
Estimated completion date	2023	2023	2023	2025
Total estimated amount of the project (million Euro)	544	530	530	There are no changes.

7.6 New 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.

Transgaz has completed the pre-feasibility study for a transmission pipeline of about 25 km and Dn 500 diameter, from the Black Sea shore to the existing T1 international gas transmission pipeline. Within the study two routes of the gas transmission pipeline were analysed, as well as different diameters of the pipeline, depending on the transmission capacity.

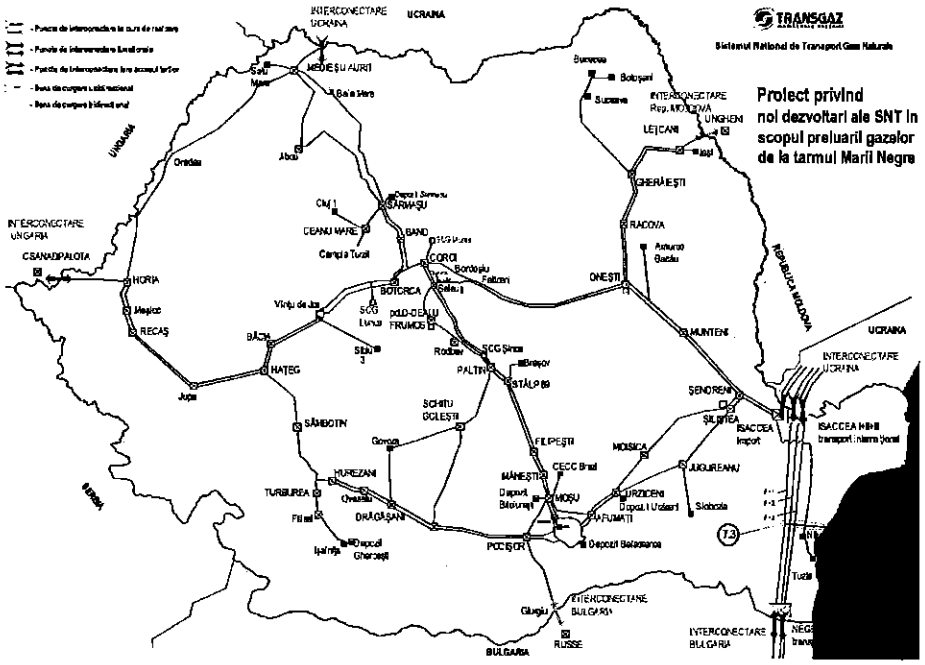


Figure 8 – NTS developments at the Black Sea

Project description

Transgaz completed the feasibility study and the FEED for a 25 km long Dn 500 gas transmission pipeline from the Black Sea shore to the existing international gas transmission pipeline T1. The transmission capacity is 1.23 bcm/a according to the Open season procedure published on Transgaz' website.

Indicative project development calendar:

Development stages	Status/Estimated completion deadline according to TYNDP 2018-2027	Status/Estimated updated completion deadline
Pre-feasibility study	Completed	Completed
Feasibility study	Completed	Completed
Technical documentation for obtaining the construction permits	Completed	Completed
Obtaining construction permits	Completed	Completed
Obtaining the comprehensive decision	Obtained	Obtained
Taking the final investment decision	2018	2019
Construction	2018-2019	2019-2020
Commissioning/start up	2019	2021

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

Estimated investment amount: Euro 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/a in the 1st phase, 4.4 bcm/a in the 2nd phase, and including new resources from the Black Sea in the 2nd and/or 3rd phase***
- **2018 ENTSOG TYNDP:** TRA-N-964

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

Changes compared to previous TYNDPs

Following the completion of the FEED, the following changes were made:

	2017 – 2026 TYNDP	2018 – 2027 TYNDP	2019 – 2028 TYNDP
Project description	25 km DN 500 pipeline	25 km DN 500 pipeline	There are no changes
Estimated completion date	2019	2019	2021
Total estimated amount of the project (million Euro)	9	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.

The analysed version for gas export towards Serbia is to take over gas from the future BRUA pipeline (Phase I).

The Project `Interconnection of the National Gas Transmission System with the similar gas transmission system of Serbia` consists in the construction of an approximately 97 km long pipeline to interconnect the national gas transmission system in Serbia in the Recaș – Mokrin direction, and of a gas metering station.

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).

Hydraulic calculations resulted in the diameter of 24 "(DN 600) at the design pressure of 63 bar.

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 bScm/a (115,000 Scm/h), pressure at Mokrin: 48.4 – 52.5 bar;
  - ✓ Transmission capacity: max. 1.6 bScm/a (183,000 Scm/h), pressure at Mokrin: 45.4 – 49.9 bar.
- Construction of a gas metering station (located on the Romanian territory).

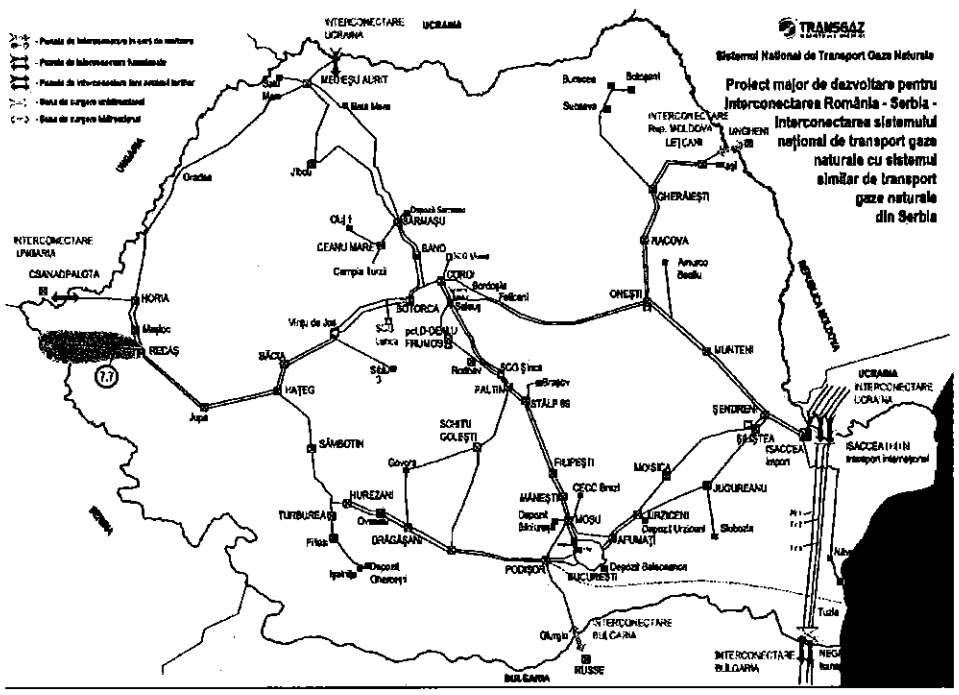


Figure 9- Interconnection of the NTS with Serbia in the Recas – Mokrin direction

Indicative project development calendar

Development stages	Status/ Estimated completion date according to TYNDP 2018-2027	Status/ Estimated updated completion date
Pre-feasibility study	Completed	Completed - February 2018
Feasibility study	August 2018	Completed - November 2018
FEED and tender books	December 2018	Completed - January 2019
FEED and permitting documentation for the construction permit	December 2018	2019
Initiation of the procedure for the procurement of the execution works	2019	2019
Construction	2019 - 2020	2019-2020
Commissioning /start-up	2020	2020

Estimated completion date: 2020

Total estimated investment amount: EURO 53.76 million of which:

Estimated investment amount	According to 2018-2027 TYNDP	Updated
Execution works	Euro 42.4 million	Euro 41.93 million

Other activities (procurement of land, design, technical consultancy, audit and technical assistance)		Euro 11.83 million
TOTAL	**Euro 42.4 million**	**Euro 53.76 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

- **2018 ENTSOG TYNDP**: TRA-N-1268

Changes compared to previous TYNDPs

Following the completion of the pre-feasibility studies, the following changes were made:

	2017 – 2026 TYNDP	**2018 – 2027 TYNDP**	**2019 – 2028 TYNDP**
Project description	Pipeline length 80 km (74 km Romania)	Pipeline length 97 km (85 km Romania)	There are no changes
Estimated completion date	2026	2020	There are no changes
Total estimated amount of the project (mil. Euro)	43 (40 Romania)	50.7 (42.4 Romania)	(53.76 Romania)

7.8 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 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. In the case of GMS Isaccea 1 the station will be built in the current station and in the case of GMS Negru Voda 1 on a location situated close to the location of the existing station.

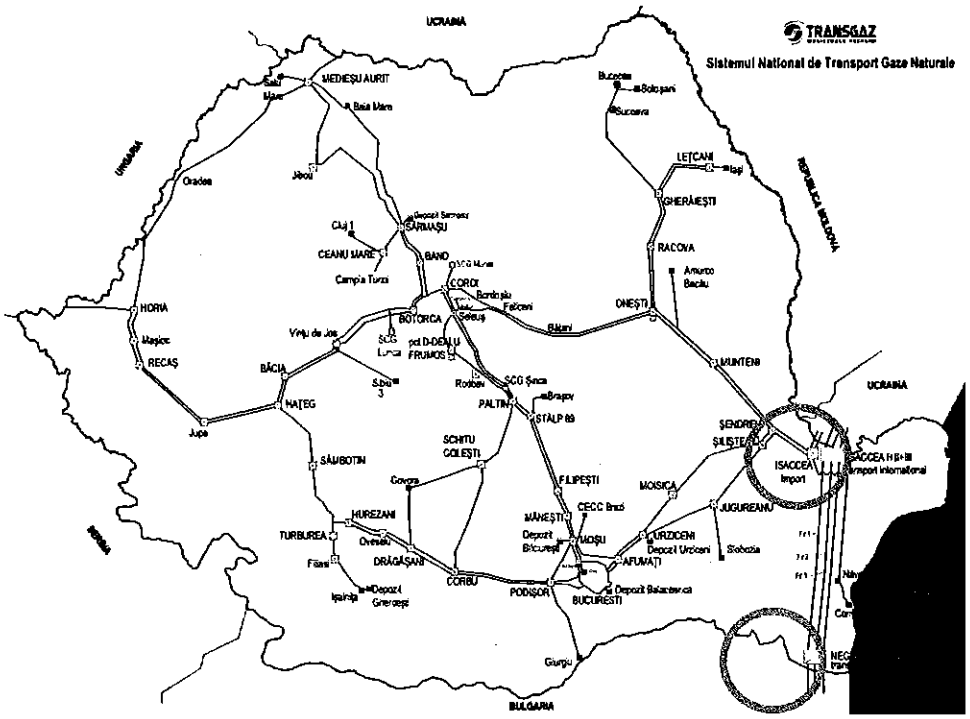


Figure 10 - Upgrading GMS Isaccea 1 and Negru Vodă 1

Project description:

1. **Gas Metering Station GMS Isaccea 1**

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

- Separation/filtering is ensured by a separating/filtering battery.
- The metering installation will consist 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 three independent metering systems (Pay, Check and Verification). The independent systems Pay and Check will employ dual ultrasonic meters and the systems for the Verification will use 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 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 caused these malfunctions are remedied.

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

2. 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 development calendar

Development stages	**Status/ Estimated completion date according to TYNDP 2018-2027**	**Status/ Estimated updated completion date**	
		GMS Isaccea 1	**GMS Negru Voda 1**
Feasibility study	2018	Completed	2019 (if the necessary land is obtained)
Design	2018	Completed	2019 (if the necessary land is obtained)
FEED and permitting documentation for the construction permit	2018	Obtained	2019 (if the necessary land is obtained)
Construction	2018 - 2019	2019	2019-2021
Commissioning /start-up	2019	2020	2021

Estimated completion deadline: 2020 for GMS Isaccea 1, 2021 for GMS Negru Voda 1

The total estimated investment amount: EUR 26.65 million of which:

- EUR 13.88 million upgrading GMS Isaccea 1
- EUR 12.77 million upgrading GMS Negru Vodă 1 (the value will be updated in the end of the feasibility study).

Inclusion in international plans

- **2018 ENTSOG TYNDP**: TRA-N-1277

Changes compared to previous TYNDPs

Following the completion of the pre-feasibility and feasibility studies, the following changes were made:

	TYNDP 2017 - 2026	**TYNDP 2018 - 2027**	**TYNDP 2019 - 2028**
Project description	Construction of two new gas metering stations in the existing facilities	Construction of two new gas metering stations in the existing facilities	There are no changes
Estimated completion date	2019	2019	2020 – GMS Isaccea 1 2021- GMS Negru Voda 1
Total estimated amount of the project (mil. Euro)	13.9	13.9	26.65

7.9 Interconnection of the gas transmission systems in Romania and in 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.

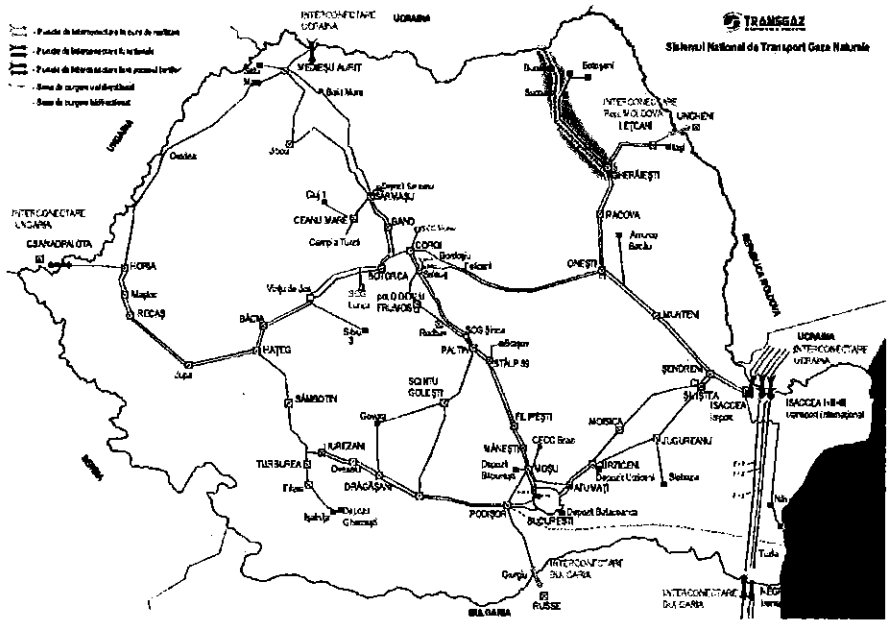


Figure 11 - Interconnection of the gas transmission systems of Romania and Ukraine in the Gherăești – Siret direction

Project description:

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

- the construction of a 130 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.

