Translation from Bulgarian

CONTROL P EOOD
1421 Sofia
2 Dragan Tsankov Blvd.
tel.: (02) 658-175

ENVIRONMENT IMPACT STATEMENT ON PROJECT

"GASIFICATION OF THE TOWN OF GORNA ORYAHOVITSA"

HEAD OF TEAM:
/ Kr. Petrov, Asst. Prof., DSc (Eng)/

GENERAL MANAGER:
/ St. Doncheva, MSc. (Eng) /

October 1998

Sworn translator: Andrey M[illegible]v

AUTHORS OF THE ENVIRONMENT IMPACT STATEMENT (EIS)

The Environmental Impact Statement on the "Gasification of Gorna Oryahovitsa" project has been developed by a team of experts of "CONTROL P EOOD" company, Sofia 1421, 2 Dragan Tsankov Blvd., University of Architecture, Construction and Geodesy, general manager Svetla Doncheva, tel.: 658 175.

I. LIST OF LICENSED EXPERTS WORKING THE EIS

No.	Expert	Participation	Signature
1	Krasimir Velkov Petrov, Asst.Prof., DSc. (Eng), License No.271/18.10.1996: waters, geological base, terrain, soils	General editing, it.1, it.2, it.3.1, it.3.2, it.3.3, it.3.4, it.3.6, it3.7, it.3.9, it.4, it.5, it.6, it.7, it. 8, it.9, it.10	
2	Petar Georgiev Petrov, M.Sc. (Eng), License No.218/25.09.1996: atmospheric air, noise, vibrations, harmful radiation	it.3.1, it.3.5, it.4, it.9, it.10	
3	Ilia Petrov Angelov, M.Sc. (Eng), License No.40/1996: vegetable kingdom	it.3.8, it.10	
4	Dr. Ilia Ivanov Ivanov, License No.528/1997: health protection zones and health hazards	it.4	

II. CONSULTANTS

1. Svetla Marinova-Garvanska, Prof., PhD (Agr.), License No.310/1996: soils, wastes

HEAD OF TEAM: / Kr. Petrov, Asst. Prof., DSc (Eng)/

GENERAL MANAGER: / St. Doncheva, MSc. (Eng) /

DECLARATION

1. I, the undersigned Krasimir Velkov Petrov, Asst.Prof., DSc. (Eng), holding License No.271/18.10.1996, issued by the Ministry of Environment and Water of Bulgaria(MEW)
2. I, the undersigned Petar Georgiev Petrov, M.Sc. (Eng), holding License No.218/25.09.1996, issued by the Ministry of Environment and Water of Bulgaria.
3. I, the undersigned Ilia Petrov Angelov, M.Sc. (Eng), holding License No.40/1996, issued by the Ministry of Environment and Water of Bulgaria
4. I, the undersigned Dr. Ilia Ivanov Ivanov, holding License No.528/1997, issued by the Ministry of Environment and Water of Bulgaria

DECLARE:

1. I possess the necessary professional qualifications and competence for working on the Environment Impact Statement (EIS)
2. I have not participated in the preliminary study and the development of the project "Gasification of the town of Gorna Oryahovitsa"
3. I am not associated with the employer and am not benefited from the implementation of the project.
4. I am familiar with the Environment Protection Law (EPL), Ordinance No.1 for EIA, the legislation related to the environment protection, as well as the requirements of Art.21, para. 2 of EPL.

I am aware that I am liable to criminal amenability for false data statements according to Art. 313 of the Criminal Code and for unobserved requirements of Art. 20, par.3, item 3 of EPL and incorrect EIA conclusions according to Art. 33 of EPL, if I am not liable to a heavier punishment for which I sign below

Sofia, October 1998

Signed:

1. ……..
2. ……..
3. ……..
4. ……..