Estimated project development calendar

Development stages	Status/ Estimated completion date according to TYNDP 2018-2027	Status/ Estimated updated completion date
Prefeasibility study	2018	Finalizat
Feasibility study	2018-2019	2019-2020
FEED	2019-2020	2020-2021*
Public procurement (material and works)	2021	2021*
Construction	2022-2024	2022-2024*
Commissioning start-up	2025	2025*

*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 date: 2025

Total estimated value of the investment: EUR 125 million

Changes as opposed to the previous NTS Development Plans (NTSDP)

	2018-2027 TYNDP	2019-2028 TYNDP
Project description	– construction of a gas transmission pipeline (130 km long) and of the related equipment in the direction Gherăești–Siret; – construction of a cross-border gas metering station; – expansion of the compressor stations Onești and Gherăești.	No changes.
Estimated completion deadline	2025	No changes.
Total estimated value (mil. Euro)	125	No changes.

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.

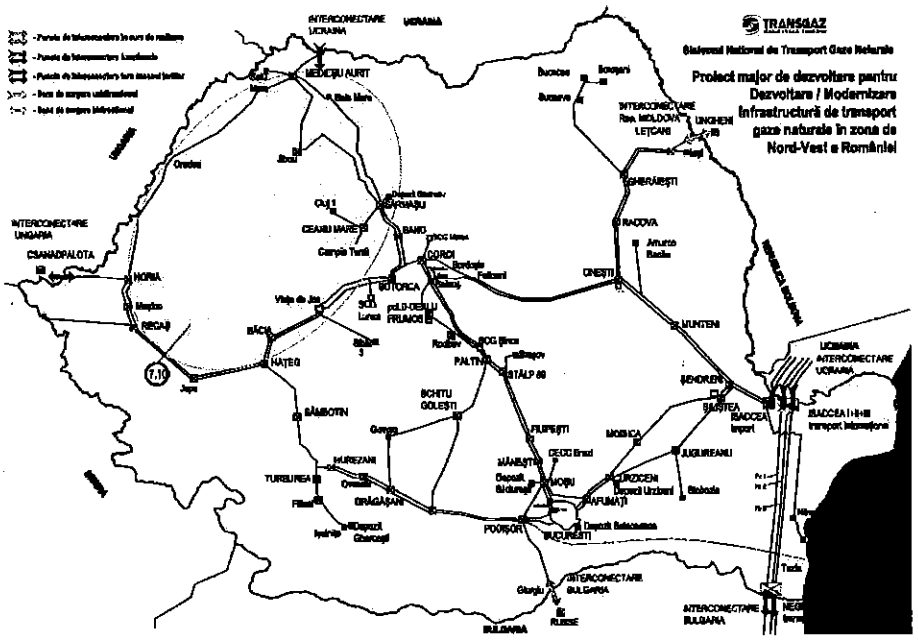


Figure 12- Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania

Project description

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

- construction of a pipeline and of the related equipment in the direction Horia–Mediesu Aurit;
- construction of a pipeline and of the related equipment in the direction Sărmășel–Mediesu Aurit;
- construction of a pipeline and of the related equipment in the direction Huedin–Aleșd;
- construction of a Gas Compressor Station at Mediesu 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 direction Horia–Borș.
- **Stage 2:**
  - construction of the pipeline and of the related equipment in the direction Borș–Abrămuț;
  - construction of a Gas Compressor Station Mediesu Aurit;
  - construction of the pipeline and of the related equipment in the direction Huedin–Aleșd.
- **Stage 3:**
  - construction of the pipeline and of the related equipment in the direction Abrămuț–Mediesu Aurit;
  - construction of the pipeline and of the related equipment in the direction Sărmășel–Mediesu Aurit.

Estimated project implementation schedule:

Milestones	Status / Estimated completion deadline
Stage 1	**2022**
Pre-feasibility study	Completed
Feasibility study	2019-2020
FEED	2020-2021
Public procurement	2021
Construction	2021-2022
Commissioning/start up	2022

Milestones	Status / Estimated completion deadline
Stage 2	**2025**
Pre-feasibility study	Completed
Feasibility study	2019-2020
FEED	2021-2022
Public procurement	2022
Construction	2023-2025
Commissioning/start up	2025
Stage 3	**2026**
Pre-feasibility study	Completed
Feasibility study	2019-2020
FEED	2022-2023
Public procurement	2023
Construction	2024-2026
Commissioning/start up	2026

Estimated completion deadline: 2022 Stage 1, 2025 Stage 2 and 2026 Stage 3

Estimated value: Euro 405 million

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

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 Southern Europe envisage gas flows in the direction South-North.

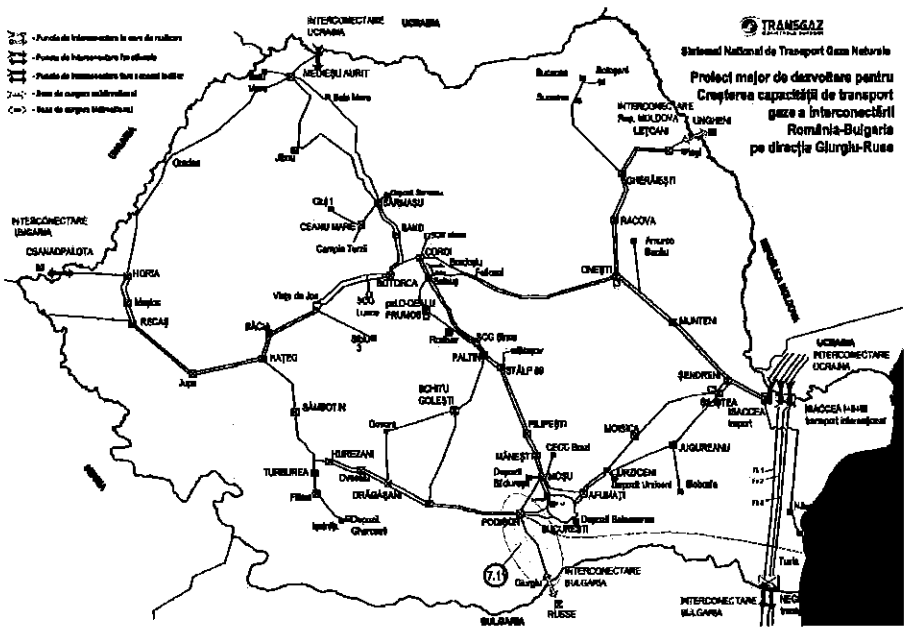


Figure 1- Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the direction Giurgiu-Ruse

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 SMG Giurgiu

Estimate project development schedule:

Milestones	Status / Estimated completion deadline
Pre-feasibility study	2019-2020
Feasibility study	2020-2021
FEED	2022-2024
Public procurement	2024
Construction	2025-2027
Commissioning/start up	2027

Estimated completion deadline: 2027

Estimated value: Euro 51.8

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.

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.

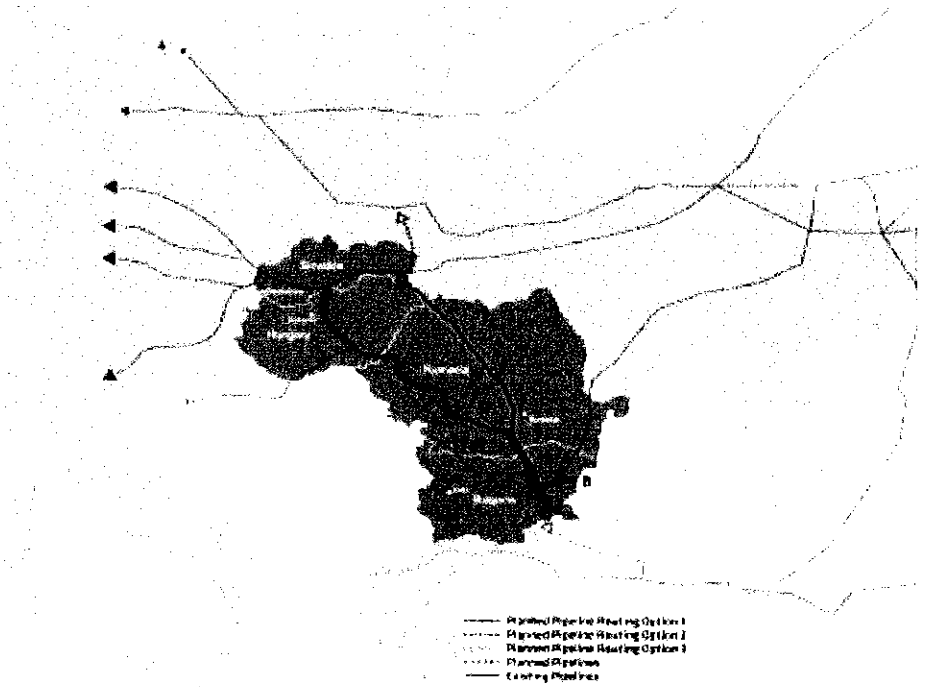


Figure 2- Eastring

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/a;
- Stage 2 – Maximum capacity 40 bcm/a.

Estimated project implementation schedule:

Milestones	Status / Estimated completion deadline
Stage 1	**2025**
Pre-feasibility study	Completed
Feasibility study	Completed
FEED	2019-2023
Public procurement	2022-2023
Construction	2023-2025
Commissioning/start up	2025
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 deadline: 2025 Stage 1, 2030 Stage 2

Estimated investment:

- **Stage 1 - Euro 1,297 mil. for Romania (2.600 mil. Euro–total);**
- **Stage 2 - Euro 357 mil. for Romania (739 mil. Euro–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;
- **2018 ENTSOG TYNDP (Eastring–Romania)**: TRA-N-655.

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

In the National gas transmission system 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 development calendar:

Development stages	Status/Estimated completion date
Feasibility study	2019
FEED	2019-2020
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	2020
Construction	2020-2023
Commissioning/start up	2021-2023

Estimated completion deadline: 2023

Estimated investment amount: EURO 8 million

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

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

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.

Indicative project development timeline:

Development stages	Status/Estimated completion date
Feasibility study	2019 - 2020
FEED	2020 - 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	2020
Construction	2020 - 2023
Commissioning/start up	2023

Estimated completion deadline: 2023

Estimated investment amount: EURO 5.5 million

8. DEVELOPMENT DIRECTIONS OF THE GAS STORAGE SYSTEM

I. OPERATED BY DEPOGAZ PLOIESTI – MAJOR STORAGE PROJECTS

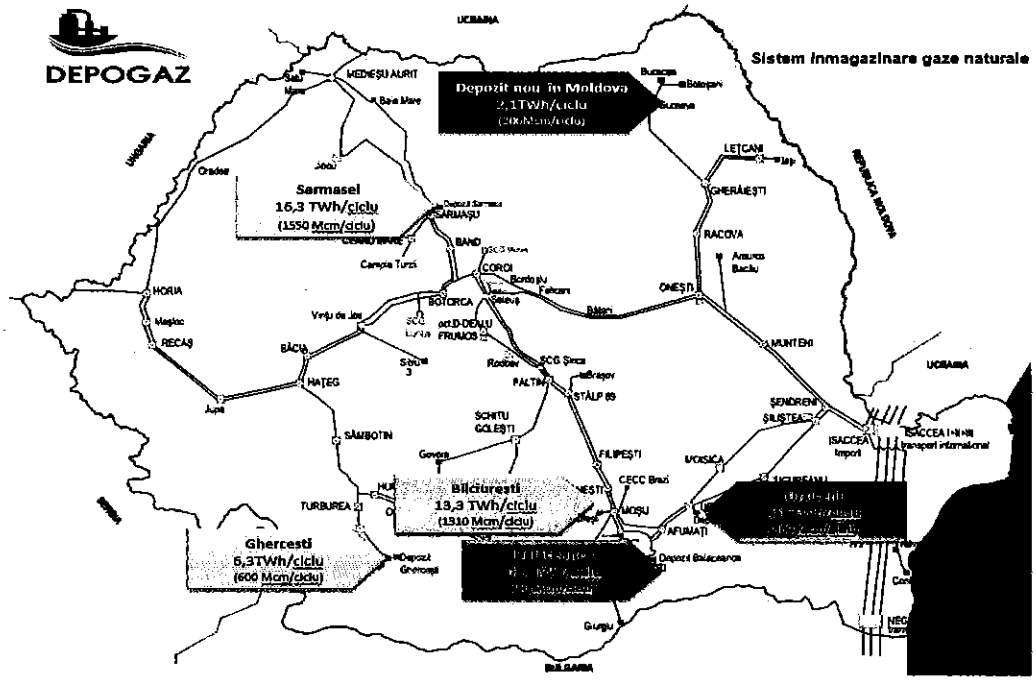


Figure 13 – Gas storage system

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 20 million m^3/day flow and ensuring increased safety during operation.

Project description:

The project consists in:

- the modernisation of the 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 19 injection/extraction wells;
- 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 development calendar

Development stages	Stage/Estimated completion date according to TYNDP 2018-2027	Stage/Estimated updated completion date
Feasibility study	completed 2017	completed 2017
Engineering	staged 2018 - 2020	2017
Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	staged 2018 - 2022	staged 2018 - 2022
Bidding and procurement documents	staged 2018 - 2022	staged 2018 - 2022
Construction	staged 2018 - 2025	staged 2018 - 2025
Commissioning/start of operation	staged 2019 - 2025	staged 2019 - 2025

Estimated completion date: 2025

Total estimated value of the investment: EUR 59 million

Changes as compared to the previous NTS development plans

	2018-2027	2019-2028

	TYNDP	TYNDP
Project description	– upgrading of separation, metering and drying facilities Bilciureşti; – 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 probes; – New gas transmission pipeline (11 Km) between the Bilciureşti storage facility and the Butimanu compressor station.	There are no changes.
Estimated completion deadline	2025	There are no changes.
Total estimated project value (mill. Euro)	59	There are no changes.

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

The project aims at completing the Gherceşti 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;
- Gherceşti gas storage facility/NTS interconnection;
- Inactive gas reserves.

Indicative project development calendar

Development stages	Stage/Estimated completion date according to TYNDP 2018-2027	Stage/Estimated updated completion date
Feasibility study	2020	2020
Engineering	2021	2021

Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	2022	2022
Bidding and procurement documents	2022	2022
Construction	2025	2025
Commissioning/start of operation	2025	2025

Estimated completion date: 2025

Total estimated value of the investment: EUR 122 million

Amendments as compared to the previous NTS development plans

	2018-2027 TYNDP	2019-2028 TYNDP
Project description	– gas compressor station; – expansion of gas drying and metering installations; – upgrading of 20 injection/withdrawal wells; – Gherceşti gas storage facility/NTS interconnection; – Inactive gas reserves.	There are no changes.
Estimated completion deadline	2025	There are no changes.
Total estimated project value (mill. Euro)	122	There are no changes.

8.3 New underground storage facility in Moldova

The project aims at the development of a new undergroung 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, Comăneşti, Todireşti 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 development calendar

Development stages	Stage/Estimated completion date according to TYNDP 2018-2027	Stage/Estimated updated completion date
Feasibility study	2020	2020
Engineering	2021	2021
FID	2021	2021
Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	2022	2022
Bidding and procurement documents	2021	2021
Construction	2025	2025
Commissioning/start of operation	2025	2025

Estimated completion date: 2025

Total estimated value of the investment: EUR 80 million

Changes as compared to the previous NTS development plans

	2018-2027 TYNDP	2019-2028 TYNDP
Project description	– Compressor stations; – Gas drying and metering installations; – installations injection/withdrawal wells technological; – injection/withdrawal wells drilling; – gas storage / NTS interconnection; – base gas.	There are no changes.
Estimated completion deadline	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, by increasing the compressing capacity, a new above ground infrastructure for 59 injection-extraction wells, the drilling of new wells, etc.

Project description:

The project consists in:

- the extension of the compressor station;
- the extension of the gas drying and metering facilities;
- injection/ withdrawal wells technological installations;
- modernisation of 46 injection/withdrawal wells;
- drilling 15 new wells;
- base gas.

Indicative project development calendar

Development stages	Stage/Estimated completion date according to 2018-2027TYNDP	Stage/Estimated updated completion date
Feasibility study	2019	2019
FID	2019	2019
Engineering	2020	2020
Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	2020	2020
Bidding and procurement documents	2021	2021
Construction	2024	2024
Commissioning/start of operation	2024	2024

Estimated completion date: 2024

Total estimated value of the investment: EUR 136 million

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**.

Changes as compared to the previous NTS Development Plans

	2018-2027 TYNDP	2019-2028 TYNDP
Project description	- extension of compressor station; - extension of drying and natural gas installations; - technological installations injection / extraction wells; - upgrading 46 injection/extraction wells; - drilling 15 new wells; - inactive natural gas reserve.	There are no changes
Estimated completion deadline	2024	There are no changes
Total estimated amount of the project (mill. Euro)	136	There are no changes

II. OPERATED BY DEPOMUREȘ – MAJOR GAS STORAGE PROJECTS

8.5 Depomureș storage facility – Retrofitting and development of the underground storage facility Târgu Mureș

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. cm. The main objectives of this project are (i) enhancing flexibility of the storage facility by increasing the injection and withdrawal capacity from the current average of approximately 1.7 mil.cm/day to approximately 3.5 mil. cm/day after the implementation of phase 1 pf the project, and approximately 5 mil. cm/day, after the implementation of phase 2 of the development, and (ii) increasing the storage capacity of the underground storage from 300 mil.m^3 to 400 mil.m^3 in a first stage, and 600 mil.m^3 in a later stage (Phase 2).

The project consists mainly in:

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

Indicative project development calendar

Development stages	Stage/Estimated completion date according to 2018-2027 TYNDP	Stage/Estimated updated completion date
Feasibility study	completed	completed
Engineering	completed (phase 1)	completed (Phase 1)
Technical documentation for obtaining the construction permits and for obtaining the Construction Permit	2019 (Phase 1)	2019 (Phase 1)
Bidding and procurement documents	2019 (Phase 1)	2019 (Phase 1)
Construction	2020 (Phase 1)	2020 (Phase 1)
Commissioning/start of operation	2021 (Phase 1)	2021 (Phase 1)

*Phase 2 will be initiated only following completion of implementation of Phase 1.

Estimated completion date: 2021 (Phase 1)

Total estimated value of the investment: EUR 87 million (Phase 1 and 2)

FID: 2019 (Phase 1); FID Phase 2 – following completion of implementation of Phase 1

The Depomures Development Project was declared by the European Commission in 2013 as a Project of Common Interest (PIC). The PIC status was reconfirmed by the European Commission both in 2015 and in 2017 when up-to-date lists of projects of common interest at European level were published. The inclusion and preservation of the Depomureş project on the list of key energy infrastructure projects of common interest at the level of the European Union proves and strengthens its strategic importance not only at national level but also at European level. Thus, the project is included in the current list of Projects of Common Interest in the corridor of NSI Gas (Central and Eastern Central Europe), a reference number in the Union List - under reference number 6.20.4

Project status

The main elements of the investment related to PCI Depomureș are:

- Construction of a new storage collector between the Central Gas Station and the existing groups, at a pressure of 100 barg, the estimated pressure of the system for Phase 2. In a first phase (Phase 1), this new pipeline would allow for the increase in

the storage capacity by increasing the safe injection pressure (up to about 64 bar) without the need for drilling new probes in this first stage.
Stage: achieved. The collector, with a construction by sections, was commissioned in stages, on 29 July 2016, respectively, on 23 March 2018.

- Upgrading existing facilities to prepare the system for superior operating pressure, reducing pressure drops, preventing flooding of wells during the extraction cycle.
  Stage: partially achieved. Upgrading works for 64 barg pressure system preparation were completed and commissioned on 31 March 2016. In the second phase, the upgrading works will aim at raising system pressure to 100 barg.
- Construction of a central gas station (two active compressor units designed at 3.5 cm/ day with back-up for an additional compressor, an active gas drying unit designed at 3.5 cm/day with back-up for an additional drying column, station bidirectional gas metering for 0.5-5 cm at Pop = 8-35 barg) and neighbouring facilities.
  Stage: partially achieved. The investment objectives of the gas drying station, respectively water supply and sewerage station were put into operation on 23 March 2018, respectively on 14 July 2018.
- Connection of the Târgu Mureş storage facility to the high pressure NTS, including the extraction of gas from the storage facilities, by creating a unique point for taking over/deliver gas from/to the high pressure NTS.
  Stage: achieved. In the context of the upgrading program and systematization of the NTS infrastructure in the area, the natural gas metering system used for delivery to the NTS of the extracted gas from the storage was relocated to Corunca, the natural gas storage facility being connected to the high pressure NTS pipes Dn600 PN 40 Corunca-Coroi Pipeline I and Pipeline II.
- Power station of 110kV/6 kV and connection to the power line;
- Installing a new compressor and an additional drying strip, drilling new wells (Phase 2 development).

The investment elements to be implemented in order to complete the Phase 1 development are the gas compressor station (2 units) and the connection to the SEN (power station), bidirectional gas metering station.

Implementation of the investments related to Phase 2 of the project (wells, additional compressor units and drying units, upgrading of the operating pressure increase system) is conditional upon the successful completion of Phase 1 of the project.

Changes as compared to the previous TYNDPs

	2018-2027 TYNDP	2019-2028 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 deadline	2021 (Phase 1)	There are no changes
Total estimated amount of the project (mill. Euro)	87 (Phase 1 and 2)	There are no changes

8.6 ANALYSIS OF STORAGE PROJECTS

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

Proiecte de înmagazinare		**TYNDP 2018**	
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 Moldova	UGS – N - 366	LA non FID
8.4	Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)	UGS – N - 371	A non FID
8.5	Retrofitting and development of the Târgu Mureș underground gas storage	UGS – N - 233	FID

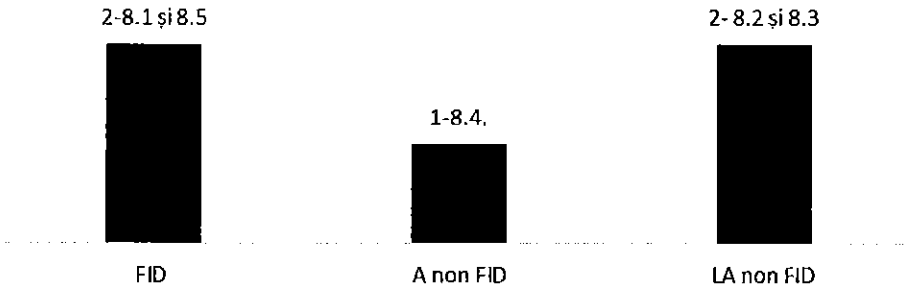


Chart 22 – Status of key storage projects

8.6. ANALYSIS ON STORAGE PROJECTS

8.6.1 Status of the Projects depending on the Final Investment Decision (FID)

Storage projects		TYNDP 2018	
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 Moldova	UGS – N - 366	LA non FID
8.4	Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)	UGS – N - 371	A non FID
8.5	Retrofitting and development of the underground gas storage facility Târgu Mureș	UGS – N - 233	FID

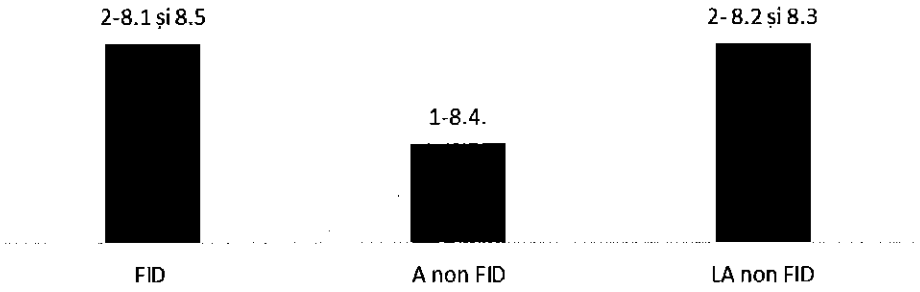


Chart 23- Status of Major Storage Projects

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	59	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	2025	Increasing the daily gas delivery capacity of the Ghercești storage facility
8.3	New underground storage facility in Moldova	80	2025	Increasing the gas storage facility capacity to ensure security of gas supply

No	Project	Estimated value mill. Euro	Completion deadline	Importance of the project
8.4	Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)	136	2024	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	87 (Phase 1 and 2)	2021 (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		**~ 0.48 billion Euro**		

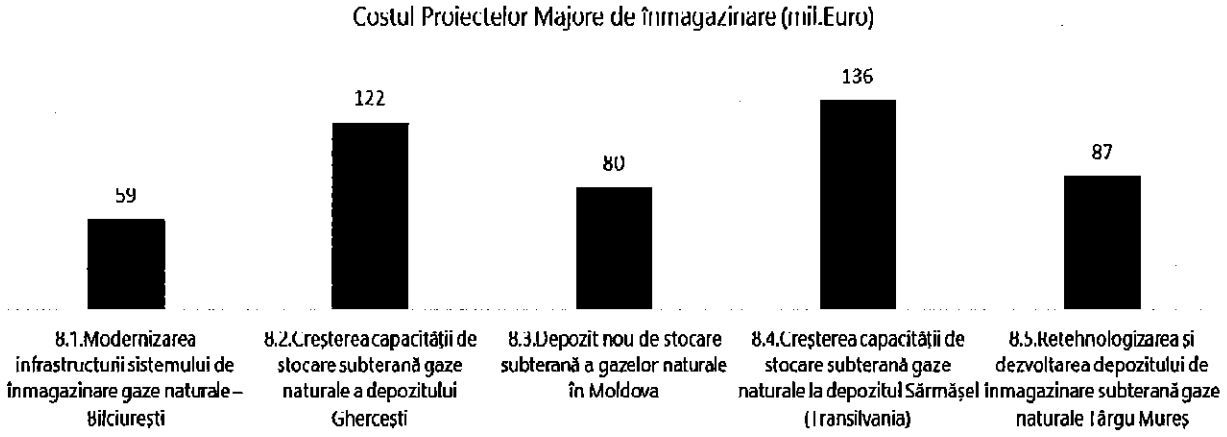


Chart 24 – Cost of major storage projects (mill. EURO)

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

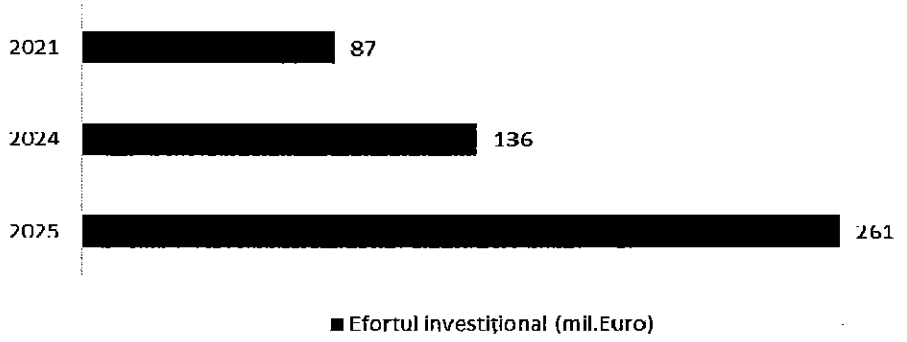


Chart 25- Investment effort – depending on the completion deadlines (mill. EURO)

Regarding the projects which are currently in the FID phase, namely the *Upgrading of the gas storage system infrastructure – Bilciurești and the Retrofitting and development of the*

underground gas storage facility Târgu Mureș Transgaz confirms that it has the necessary capacity to take over the relevant quantities, considering the discussions held with Romgaz and Depogaz 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 Moldova* in the LA non FID (FID 2021);
- *Increasing the storage capacity of the Sărmășel underground gas storage facility (Transylvania)* in the A non FID (FID 2019);

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

9. Analysis of Transgaz' strategic projects

9.1 Status of the Projects

According to the Final Investment Decision (FID) in the TYNDP 2015 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 2019-2028 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**	FID
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	A non FID
7.3	Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow at Isaccea	FID
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	FID

	to ensure the transmission capacities towards the Republic of Moldova	
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 Negru Vodă 1	FID
7.9	Interconnection of the gas transmission systems in Romania and in 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

Table 7 – Status of key projects for 2019-2028

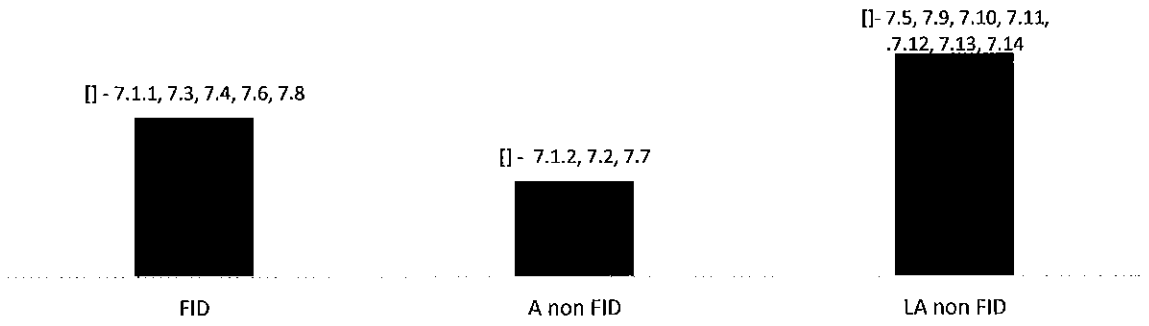


Chart 26 – Status of Transgaz key projects

Note

As compared to the 2018-2027 TYNDP Projects, 7.4 and 7.6 changed their status from A non FID to FID.