CONTROL P EOOD
1421 Sofia, 2 Dragan Tsankov Blvd., tel.: 658 175

ENVIRONMENTAL IMPACT STATEMENT ON THE PROJECT "GASIFICATION OF THE TOWN OF GORNA ORYAHOVITSA"

NON-TECHNICAL SUMMARY

The project has been developed by "Overgas" OOD, Sofia on the basis of technical specifications by the employer Overgas Inc. AD, Sofia, dated 1998 and covers the following:

- Distribution gas pipeline (12 bar) from AGRS to GRP-1 Town Section and GRP2-Town Section in the town area, including GRP-1 Town Section and GRP2-Town Section and gas pipeline connection to users in the Industrial Zone
- Town distribution network (4 bar) and gas pipeline connection to users in the town area, including 6 GRP-Quarter section
- Quarter distributions network (100 mbar) and gas pipeline connection to residential users, including 2 GRP-Quarter section

The project is related to a facility referred to in Section 3. Power facility, item 3.3 Transportation of gases, liquids and technical maintenance of crude oil and gas pipelines with length over 1 km of Annexes 1 and 2 to Art. 20, para. 1, item 1 of the EPL (published in State Gazette /SG/ issue 86 from 1991, corrected, issue 90 from 1991, modified and expanded, issue 100 from 1992, issue 31 and issue 63 from 1995, modified issue 13 and issue 85 from 1997).

A Preliminary EIS has been developed according to Art.9 (1), item 3 of Ordinance No. 4 for EEA (7.07.1998).

Tentative project value – submitted to the Regional Inspection for Environment and Waters (RIEW) -Veliko Tarnovo by the employer.

Employer: Overgas Inc. AD, Sofia.

The results from the investigations in the EIS for the "Gasification of Gorna Oryahovitsa" project impose the following conclusions:

1. The project has ecological purpose. It foresees substitution of the solid and liquid fuels, currently used in the industry, administrative and residence districts of the town of G. Oryahovitsa for natural gas which has the lowest emission generation capability.
2. The site of the project and the activities on it do not run counter to the current legislation in the areas of environmental protection, sanitary, hygiene and construction standards in the Republic of Bulgaria.
3. The construction and operation of the project has insignificant effect upon the environmental components – air, surface and ground waters, soil, vegetation, fauna and people.
4. The implementation of the project will improve the environmental and living conditions in the town of Gorna Oryahovitsa.

In conclusion the team of independent experts of Control – P EOOD proposes to the Expert Ecological Council (EEC) of RIEW-Veliko Tarnovo to accept the present EIS as final according Art. 9 (2) of Ordinance No.4/7.07.1998 and to permit the implementation of the project according Art.20(2) and Art.20(3) item 1.

CONTROL P EOOD
1421 Sofia, 2 Dragan Tsankov Blvd., tel.: 658 175

TABLE OF CONTENTS

CONTROL P EOOD
1421 Sofia, 2 Dragan Tsankov Blvd., tel.: 658 175

1. GENERAL INFORMATION

1.1. Name of the project, address of the employer, persons for contact

- Project: Gasification of G. Oryahovitsa
- Employer: Overgas Inc. AD, Sofia, 36 Dragan Tsankov Blvd.
- Designer: Overgas OOD, Sofia, 36 Dragan Tsankov Blvd.
- Contact persons: Vania Spasova, Overgas Inc AD, tel.: (02) 971 21 59; Dimitar Dimitrov, Rahovetz Gas OOD, Gorna Oriahovitsa, tel.: (0618) 3 10 79, fax 4 22 03.

1.2. Indication of physical and legal persons, which can be affected by the project

According to employer data (Annexes 1, 2, 3, 4) no physical persons will be affected by the project implementation. The affected juridical persons are:

- Municipality of Gorna Oryahovitsa;
- Municipality of Lyaskovets.

The route of the trunk branch from the national gas network (north semi-ring) for the region of Gabrovo and V.Tarnovo, as well as the site of AGRS-Gorna Oryahovitsa, are subjects of another project: Trunk gas pipeline for V.Tarnovo and Gabrovo regions. For them a PD EIA has been developed and a Resolution No. 139/1996 of RIEW, V.Tarnovo has been issued, the validity of the latter has been prolonged by letter ¹. 924/22.01.1998.

1.3. Location – map or scheme and description of the area

The project includes the whole area of the town of Gorna Oryahovitsa, situated in Central Northern Bulgaria in the valley of the river Yantra. Gorna Oryahovitsa is an important railway junction. The terrain is flat with undulations-at 50 – 60 m above sea level. The area is surrounded by the Tarnovo heights (Arbanassi) to South-West. To the North and East the area is open with a few low elevations. The gas supply system of the town of Gorna Oryahovitsa will be supplied by the Northern semi-ring of the Republican gas network through a gas pipeline branch and AGRS, situated about 2.0 km East of the town on the land of the town of Lyaskovets. The route of the distribution pipeline from AGRS to the eastern town area of Gorna Oryahovitsa is located on municipal agricultural land of Gorna Oryahovitsa and Lyaskovets municipality (item 1.2). The remaining part of the distribution pipeline to GRP1-Town section and GRP2- Town section, the equipment installed on it, the urban and quarter distribution networks and the equipment on the latter are situated underground the G. Oryahovitsa streets covering the potential customers.