Project no.	Project name	Projects for which the Open Season

		procedure applies
7.1.1	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – **Phase 1**	x
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
7.3	Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow at Isaccea	X phase I
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	
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
7.7	Romania - Serbia Interconnection	
7.8	Upgrading GMS Isaccea 1 and Negru Vodă 1	
7.9	Interconnection of the gas transmission systems in Romania and in 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	

Table 8 – Projects for which the Open Season procedure applies

9.2 The cost of the projects

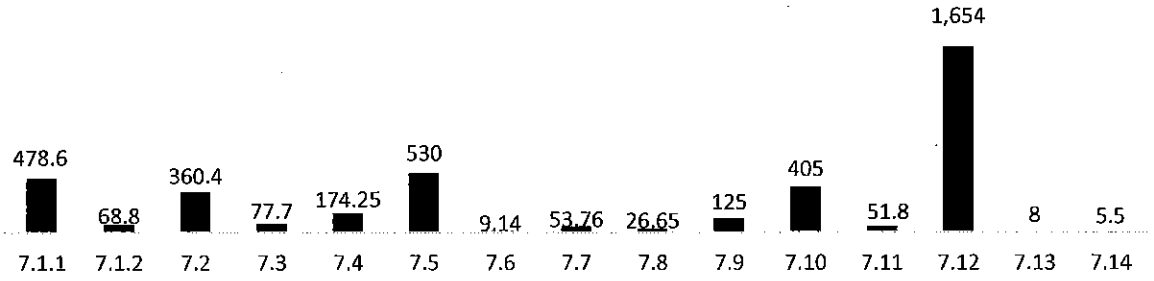


Chart 27-Cost of major projects (mill. Euro)

Summary of the major projects:

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
1	**7.1.1**	Development on the territory of Romania of the National Gas Transmission System on the **Bulgaria-Romania-Hungary-Austria Route (Phase I)**	478.6	2020	Ensuring a natural gas transmission capacity to Hungary of 1.75 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 third list of projects of common interest.	FID
2	**7.1.2**	Development on the territory of Romania of the National Gas Transmission System on the **Bulgaria-Romania-Hungary-Austria Route (Phase II)**	68.8	2022	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
3	**7.2**	Development of the **Southern Trasmission Corridor** on the territory of Romania for taking over natural gas from the Black Sea shore	360.4	2021	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	A non FID

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
					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.	
4	7.3	**Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow Isaccea**	**77.7** Phase 1: 8.8 Phase 2: 68.9	Phase 1: 2018 Phase 2: 2020	Transgaz has a great interest in implementing this project for the following reasons: *to eliminate the possibility of European Commission imposing extremely costly financial penalties.* We mention that this project is part of the first, second and third list of projects of common interest at EU level and will be carried out in two Phases.	FID
5	7.4	**Developments of the NTS in the Northeast 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
6	7.5	**Extension** of the bidirectional **gas transmission corridor Bulgaria–Romania–Hungary–Austria (BRUA-Phase III)***	530	2025	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
7	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
8	7.7	**Romania-Serbia Interconnection**	53.76	2020	Construction of an interconnection pipeline with Serbia to diversify sources of supply and increase energy security in the region.	A non FID
9	7.8	**Upgrading GMS Isaccea 1 and Negru Vodă 1**	26.65	2021	Upgrading the gas metering stations at interconnection points to increase the level of energy security in the region.	FID

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
10	7.9	**Interconnection** of the national gas transmission system with the natural gas transmission system of **Ukraine, Gherăeşti-Siret**	125	2025	Establishing an interconnection with Ukraine in the direction of Gherăieşti-Siret, 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
11	7.10	Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania	405	Stage 1 2022 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
12	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
13	7.12	Eastring-Romania	Phase 1: 1,297 Romania Phase 2: 357 Romania	Phase 1: 2025 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
14	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
15	7.14	Development of the SCADA system for the National Gas Transmission System	5.5	2023	Upgrading the natural gas transmission infrastructure by	LA non FID

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
					upgrading hardware and software architecture.	

- ***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	**7.1.1**	Development on the territory of Romania of the National Gas Transmission System on the **Bulgaria-Romania-Hungary-Austria Route (Phase I)**	478.6	2020	Ensuring a natural gas transmission capacity to Hungary of 1.75 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 third list of projects of common interest.	FID
2	**7.3**	**Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow Isaccea**	**77,7** Phase 1: 8.8 Phase 2: 68.9	Phase 1: 2018 Phase 2: 2020	Transgaz has a great interest in implementing this project for the following reasons: *to eliminate the possibility of European Commission imposing extremely costly financial penalties.* We mention that this project is part of the first, second and third list of projects of common interest at EU level and will be carried out in two Phases.	FID
3	**7.4**	**Developments of the NTS in the Northeast 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	**7.6**	**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	FID

No	Project no	Project	Estimated amount mill. Euro	Completion deadline	Importance of the project	Project status
					Black Sea offshore exploitation blocks.	
5	7.8	**Upgrading GMS Isaccea 1 and Negru Vodă 1**	26.65	2021	Upgrading the gas metering stations at interconnection points to increase the level of energy security in the region.	FID
	TOTAL FID projects:		**766.34 mill. EURO**			

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

Total estimated amount of A non FID projects:

No	Project no	Project	Estimated amlount mill. Euro	Complation 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)	68.8	2022	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

No	Project no	Project	Estimated amlount mill. Euro	Complation deadline	Importance of the project	Project status
2	7.2	Development of the **Southern Trasmission Corridor** on the territory of Romania for taking over natural gas from the Black Sea shore	360.4	2021	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.	A non FID
3	7.7	**Romania-Serbia Interconnection**	53.76	2020	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		**482.96 mill.EURO**			

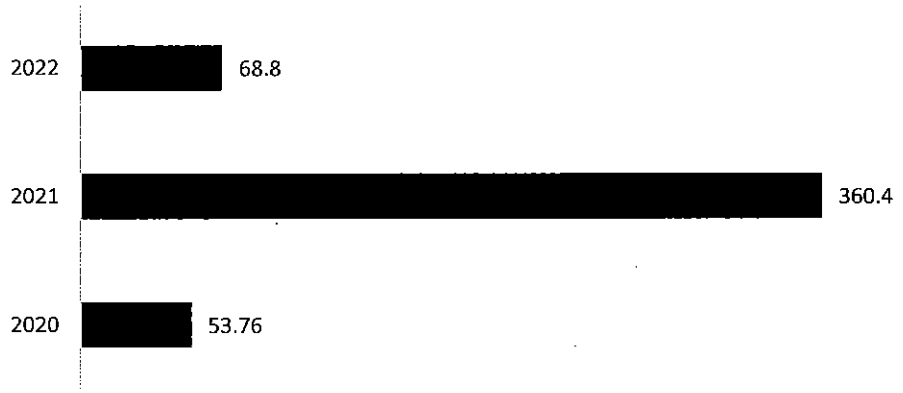


Chart 29 – Investment effort of Transgaz for A non FID projects depending on the estimated completion deadline (mill. Euro)

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

No	Status of the projects	Total estimated amount (mill.euro)
1	FID projects	766.34
2	A non FID projects	482.96
TOTAL FID and A non FID projects		**1,249.30**

Chart 30 – Investment effort of Transgaz for FID and A non FID projects depending on the estimated completion deadline (mill. Euro)

For the period 2019-2028 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	2025	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**	125	2025	Establishing an interconnection with Ukraine in the direction of Gherăieşti-Siret, 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 2022 Stage 2 2025	Increasing the natural gas transmission capacities in the North-West of Romania to ensure	LA non FID

No.	Project no	Project	Estimated value mill. Euro	Completion deadline	Importance of the project	Status of the project
				Stage 3 2026	the trends of consumption growth in the region.	
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
5	7.12	Eastring-Romania	Phase 1: 1,297 Romania Phase 2: 357 Romania	Phase 1: 2025 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
	TOTAL LA non FID projects		**2,779.30 mill. Euro**			

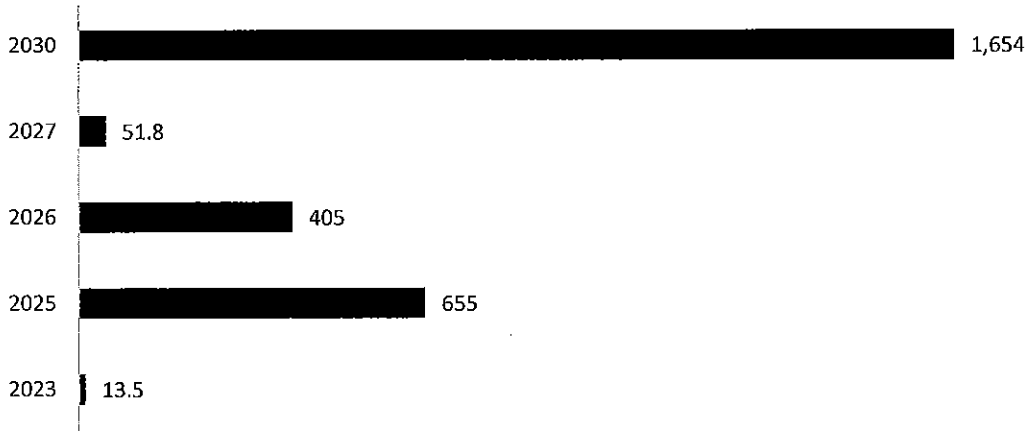


Chart 31 – Investment effort of Transgaz for LA non FID projects depending on the estimated completion deadline (mill. Euro)

9.3 Planning the investments related to Transgaz' Strategic Projects for the period 2019-2028

Objective name	D mm	L km	Updated estimated amount (Mil. Euro)	Achievements 2013 - 2018 Mil. Euro	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Proiect Status
Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania– Hungary- Austria Route	800	479	478,6	108,02	324,02	46,38	0,18								FID
	800	50	68,8	0,2	0,1	17,5	34	17							A non FID
Development on the Romanian territory of the Southern transmission Corridor for taking over gas from the Black sea shore	1000/ 1200	308,3	360,4	1,39	9,84	186,85	162,32								A non FID

Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow Isaccea	800	66	77,7	0,79	23,07	53,84									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	700	165,15	174,25	2,18	24,29	110,8	36,98								FID
Enhancement of the bi-directional gas transmission corridor Bulgaria - Romania-- Hungary-Austria (BRUA Phase III)	800	645*	530			0,5	1,5	132	132	132	132				LA non FID
Objective name	**D mm**	**L km**	**Estimated amount (Mil. Euro)**	**Achievements 2013 - 2018 Mil. Euro**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**Statut proiect**
Project for new NTS developments for taking over Black Sea gas	500	25	9,14	0,13	2,25	4,5	2,26								FID
Romania-Serbia Interconnection	600	85	53.76	0,11	3,2	50,45									A non FID
Upgrading GMS Isaccea 1 and GMS Negru Vodă 1			26,65	0,35	0,2	13,1	13								FID

Interconnection of the national gas transmission system with the gas transmission system of Ukraine in the Gherăești – Siret direction	700	130	125	0	0,4	1	1	0,1	45	45	32,5			LA non FID
Development/ Upgrading of the gas transmission infrastructure in the North-Western part of Romania			405	0	0,5	2,5	67	67	67	67	67	67		LA non FID
Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction			51,8	0	0,2	0,6	1,2	8,3	8,3	8,3	8,3	8,3	8,3	LA non FID
Eastring-Romania			1.654**	0	8,4	17,8	137,5	267,7	425,4	440	8,5	8,5	8,5	9	LA non FID
Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System			8	0	0	0,5	2,5	3	2					LA non FID
Development of the SCADA system for the National Gas Transmission System			5,5	0	0	0,5	1	2	2					LA non FID
Objective name	**D mm**	**L km**	**Estimated amount (Mil. Euro)**	**Achievements 2013 - 2018 Mil. Euro**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**Statut prolect**
TOTAL of which:			**4.028,60**	**113,17**	**396,47**	**506,82**	**460,44**	**497,10**	**681,70**	**692,30**	**248,30**	**83,80**	**16,80**	**9**	
TOTAL FID and A non FID PROJECTS			**1.249,30**	**113,17**	**386,97**	**483,42**	**248,74**	**17,00**							

- **** On certain sections, existing capacities will be used by upgrading the National Transmission System***
- *****1,654 million Euro is the estimated value of the project with completion deadline 2030. The table illustrates the split of the project until 2028 (1.331.3 Euro million).***

Table 9 – Planning of 2019-2028 key projects

The annual investment effort of SNTGN Transgaz SA by project completion date, the LA non FID projects included, is as follows:

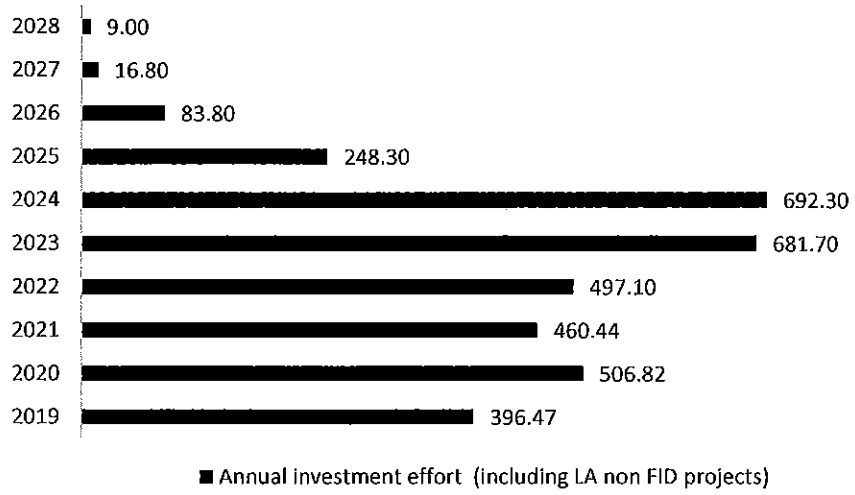


Chart 31 – Annual investment effort (the LA non FID projects included) -mil. Euro

The annual investment effort of SNTGN Transgaz SA by FID and A non FID projects completion date is as follows:

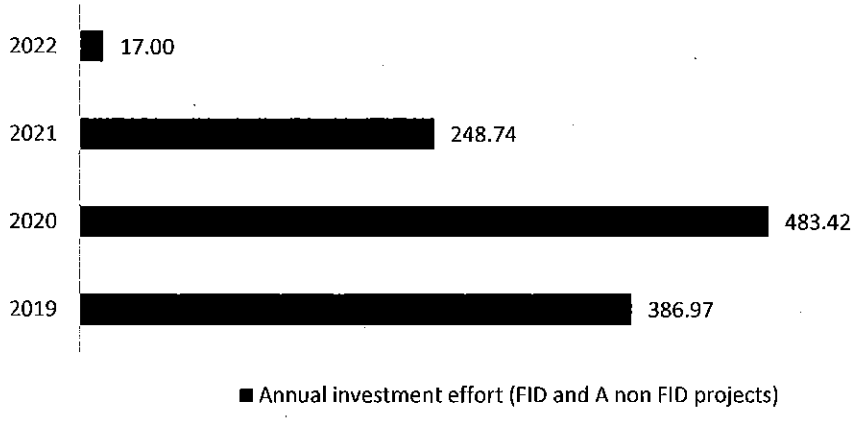


Chart 32- Annual Investment effort for the achievement of FID and non FID projects -mil. Euro

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 2018 ENTSOG TYNDP / 2019 – 2028 TYNDP

No.	Project code 2019 TYNDP	TYNDP project name	Project code 2018 TYNDP	2018 TYNDP project name
1	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
2	7.1.2.	Development on the Romanian territory of the National gas Transmission System on the Bulgaria – Romania – Hungary – Austria corridor – (Phase II)	TRA -N-1322	Development on the Romanian territory of the NTS (BG–RO-HU-AT) - Phase II

No.	Project code 2019 TYNDP	TYNDP project name	Project code 2018 TYNDP	2018 TYNDP project name
3	7.2.	Development on the Romanian territory of the Southern Corridor for taking over Black Sea shore gas	TRA-N-362	Development on the Romanian territory of the Southern Transmission Corridor
4	7.3.	Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow at Isaccea	TRA-N-139	Interconnection of the NTS with the DTS and reverse flow at Isaccea
5	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-N-357	NTS developments in North-East Romania
6	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
7	7.6.	Project on the new NTS developments for taking over Black Sea shore gas	TRA-N-964	New NTS developments for taking over gas from the Black Sea shore
8	7.7	Romania - Serbia Interconnection	TRA-N-1268	Romania-Serbia Interconnection
9	7.8	Upgrading GMS Isaccea 1 and Negru Vodă 1	TRA-N-1277	Upgrading GMS Isaccea 1 and GMS Negru Voda 1
10	7.9	Interconnection of the gas transmission systems in Romania		

No.	Project code 2019 TYNDP	TYNDP project name	Project code 2018 TYNDP	2018 TYNDP project name
		and in Ukraine in the Gherăești – Siret direction		
11.	7.10	Development/Upgrading of the gas transmission infrastructure in the North-Western part of Romania		
12.	7.11	Increase in the gas transmission capacity of the interconnection Romania-Bulgaria, in the Giurgiu-Ruse direction		
13.	7.12	Eastring-Romania	TRA-N-655	Eastring - Romania
14.	7.13	Monitoring system, data control and acquisition for the cathodic protection stations related to the National Gas Transmission System		
15.	7.14	Development of the SCADA system for the National Gas Transmission System		
16.		Project completed	TRA-F- 029	Romania-Bulgaria Interconnection (EEPR-2009-INTg-RO-BG)

Table 10 - 2019 TYNDP / 2018 TYNDP code comparison

Romania – Bulgaria interconnection project (TRA-F-029) – completed project

The Project for the Interconnection of the Gas Transmission Systems in Bulgaria and Romania on the Ruse-Giurgiu direction was carried out at the end of 2016 on the basis of the Memorandum of Understanding signed between BULGARTRANSGAZ EAD and SNTGN Transgaz SA on 01.06.2009.

PROJECT DESCRIPTION

The Interconnection Project comprises the following objectives:

- above ground pipeline (DN 500, PN 40 bar, L= 5,1 km) on the Romanian territory between the Gas Metering Station (GMS) Giurgiu and the Danube undercrossing point on the Romanian shore and the GMS in the vicinity of Giurgiu – the implementation was the responsibility of SNTGN Transgaz SA;

- above ground pipeline (DN 500, PN 40 bar, L = 15,4 km) on the Bulgarian territory between the Gas Metering Station (GMS) Ruse and the Danube undercrossing point on the Bulgarian shore and the GMS in the vicinity of Ruse – the implementation was the responsibility of Bulgartransgaz EAD;
- Danube undercrossing with two pipelines (DN 500, PN 50 bar), each section with a length of 2.1 km, representing the Main Pipeline and the Back-up Pipeline - the implementation task was shared between Transgaz and Bulgartransgaz

The estimated total eligible amount of the project was approximately € 23 million, broken down as follows:

- about Euro 11 million, for the Romanian side
- about Euro 12 million for the Bulgarian side

The project received funding from the European Commission (under the EEPR program, Financing Decision C (2010) 5962/06.09.2010) of max. Euro 4.5 million for the Romanian section and no more than Euro 4.1 million for the Bulgarian section

The European Commission funding was split by activities ranging from 36% to 40% of the estimated eligible amount.

For the Danube River undercrossing the two Beneficiaries - TRANSGAZ and BULGARTRANSGAZ agreed to undertake, on the basis of cooperation agreements, two procurement procedures as follows:
(a) for the Main Pipeline - under the Bulgarian Procurement Law
(b) for the Back-up Pipeline- in accordance with the public procurement law in Romania;

Both public procurement procedures were successfully completed by concluding works contracts with the Contractors who were declared winners of the procedure as follows:

On **06.04.2016**, the works contract was signed for the Danube undercrossing by the main pipeline, between TRANSGAZ - BULGARTRANSGAZ and SC HABAU PPS PIPELINE SYSTEMS SRL Ploieşti, Romania.

The operations related to the construction of the main pipeline were completed, the Minutes for the Commissioning was signed on 4.11.2016.

On **30.05.2016**, TRANSGAZ and BULGARTRANSGAZ signed the contract with the bidder who was declared the winner of the tender for the construction of the Danube undercrossing pipeline – the Association of INSPET SA, the leader - HABAU PPS Pipeline Systems SRL, as associate.

The operations related to the construction of the back-up pipeline were completed. The Minutes for the Commissioning was signed on 22.12.2016.

The interconnection - completed in 2016 from a technical point of view - became operational after the capacity allocation auctions were held, in accordance with Regulation (EU) No. 2013/984 establishing a Network Code on Capacity Allocation Mechanisms on 1 January 2017.

The parties signed an Interconnection Agreement - in accordance with Regulation (EU) no. 2015/703 laying down a network code for interoperability and data exchange rules - which provides both for the operation of the Ruse-Giurgiu interconnection point and for the related capacity allocation procedure.

The technical characteristics of the interconnection are:

- Maximum transmission capacity– 1.5 bcm/a;
- Minimum transmission capacity – 0.5 bcm/a;
- nominal pressure – 50 bar;
- operating pressure – 21-40 bar;
- Diameter of the interconnection pipeline – DN 500.

Objectives	**Status**
Gas Metering Station (GMS) Giurgiu	COMPLETED
Gas Metering Station (GMS) Ruse	COMPLETED
The line valve assembly and the above ground pipeline from GMS Giurgiu to the valve assembly on the Romanian shore of the Danube	COMPLETED
The line valve assembly and the above ground pipeline from GMS Ruse Ia to the valve assembly on the Bulgarian shore of the Danube	COMPLETED
The protection pipe and the placement of the optic fibre for data transmission, undercrossing the Danube river	COMPLETED
Connection of the optic fibre to the two GMS – Giurgiu and Ruse	COMPLETED
The Danube river undercrossing (the main pipeline and the back-up pipeline) MAIN PIPELINE BACKUP PIPELINE	 COMPLETED COMPLETED

9.6 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 **it 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 2019 – 2028 are from:

- own sources;
- attracted sources.

The value of the FID și A non FID Major Transgaz Projects for the period 2019-2028, estimated at approximately EUR 1.25 billion, will be 35% covered from own sources, and 65% from attracted sources.

SNTGN Transgaz SA endeavors, 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.

10. THE 2018 – 2021 NTS UPGRADING AND INVESTMENT PLAN

No.	Type of work	2018	2019	2020	2021
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				
1.1.3	GAS AND SMOKE DETECTION SYSTEM IN THE TURBO-COMPRESSOR HALL AT ȘINCA TCS				
1.1.4	REPLACEMENT OF THE GAS METERING STATION AT GMS ISACCEA 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 16" VASLUI - IAȘI GAS TRANSMISSION PIPELINE (VASLUI – MOGOȘEȘTI PIPELINE SECTION) – in the Bârnova forest and pressure tests				
2.1.2	Ø 28 " GĂNEȘTI - IDRIFAIA – COROI GAS TRANSMISSION PIPELINE				
2.1.3	Ø 12" NEGRU VODA – TECHIRGHIOL GAS TRANSMISSION PIPELINE - STAGE II (Pecineaga - Techirghiol pipeline section- revision 1)				
2.1.4	Ø 28" MRS SIDEX GALAȚI CONNECTION PIPELINE				
2.1.5	INSTALLATION OF THE PIG RECEIVING TRAP (TEMPORARY) DN 800 ON THE Ø32" BATANI – ONEȘTI PIPELINE, Bogdănești area				
2.1.6	PIPELINE SYSTEMATIZATION IN THE AREA OF THE MOȘU TECHNOLOGICAL NODE				
2.1.7	MODERNIZATION OF GAS SUPPLY TO PLOIEȘTI				
2.1.8	INSTALLATION OF THE PIG RECEIVING TRAP DN 500 MM P ȘENDRENI ALBESTI PIPELINE				
2.1.9	Reconstruction of the Vulcăniţa stream undercrossing by THE Ø28" PALTIN - VARF DIHAM AND Ø20" CS ȘINCA - STÂLP 89 PIPELINES, points 1,2,3 and 4 Vulcanița- river bank consolidation works				
2.1.10	REHABILITATION OF THE Ø20" HUREZANI – HAȚEG PIPELINE, HUNEDOARA: COUNTY UNDERCROSSING NATIONAL ROAD DN 66				
2.1.11	Ø 20" PLĂTĂREȘTI – BĂLĂCEANCA GAS TRANSMISSION PIPEPLINE				
2.1.12	SECURING WORKS FOR Ø32" ȘENDRENI - SILIȘTEA – BUCHAREST PIPELINE, Scortaru Vechi – Comăneasca area				
2.1.13	SECURING WORKS FOR DN 700, PLATOU IZVOR SINAIA – FILIPEȘTI PIPELINE, Talea - Breaza area (stage.II).				
2.1.14	INSTALLATION OF THE PIG RECEIVING TRAP AT POSADA FOR THE Ø20" STALP 89 - POSADA AND Ø20" POSADA – MOȘU PIPELINES				

No.	Type of work	2018	2019	2020	2021
2.1.15	REHABILITATION OF Ø20" HUREZANI – HATEG PIPELINE,. GORJ COUNTY AND HUNEDOARA COUNTY: CONSTRUCTION WORKS (VALVE ENCLOSURES, COUPLING AND PRESSURE DISCHARGERS)				
2.1.16	SECURING WORKS FOR THE CROSSING OF THE TÂRNAVA MICĂ RIVER BY THE DN 700 BAHNEA – IDRIFAIA GAS TRANSMISSION PIPELINE, Bahnea zone				
2.1.1.7	Ø 24" MASLOC - RECAŞ GAS TRANSMISSION PIPELINE - STAGE I, (part II - forest fund area)				
2.1.1.8	Ø 28² MOŞU - BUCIUMENI GAS TRANSMISSION PIPELINE				
2.1.1.9	Ø 10" CÂMPULUNG MOLDOVENESC - VATRA DORNEI GAS TRANSMISSION PIPELINE (Pojorata - Vatra Dornei pipeline section)				
2.1.20	Ø20" CRAIOVA - SEGARCEA - BĂILEŞTI – CALAFAT GAS TRANSMISSION PIPELINE, stage.I, Craiova - Segarcea pipeline section				
2.1.21	OLT RIVER UNDERCROSSING BY THE Ø 12" DRĂGĂŞANI - CARACAL Pipeline (gas supply connection of Caracal)				
2.1.22	Ø 32" CREVEDIA – PODIŞOR GAS TRANSMISSION PIPELINE				
2.1.23	Ø12'' MOINEŞTI – DĂRMĂNEŞTI PIPELINE DEVIATION, Dărmăneasca zone				
2.1.24	ARGEŞ RIVER CROSSING BY THE DN 500 SCHITU GOLEŞTI – TIGVENI PIPELINE, Valea Danului zone, stage.I and stage.II				
2.1.25	SECURING WORKS FOR THE CROSSING OF THE VEŢCA RIVER BY DN600 COROI – BORDOŞIU PIPELINE, Bordoşiu zone				
2.1.26	TISAUTI – BUCECEA PIPELINE DEVIATION, Salcea zone				
2.1.27	RIVER SHORE PROTECTION FOR Ø 20" BOTORCA - ARAD AND COROI – MASLOC PIPELINES, Zeicani zone				
2.1.28	Ø 12" MINTIA - BRAD – STE GAS TRANSMISSION PIPELINEI, stage.I MINTIA - BRAD				
2.1.29	SECURING WORKS FOR THE CROSSING OF THE IAZUL RIVER BY DN 500 ROTBAV-ŞINCA, DN 600 AND DN 700 BĂRCUŢ - ŞINCA PIPELINES, Toderiţa zone				
2.1.30	SECURING WORKS FOR THE Ø12 " Agârbiciu – SIBIU PIPELINE, Şeica Mare zone				
2.1.31	SECURING WORKS FOR THE UNDERCROSSINGCROSSING OF THE BOGDANA RIVER BY DN 800 ONEŞTI- HAN DOMNEŞTI PIPELINE, Bogdana zone				
2.1.32	SECURING WORKS FOR THE TRANSIT 3 PIPELINE Ceamurlia zone				
2.1.33	CONNECTION TO MRS COMĂNEŞTI 2 AND UNDERCROSSING CRINULUI ROAD BY DN 200 PIPELINE				
2.1.34	SECURING WORKS FOR THE TRANSIT 1 PIPELINE, Camena zone				
2.1.35	THE INTERCONNECTION OF THE JUPA COMPRESSOR STATION WITH THE NTS				
2.1.36	GAS TRANSMISSION PIPELINE PROTECTION Ø 10" TÂRGU OCNA - SLĂNIC MOLDOVA, Cerdac area, the county of Bacău				
2.1.37	INTERCONNECTION GAS TRANSMISSION PIPELINE BETWEEN Ø 10" TELINE - SIGHIŞOARA AND Ø 28" COROI - BĂRCUŢ				