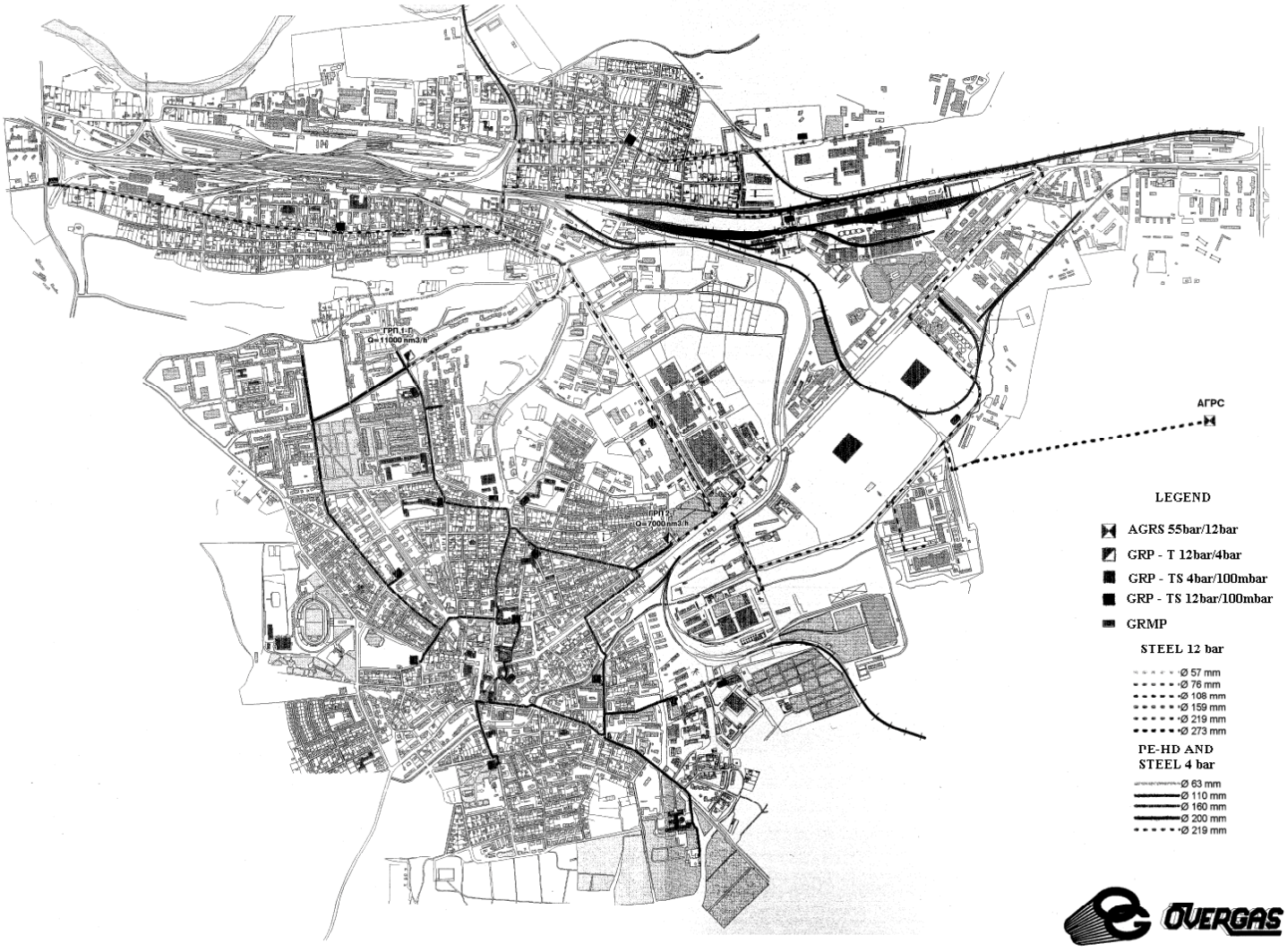
1.4. Legislative and institutional framework

The EIS has been developed at the employer's request with regards to the regulations of Art. 2 (1) item 4 of the Ordinance No. 4 for EIA (7.07.1998).