No.	Type of work	2018	2019	2020	2021
2.1.38	SECURITY OF THE PIPELINES DN 200 OCNA MUREŞ - AIUD AND DN 250 OCNA MUREŞ - AIUD, Mirăslău AREA				
2.1.39	WORKS FOR THE SECURITY OF THE GAS TRANSMISSION PIPELINE DN 500 MĂNEŞTI - BRAZI PIPELINE I AND II, IN THE Stănceşti AREA				
2.1.40	GAS TRANSMISSION PIPELINE DN 500 SĂRMĂŞEL - BAIA MARE - SATU MARE, Sucutard AREA				
2.1.41	GAS TRANSMISSION PIPELINE FOR THE INTERCONNECTION OF MRS BROŞTENI TO THE NTS				
2.1.42	RESIZING THE GAS SUPPLY CONNECTION TO MRS FORD CRAIOVA				
2.1.43	SECURITY OF THE PIPELINE DN 350 LUNA - AIUD, DN 250 LUNA – OCNA MUREŞ (PIPE I) AND DN 250 LUNA -OCNA MUREŞ (PIPE II), Razboieni AREA				
2.1.44	SECURITY OF THE PIPELINE DN 200 CORNATEL - AVRIG, Cornatel – Sacadate AREA				
2.1.45	SECURITY OF THE PIPELINE DN 500 MEDIEŞU AURIT - ABRAMUT, Culciu Mare AREA				
2.1.46	RESTORATION OF THE UNDERCROSSING OF THE STREI RIVER BY THE E WEST2 AND WEST 3 PIPELINES, Totia AREA				
2.1.47	FENCING OF THE PIPELINE GROUP ON THE MOGOSESTI – LETCANI PIPELINE AND FENCING THE VALVE GROUP ON THE VASLUI – IASI PIPELINE				
2.1.48	UNDERCROSSING OF THE DAMBOVITA RIVER BY THE INEL BUCURESTI PIPELINE, Balaceanca AREA				
2.1.49	SECURITY OF THE PIPELINE Ø 8" CONNECTION PM ALAMOR, in THE Alamor AREA				
2.1.50	SISTEMATIZATION AND OPERATIONAL SECURITY INCREASE PF THE NTS INFRASTRCTURE IN THE AREA TG. MURES - UNGHENI - CORUNCA - COROI - ERNEI - REGHIN				
2.1.51	RECLASSIFICATION OF THE PIPELINE DN 500 GIURGIU-PODISOR BY THE PRESSURE TEST, MOUNTING AFTER PROJECTION REGULATION OF THE MRS GIURGIU AND REPLACEMENT OF THE PIPELINE SECTION INSIDE THE CMID FRATESTI				

No.	Type of work	2018	2019	2020	2021
2.1.52	PIPELINE INTERCONNECTION IN THE SARMAS - VEST III DIRECTION IN TN BAND				
2.2.	INCREASING NTS TRANSMISSION CAPACITY				
2.2.1	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				
2.2.1.1	Ø 28" ONEŞTI - GHERAIEŞTI – LEŢCANI 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	ARCHAEOLOGICAL WORKS				
2.2.2	DEVELOPMENT ON THE ROMANIAN TERRITORY OF THE NATIONAL GAS TRANSMISSION SYSTEM ON THE BULGARIA – ROMANIA – HUNGARY – AUSTRIA CORRIDOR – PHASE 1				
2.2.2.1	PIPELINE EXECUTION WORKS (Phase 1)				
2.2.2.2	COMPRESSOR STATIONS EXECUTION WORKS (Podişor, Bibeşti, 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	ARCHAEOLOGICAL SURVEILLANCE WORKS				
2.2.2.7	EXCAVATIONS FOR INTRUSIVE ARCHEOLOGICAL DIAGNOSIS				
2.2.2.8	EXCAVATIONS FOR PREVENTIVE ARCHEOLOGICAL RESEARCH				
2.2.2.9	THE FINANCIAL AUDIT DEPARTMENT OF THE BRUA PROJECT PHASE I				
2.2.2.10	SERVICES WITH THE NATIONAL MEOTOROLOGICAL ADMINISTRATION				
2.2.2.11	EXPENSES WITH THE RESTORATION OF THE FORESTRY VEGETATION				
2.2.2.12	SERVICES FOR CAPITALIZATION OF THE STANDING TIMBER				
2.2.3	DEVELOPMENT ON THE ROMANIAN TERRITORY OF THE SOUTHERN CORRIDOR FOR TAKING OVER BLACK SEA SHORE GAS (Black Sea shore – Podişor)				
2.2.3.1	ARCHAEOLOGICAL WORKS				
2.2.4	THE INTERCONNECTION OF THE NATIONAL GAS TRANSMISSION SYSTEM WITH THE INTERNATIONAL GAS TRANSMISSION PIPELINE T1 AND REVERSE FLOW ISACCEA				
2.2.4.1	BUILDINGS				
2.2.4.2	ELECTRICAL INSTALLATIONS AND AUTOMATION				
2.2.4.3	INTEGRATED SYSTEM FACILITY MONITORING				
2.2.5	NEW NTS DEVELOPMENTS FOR TAKING OVER BLACK SEA GAS (VADU - T1)				

No.	Type of work	2018	2019	2020	2021
2.2.6	*REINFORCEMENT OF THE ROAMNIAN GAS TRANSMISSION SYSTEM BETWEEN ONEȘTI-ISACCEA AND REVERSE FLOW AT ISACCEA – PHASE 2 (INTERCONNECTION OF THE GAS TRANSMISSION SYSTEM WITH THE INTERNATIONAL TS AND REVERSE FLOW AT ISACCEA) – PHASE 2 UPGRADING GCS ONESTI AND UPGRADING GCS SILISTEA*				
2.2.7	*INTERCONNECTION OF THE GAS TRANSMISSION SYSTEM WITH THE SIMILAR GAS TRANSMISSION SYSTEM OF SERBIA (INCLUDING POWER SUPPLY, CATHODIC PROTECTION AND OPTIC FIBRE)*				
2.2.7.1	*ARCHAEOLOGICAL WORKS*				
2.2.8	*NTS INTERCONNECTION WITH THE INTERNATIONAL TRANSMISSION SYSTEM AND REVERSE FLOW AT ISACEA – STAGE 2 – NT WORKS SENDRENI - EXISTING*				
2.2.8.1.	*BUILDINGS*				
2.2.8.2	*ELECTRICAL INSTALLATIONS AND AUTOMATION*				
2.3	***SURFACE CONSTRUCTION AND INSTALLATION WORKS FOR MRS (Annex 3)***				
2.4	***CATHODIC PROTECTION STATIONS (Annex 4)***				
2.5	***SURFACE INSTALLATION AND CONSTRUCTION WORKS FOR ODORIZATION (Annex 5)***				
2.6	***WORKS AT GAS TRANSMISSION PIPELINES LOCATING IN RISK-BEARING AREAS (Annex 6)***				
3	*ELECTRIC INSTALLATIONS AND NETWORKS*				
4	*LAND PROCUREMENT*				
5	*NTS ACCESS WORKS*				
6	*NTS DEVELOPMENT ACCORDING TO LAW 123/2012 (UPDATED) ART 130, AL. E^1 AND E^2*				

PMDI – Annex 1 – THE PROGRAMME SCADA AND TECHNOLOGICAL NODES AUTOMATIONS

No.	Type of work	2018	2019	2020	2021
1	Racova Technological Node				
2	Drăgășani Technological Node				
3	Bacia Technological Node				
4	Recaș Technological Node				
5	Moisica Technological Node - automation works				
6	Feliceni Technological Node - automation works				
7	Lazarești Technological Node - automation works				
8	ABBNGC8206 gas chromatograph relocation from SMIR Mănești to Mănești TN and the adding of additional flow				
9	Upgrading technological node Bogata III – power supply to the actuating, automation and facility surveillance components,				
10	Technological node Gheraesti – Power supply of the actuation, automation and surveillance components				

No.	Type of work	2018	2019	2020	2021
11	Upgrading TN Schitu Golesti – mounting pig station				

PMDI – Annex 2 – DATA ACQUISITION CONTROL SYSTEM

No.	Type of work	2018	2019	2020	2021
1	***SCADA SYSTEM***				
1.1	Integration of GMS in the SCADA System				
1.2	Supplementation of Scada HIGH-LEIT licence for terminal server				
2.	***SCADA AND TECHNOLOGICAL NODES VALVE ENCLOSURE***				
2.1	**SCADA valves**				
2.1.1	R6 + R43 Lutita valve				
2.1.2	R53 Sarmisegetusa valve				
2.2	**Technological nodes**				
2.2.1	Feliceni				

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

No.	Type of work	2018	2019	2020	2121
1	Isalnita MRS				
2	MRS - Lot 3				
3	Re-location, re-sizing and field adaptation of the technological installation from MRS Supercom Afumați to MRS Dragomirești				
4	Replacement of technological installations at the Timișoara I MRS				
5	Modernization of MRS Nadrag				
6	Modernization of MRS Chisineu Cris				
7	MRS Clinceni - Improvement of metering system by supplementing the technological installation with appropriate elements/equipment				
8	MRS DEJ II				
9	Modernization and adaptation to field of MRS Suceava				
10	**Field adaptation:**				
10.1	MRS Fălticeni				
10.2	MRS Izvin				
11.	Modernization of gas flow metering system at GMS Isaccea Transit 3 and GMS Negru Voda Transit 3				

No.	Type of work	2018	2019	2020	2121
12.	Connection of the electronic commercial metering system with the process gas chromatographs orifice plate				
13	Upgrading, relocation MRS Bistrita and NTS connection				
14	Upgrading and replacement of technological installation in the MRS Miercurea Ciuc				
15	Filtering/separating installation in MRS SIDEX Galati				
16	Relocation and adaptation of the land of the technological installation MRS poroterm Orastie on the location of MRS Baru				
17	Upgrading MRS Ganesti				

PMDI – Annex 4 – CATHODIC PROTECTION STATIONS

No.	Type of work	2018	2019	2020	2021
1	Cathodic protection station Marsa				
2	Cathodic protection station Sibiu 2				
3	Cathodic protection station in the area of PM Ilimbav				
4	Cathodic protection station Vădeni, the county of Gorj				
5	Cathodic protection station Bogatu Român				
6	Cathodic protection station on the Coroi – Mașloc pipeline, the area of Craciunelul de Jos - SPC Craciunelu 2				
7	Power supply installation at CPS Gearmata Vii				

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

Plan item no.	Type of work	2018	2019	2020	2021
1	Adaptation to field of the odorization installations				

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

Plan item no.	Type of work	2018	2019	2021
1	*WORKS FOR SECURING GAS SUPPLY CONNECTON PIPELINE Ø 10² SRM BREAZA*			

2	*WORKS FOR SECURING* ***Ø8² CORNATEL - AVRIG*** *PIPELINE, Avrig zone*			
3	*WORKS FOR SECURING GAS SUPPLY CONNECTON PIPELINE MRS* ***RĂCĂCIUNI,*** *Dumbrava Tourist Complex zone.*			
4	*WORKS FOR SECURING GAS SUPPLY CONNECTON PIPELINE MRS* ***BRĂILA,*** *the Agricultural Farm.*			
5	*WORKS FOR SECURING* ***Ø8" OCNA MURES – AIUD*** *PIPELINE, Decea zone*			
6	*WORKS FOR SECURING GAS TRANSMISSION PIPELINE* ***Ø20" HAŢEG - DEALUL BABII - PAROSENI,*** *Dealul Babii zonE, Hunedoara County*			
7	*WORKS FOR SECURING Ø 10"* ***FRASIN - SPĂTĂREŞTI*** *PIPELINE, Spătăreşti zone*			

Note: The 2018 Upgrading and Investment Plan was approved based on the Resolution of the Board of Administration no 1 of 18 January 2019.

[redacted] Works not completed in 2018, which are in progress in 2019

Within the PMDI for 2019 and estimates for the period 2020-2021, investments in NTS developments were included in accordance with the provisions of Law 123/2012, investments to ensure the expansion of the National Transmission System in areas with newly established distribution systems. According to art. 151 of the Law 123/2012, the transmission system operator has the obligation to finance the expansion works under economic efficiency conditions. 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, AL. E1 and E2, as follows***:

- thousand lei -

	REB 2019	**Estimated 2020**	**Estimated 2021**
NTS Development in line with law 123/2012	**150,000**	**350,000**	**400,000**

The amounts included in the NTS Development Plan 2019-2028 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 no 123/2012 and of Order ANDRE no 82/2017.

11. 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 neighboring 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 neighboring countries.

By achieving the objectives set in **the 2019-2028 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 2028 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 EUR 4.03 billion (of which EUR 1.25 billion 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, will be 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 favorable conditions for developing and attracting foreign investments.

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Ion STERIAN

Deputy Director - General
Grigore Târsac

Chief Financial Officer
Marius Lupean

Director of Strategy and Corporate Management Division
Ghidiu Elisabeta

List of figures, charts and tables

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	The group of projects for the staged increase of the Bulgaria – Romania – Hungary –Austria bi-directional transmission corridor capacity
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 Azerbaidjan-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

Annexes: Maps and technical specifications

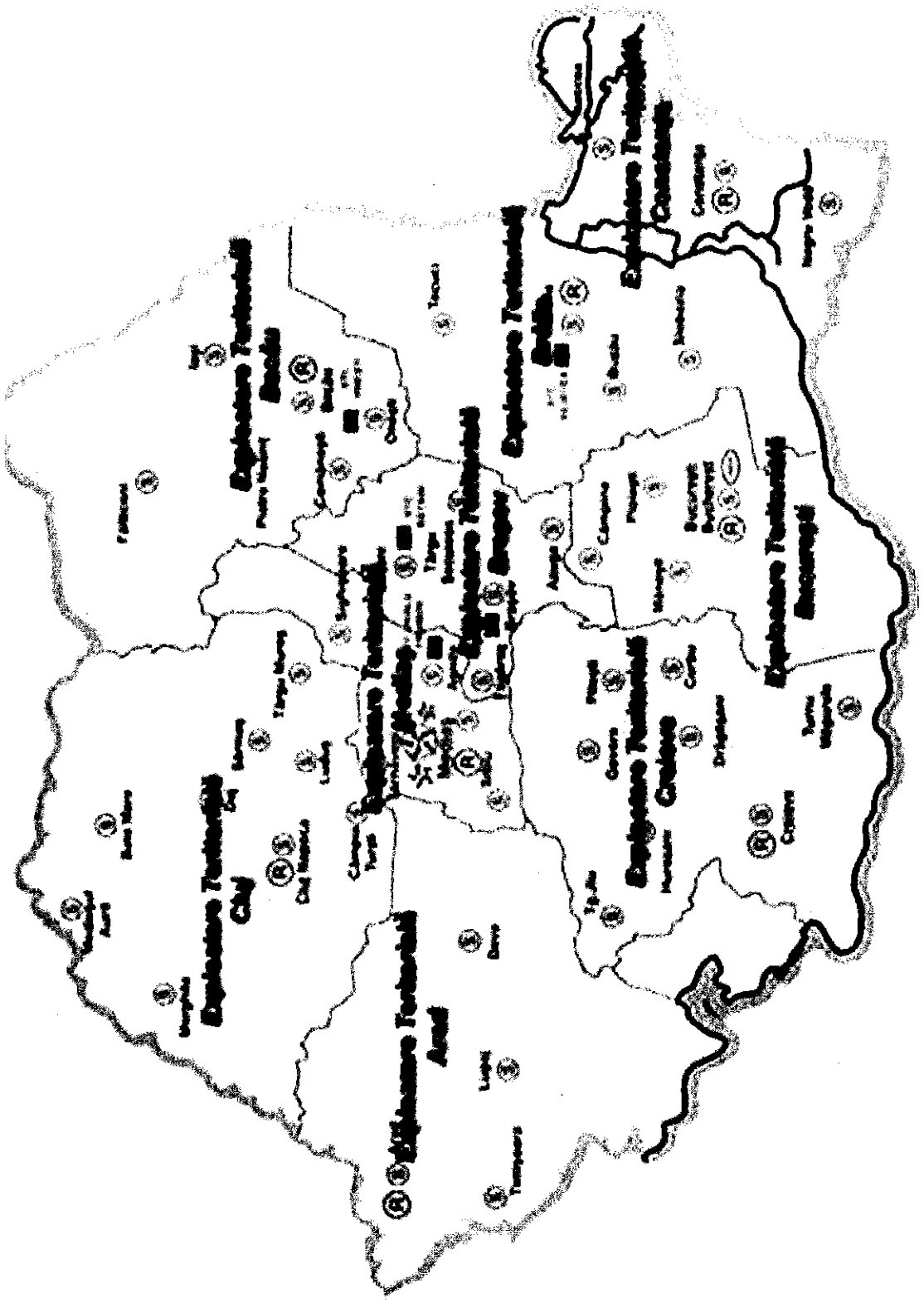

Figure 14- SNTGN Transgaz SA Mediaş territorial map

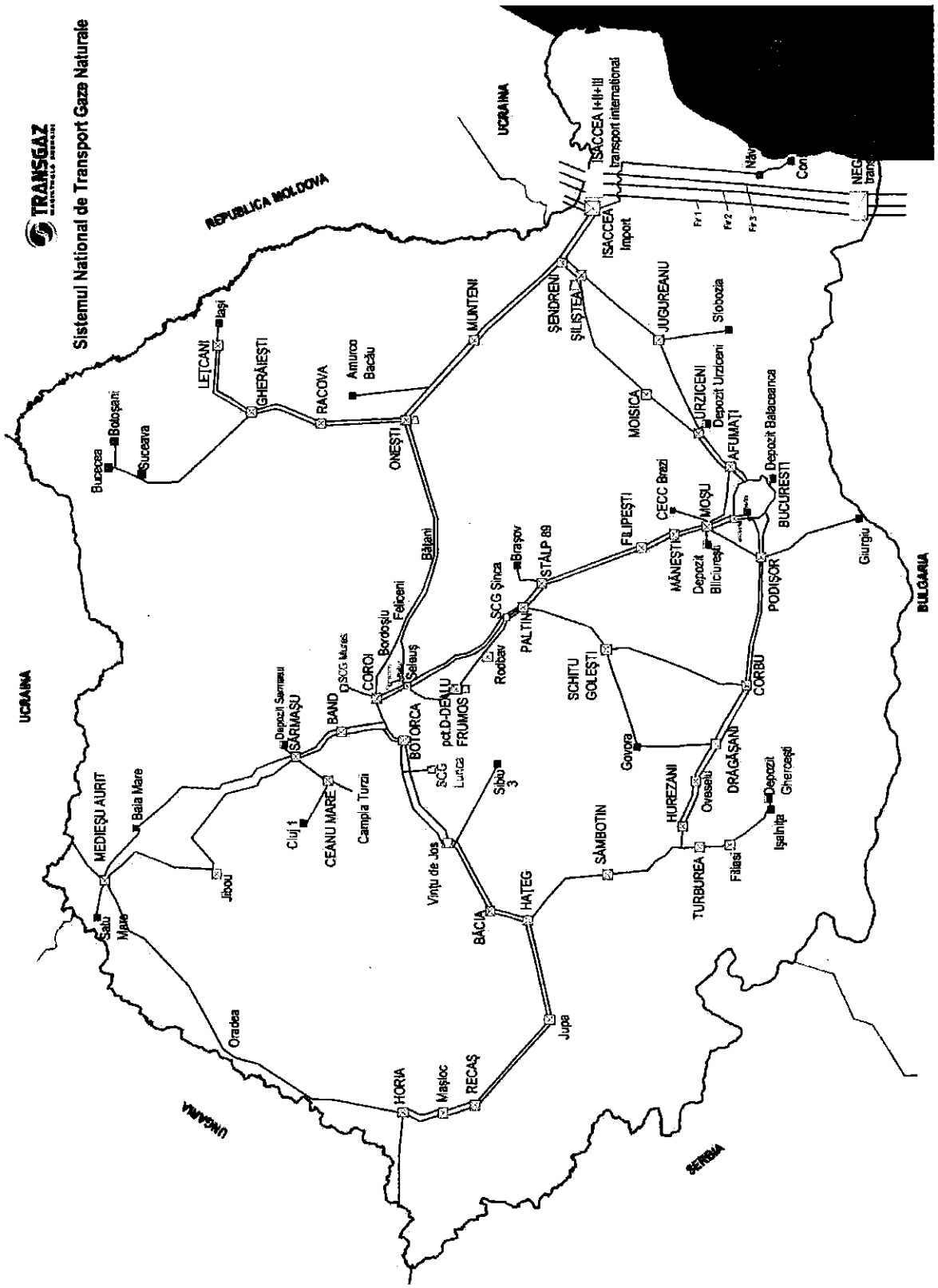

Figure 15- *NTS map*

National Gas Transmission System features

Main components of the National Gas Transmission System
13,381 km of main transmission pipelines and gas supply connections, of which 370 km international transmission pipelines
▪ 1,130 gas metering regulating stations
▪ 58 valve control stations (VCS, TN);
▪ 7 import gas metering stations
▪ 4 Metering stations located on the transit pipelines (GMS);
▪ 3 gas compressor stations (GCS);
▪ 1,039 cathodic protection stations (CPS);
▪ 902 odorization stations (GOS).

Table 11 – Main NTS elements on 31.12.2017

Analysis of main NTS facilities from life span perspective			
Life span	**Transmission pipelines (km)**	**Supply connections (km)**	**Number of metering regulating stations (Directions)**
> 40 years	6,628	350	149
30 - 40 years	2,001	164	60
20 -30 years	692	302	252
10-20 years	1,505	859	575
< 10 years	760	120	201
TOTAL	**11,586**	**1,795**	**1,130 MRSs (1,237 measuring directions)**
	13,381		

Table 12 – Analysis of main NTS facilities form life span perspective

Technical status of compressors			
CS	**COMPRESSOR**	**Month/year PIF**	**TECHNICAL STATUS**
VINŢU	G1(3.2 MW)	III 1966	The compressors are physically worn and torn. If from the technological perspective, in the new context of gas flows in the NTS, the station would have to be operational, a complete modernization of the installations and the replacement of the existing assemblies will be required.
	G2 (3.2 MW)	III 1966	
ŞINCA	G1 (3.2 MW)	II 1974	Compressor 1 and 2 (station 1) are operational. Station 1 was modernized during 2010-2013 without the changing of the compressors. Compressor 3 and 4 (station 2) were installed under the 2015 modernization plan (PIF 15.12.2015)
	G2 (3.2 MW)	II 1974	
	G3 (4.6 MW)	XII 2015	
	G4 (4.6 MW)	XII 2015	
DEALU FRUMOS	G1 (0.75 MW)	VI 1987	The compressors are technically outdated, activity being suspended. If technologically, in the new context of NTS gas flows, the station will have to be functional, a general overhaul and eventually a capital repair will be required, depending on the result of the revision.
	G2 (0.75 MW)	XI 1987	
	G3 (0.75MW)	XI 1987	
	G4 (0.75 MW)	XII 1987	
ONEŞTI	G1 (3.2 MW)	VIII 1976	Operational; the technological installation was modernized under the 2010-2015modernization plan.
	G2 (3.2 MW)	IV 2007	
SILIŞTEA	G1 (3.2 MW)	XII 1980	Modernization of the station is in progress through the replacement of the existing compressors and compressor installations.
	G2 (3.2 MW)	XII 1980	

Table 13 – Technical status of compressors

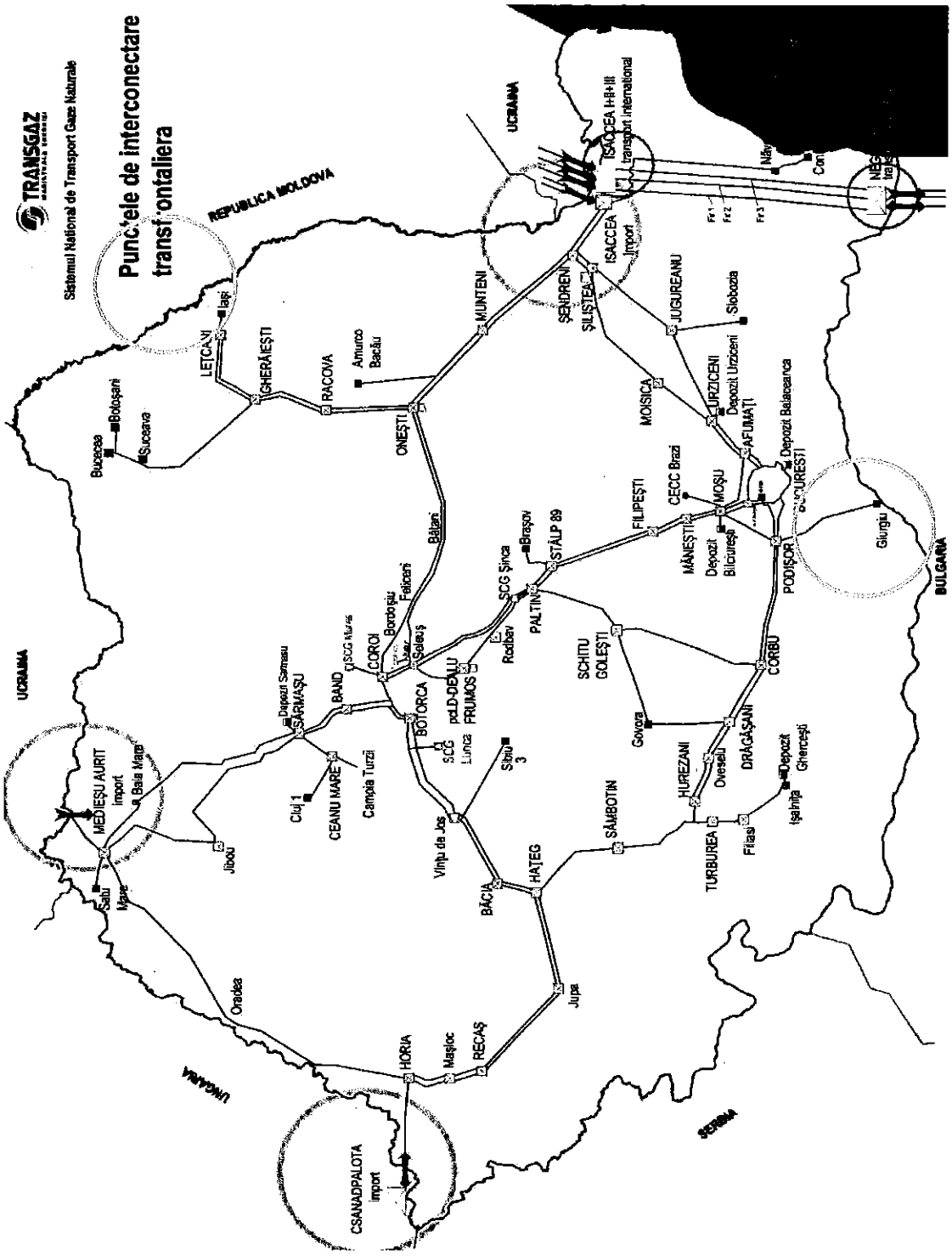

Figure 16- NTS cross-border interconnection points

Technical features of the cross-border interconnection and international gas transmission pipelines

Features of cross-border interconnection pipelines	
UKRAINE	**Orlovka (UA) – Isaccea (RO)** DN 1000 Capacity = 8.6 bcm/a P_{max} = 55 bar
	Tekovo (UA) – Medieşu Aurit (RO) DN 700 Capacity = 4.0 bcm/a P_{max} = 70 bar
HUNGARY	**Szeged (HU) – Arad(RO)- Csanadpalota** DN 700 Capacity = 1.75 bcm/a P_{max} = 63 bar
MOLDOVA	**Ungheni (MO) – Iaşi (RO)** DN 500 Capacity = 1.5 bcm/a P_{max} = 50 bar
BULGARIA	**Ruse (BG) – Giurgiu (RO)** DN 500 Capacity = 1.5 bcm/a P_{max} = 40 bar

Table 14 – Technical features of cross-border interconnection pipelines

Features of international gas transmission pipelines
-the dedicated pipelines are not connected to the National Gas Transmission System-

International gas transmission for Bulgaria	
LINE I connected to the NTS:	DN 1000 L = 183.5 km Technical capacity = 6.1 bcm/a
International gas transmission for Turkey, Greece, Makedonia – dedicated pipelines, which are not connected to the NTS	
LINE II:	DN 1200 L = 186 km Technical capacity = 9.6 bcm/a
LINE III:	DN 1200 L = 183.5 km Technical capacity = 9.7 bcm/a