The project is related to a facility referred to in Section 3. Power facility, item 3.3 Transportation of gases, liquids and technical maintenance of crude oil and gas pipelines with length over 1 km of Annexes 1 and 2 to Art. 20, para. 1, item 1 of the EPL (published in State Gazette issue 86 from 1991, corrected, issue 90 from 1991, modified and expanded, issue 100 from 1992, issue 31 and issue 63 from 1995, modified issue 13 and issue 85 from 1997).

A Preliminary EIS has been developed according to Art.9 (1), item 3 of Ordinance No. 4 for EIA (7.07.1998).

GASIFICATION OF THE TOWN OF GORNA ORYAHOVITSA



1.5. Information supply

1. Project: "Gasification of the town of Gorna Oryahovitsa", stage feasibility study, developed by Overgas OOD, June 1998.
2. Climatic reference book of the People's Republic of Bulgaria, volumes 1, 2, 3, 4, publication of the Bulgarian Academy of Science National Meteorological and Hydrological Institute, 1983 – 1990.
3. Geomorphology of Bulgaria, D.Kanev, 1989, "Kliment Ohridski" University Publishing House.
4. Chorological atlas of medicinal herbs in Bulgaria, "Prof.M.Drinov" Academic Publishing House, 1995.
5. Hydrological reference book of rivers in Bulgaria, volumes II – V, Bulgarian Academy of Science National Meteorological and Hydrological Institute, 1981 – 1984.
6. Year-book of the state of the environment in the Republic of Bulgaria, (green book), Sofia, 1992.
7. State of the environment in the Republic of Bulgaria, annual bulletin 1996, National Centre for Environment and Control of Resources (NCECR), Sofia, 1997.
8. Quarterly bulletins for the state of the environment, NCECR, Sofia, 1996 – 1998.
9. Ameliorative Pedology, Penkov, M., Tehnika, Sofia, 1986.
10. National parks and preserves in Bulgaria, Georgiev, G., Prosveta, 1993.
11. Gas supply, Petkov, P., Alichkov, D., Architectural, Construction and Geodesical University publishing house, 1997.
12. Reference book for current methods for environmental effect assessment and prognosis, MEW, 1997.
13. Information about the state of the atmospheric air in Gorna Oriahovitsa 1997-1998 from RIEW-V.Tarnovo.
14. Information about the monuments of culture in Gorna Oriahovitsa from the Historical museum.
15. Information about the registered diseases by classes for 1997 from the Regional Health Centre, V.Tarnovo.
16. Information from Gorna Oriahovitsa municipality.
17. Protocols concerning the choice of routes and the installation sites – 4p.
18. Tentative IES of the project " Trunk gas-pipeline for V. Tarnovo and Gabrovo Regions", Strojkomplekt – PEK V. Tarnovo, 1996
19. Company archive of " Control P " EOOD

2. PROJECT ANNOTATION

The project has been developed by Overgas OOD, Sofia on the basis of technical specifications by the employer Overgas Inc. AD, Sofia, dated 1998 and covers the following:

- Distribution gas pipeline (12 bar) from AGRS to GRP-1 Town Section and GRP2-Town Section in the town area, including GRP-1 Town Section and GRP2-Town Section and gas pipeline connection to users in the Industrial Zone;
- Town distribution network (4 bar) and gas pipeline connection to users in the town area, including 6 GRP-Quarter section;
- Quarter distributions network (100 mbar) and gas pipeline connection to residential users, including 2 GRP-Quarter section;

The project complies with the requirements of: Ordinance No. 2 for fire protection construction standards, Ordinance No. 21/1990 for arrangement and operation of gas equipment and facilities, Ordinance No. 3/20.02.1995 (SG issue 24/1995) for design of natural gas supply systems in residential areas and gas networks in buildings and legal provisions, setting requirements towards gas supply systems and facilities – for issues which are not arranged by the standards in item 1 of Ordinance No. 3.

2.1. Characteristic of the technological processes

General technological flow chart of the gas supply systems

Each gas supply system is a sophisticated complex of gas pipelines and facilities, consisting of the following main elements:

- Source of natural gas – trunk gas pipeline;
- Gas pipeline connections connecting the trunk gas pipeline with gas regulation and gas metering stations, which supply the whole gas supply system;
- Industrial, town and quarter gas distribution networks of high, medium, low pressure and their facilities;
- Gas regulation and gas metering points supplying the gas distribution networks;
- Gas pipeline connections to individual consumers and pertaining gas regulation and gas metering points;
- Internal gas pipeline network and combustion facilities;
- Technological communications.