Table 15 – Technical features of the international gas transmission corridors

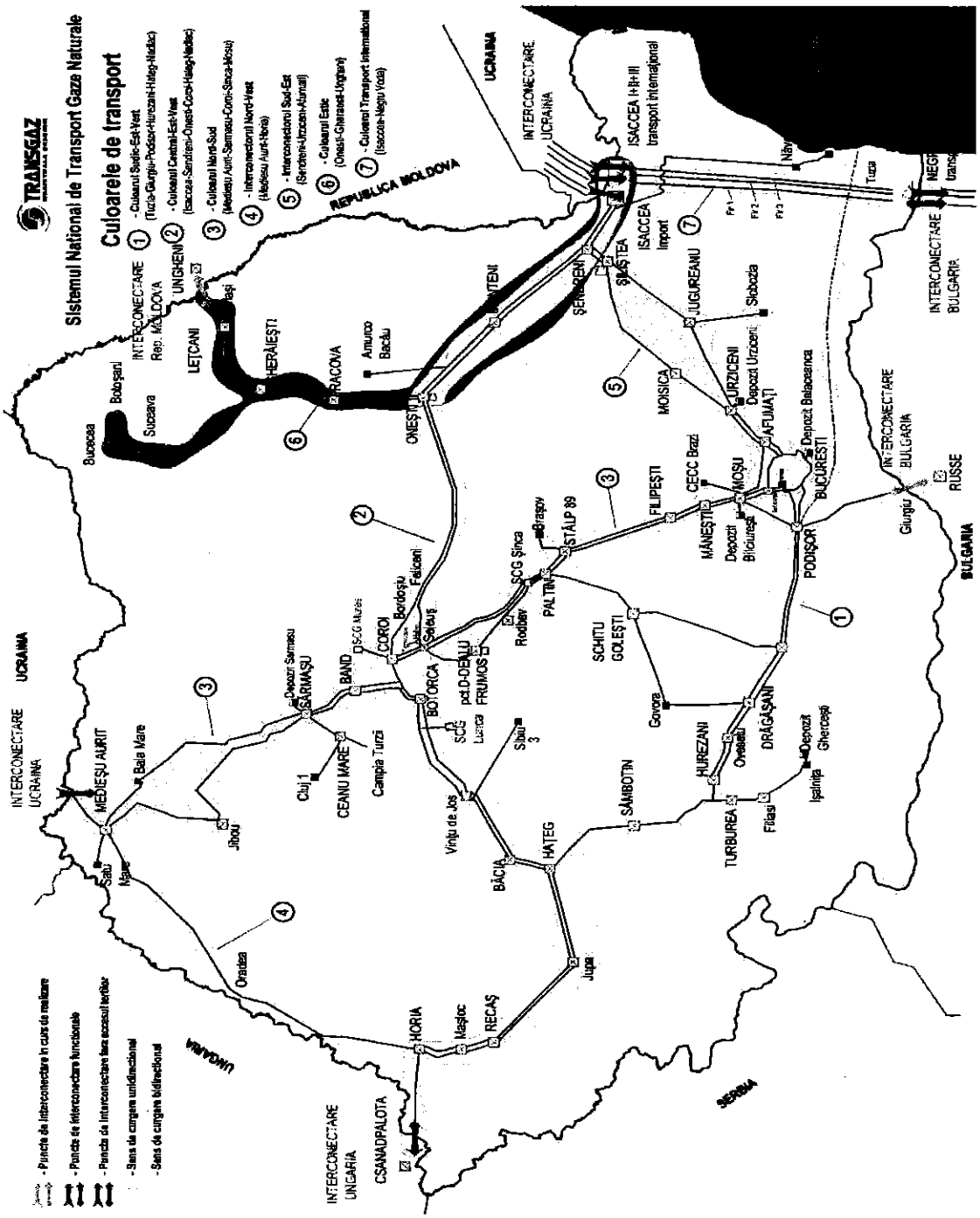

Figure 17 – NTS gas transmission corridors

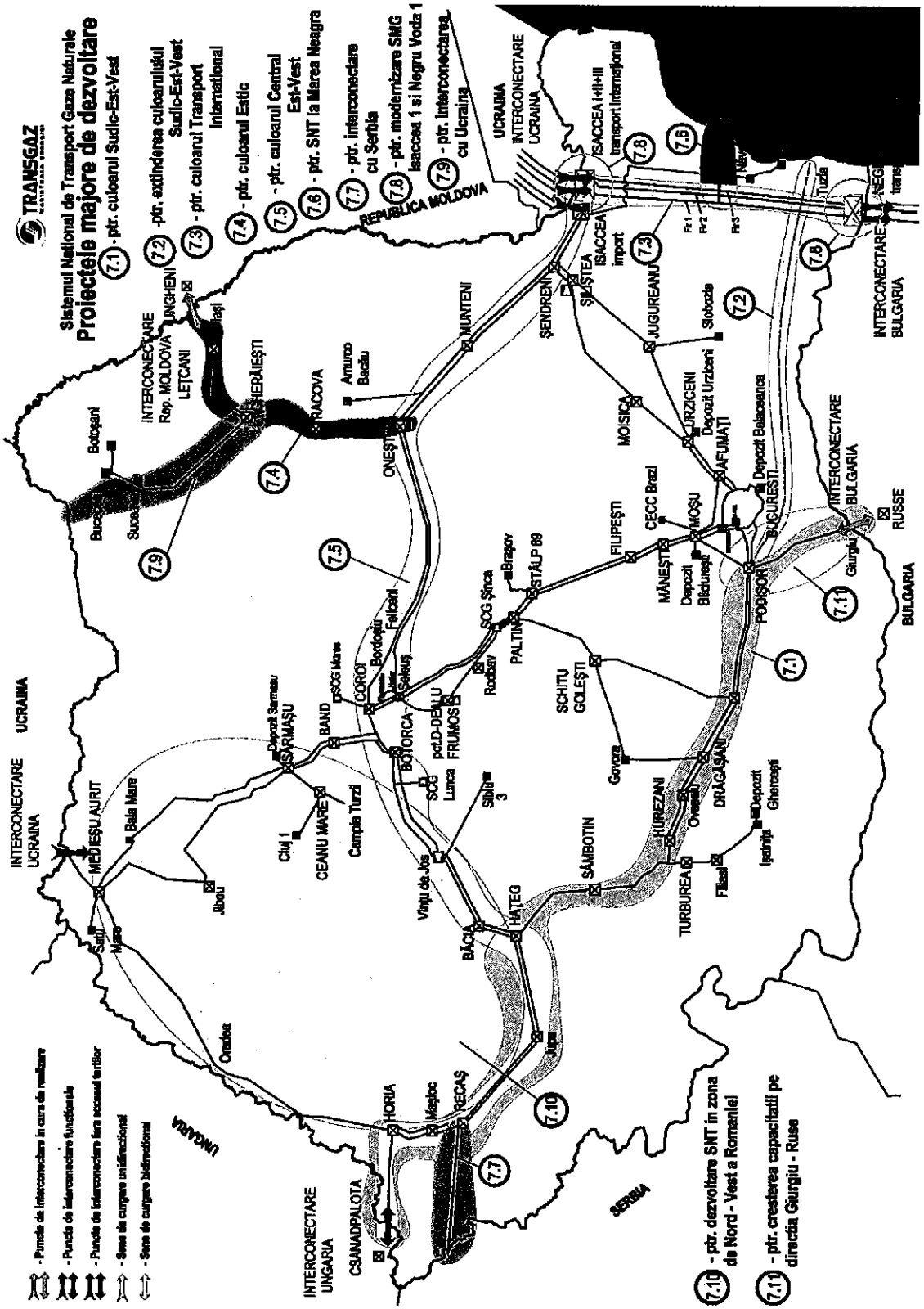

Figure 18- Map of major NTS projects

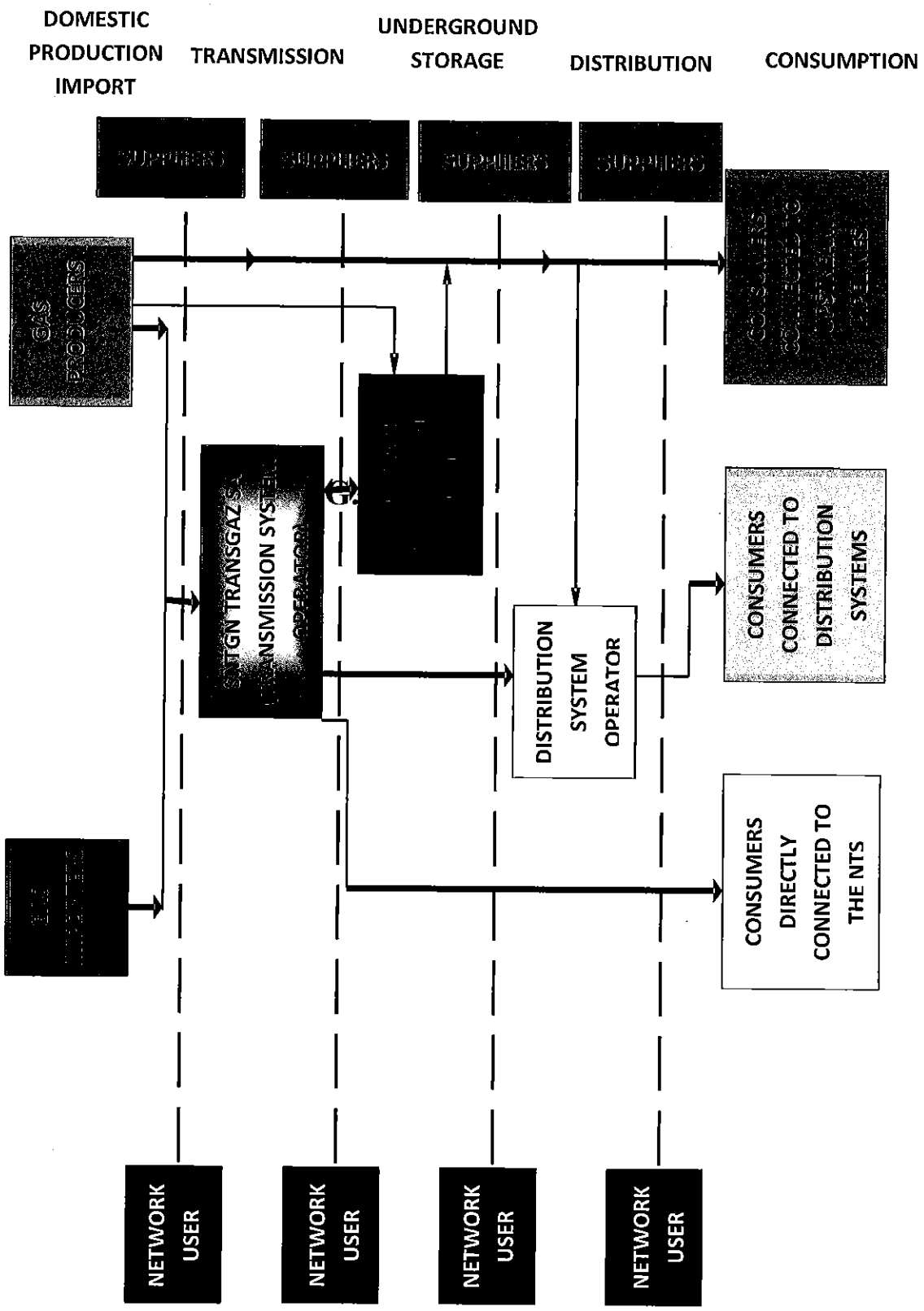

Figure 19 – The Romanian gas market

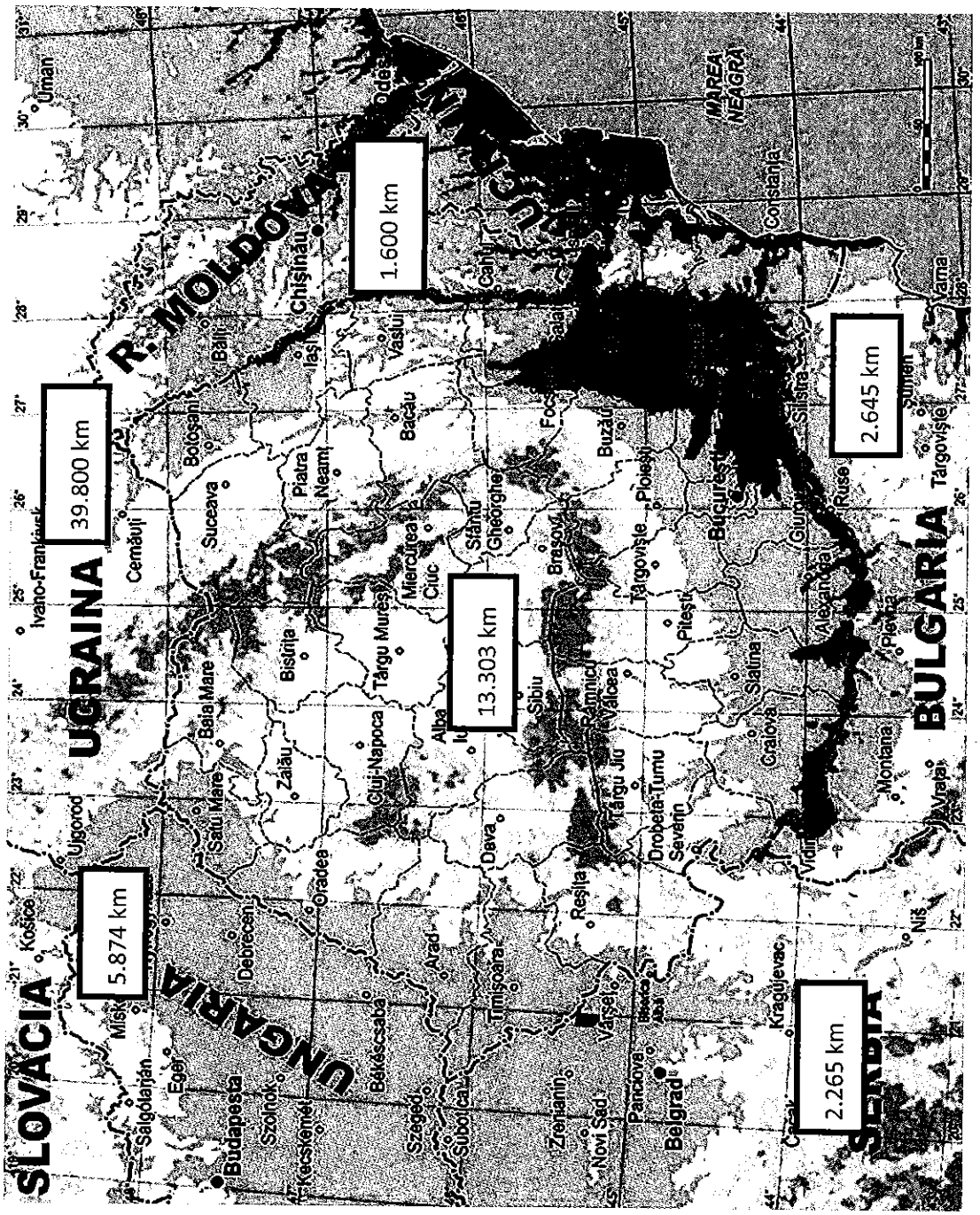

Figure 20 - Map of Romania`s neighboring countries and lengths of gas transmission systems