General technological processes in the gas supply systems

The technological processes, which are implemented in the industrial and residential gas supply systems are the following:

- Natural gas transportation by means of underground and above ground pipelines; pressure regulation and control (increase or decrease);
- Natural gas purification from mechanical admixtures;
- Natural gas odourization for consumer needs;
- Natural gas distribution to users;
- Natural gas temperature and flow measurement.

All technological processes are monitored and controlled by automation system. They are implemented in an underground, closed, pipeline gas supply network. The main technological processes are not a source of environment polluting emissions.

Although not a part of the gas supply network developed in the project, the user gas appliances and facilities are terminal elements of the former. They implement a combustion technological process, the flue gases of which affect the environmental components.

Technological flow chart of the gas supply scheme of the town of Gorna Oryahovitsa

A number of variants have been examined and compared during the process of the development of the flow chart of gasification of the town of Gorna Oryahovitsa from which one with the best technical and economic indices has been chosen. The approved variant of the project "Gasification of the town of Gorna Oryahovitsa" (according to the feasibility study) is considered in the EIS. The former includes the following elements:

1. Initial Section – supplies natural gas from the Northern semi-ring of the national gas pipeline network to the towns of Gorna Oryahovitsa and Lyaskovets via the main branch (P = 5.5 MPa = 55 bar) supplying AGRS "Gorna Oryahovitsa".

2. AGRS (Automatic gas regulation station) – 1 piece

The natural gas is delivered to the users with a certain pressure depending on its conditions of utilization. By means of an AGRS the pressure is reduced from 55 to 12 bar and automatically stabilized at this level irrespective of flow and pressure variations before and after an AGRS. In order to achieve gas supply reliability (without interruptions) an AGRS includes several regulation lines and a bypass connection. Simultaneously with the pressure reduction the gas is purified from mechanical admixtures, its inlet and outlet pressure and temperature are monitored, its flow is registered and gas pipeline network protection from pressure increase or decrease is implemented in an AGRS. All processes in an AGRS are automated. An AGRS with a capacity of 50000 nm^3/h will be used for gas supply of Gorna Oryahovitsa. It will be set up on a site situated on the municipal land of the town of Lyaskovets about 1.0 km east of the town. The former will supply with natural gas the town of Lyaskovets as well. The technological flow chart of an AGRS with above parameters is shown on Fig.1.

3. GRP (gas regulation and metering point) - Town section – 2 pcs (12/4 bar)

The town GRPs reduce the pressure of the natural gas, coming through a distribution gas pipeline from the AGRS from max. 12 bar to 4 bar before entering the town distribution network. The gas for residential use is purified, odorized and its flow is measured in order to monitor the gas distribution in GRP. Instrumentation and controls similar to those of an AGRS

are installed in a GRP. They comprise a main and a back-up regulation line and a metering line with a by-pass.

According to the approved variant there are 2 GRPs. Their technological flow chart is shown on Fig.3. GRP-Town Section No. 1 with a capacity of 11000 nm^3/h is situated in the northern town area. GRP-Town Section No. 2 with a capacity of 7000 nm^3/h is situated in the eastern town area on the borderline with the industrial area. Both are interconnected by a closed ring. GRP-Town Section No. 1 serves users in the north-eastern part of the town directly and via GRPs-Quarter Section. Five GRPs-Quarter Section with a capacity of 2000 nm^3/h, one with a capacity of 1000 nm^3/h for the downtown area, one with a capacity of 750 nm^3/h for Kaltinets quarter and one with a capacity of 1500 nm^3/h for the railroad station area are provided for the needs of the town.

Each GRP-Town Section is installed in a metal case with dimensions 3.8x2.4 m with a height of 2.0 m mounted on a concrete base. The metal cases are equipped with a ventilation plug with a height of 3.0 m above ground. The electric control panel and the odourizing facility (if needed) are installed in separate metal cabinets. There are provisions for grounding and lightening protection. Corrosion protection is done by paint and lacquer coatings.

4. GRP (Gas regulation and Gas metering points)- Quarter Section – 6 pcs (4 bar/100 mbar) and 2 pcs (12 bar/100 mbar)

Six of the GRPs-Quarter Section reduce the pressure of the natural gas coming from the 4 bar town distribution pipelines to 100 mbar in the quarter distribution network. The remaining 2 have regulation lines 12 bar/100 mbar. Gas purification is performed in these points as well. In order to avoid interruptions in gas supply, two independent regulation lines are envisaged in a GRP-Quarter Section. Gas flow metering is not performed in GRPs-Quarter Sections. According to the authoritative variant the set up of eight GRPs-Quarter Section are provided for in the gas supply network of the town of Gorna Oryahovitsa. Five of them with a capacity of 2000 nm^3/h serve the town area (GRP-Quarter Section No. 2 to GRP-Quarter Section No. 6) and one with a capacity of 1000 nm^3/h (GRP-Quarter Section No. 1) serves the downtown area. Due to the specificity of the town of Gorna Oryahovitsa Kaltinets quarter is supplied from GRP-5 with a capacity of 1500 nm^3/h and the railroad station area from GRP-Quarter Section 750 nm^3/h. The technological flow chart of a GRP-Quarter Section is shown on Fig.2. They are installed above ground in metal cases upon concrete base equipped with ventilation plugs, lightening protection and grounding.

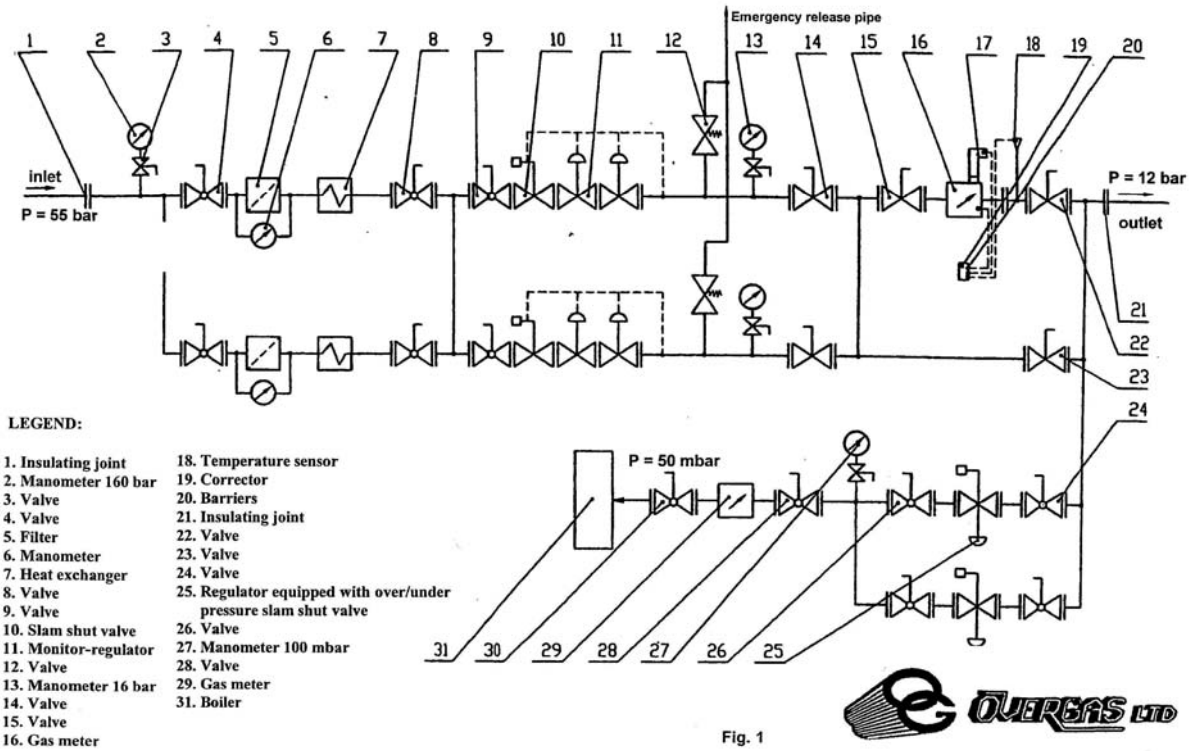
5. GRGMP (Gas regulation and Gas metering points)

A GRGMP is installed in those parts of the high, medium and low pressure gas pipeline networks where a relevant burner is the terminal element of the connection for pressure reduction and gas flow commercial recording. A primary element of these points is a gas flow corrector. It is designed to convert the volumetric gas flow measured by a flowmeter on different conditions to standard units.

The number of GRGMPs depends on the number of industrial and administrative users which will be connected to the network. The number of GRGMPs with 12 bar outlet pressure for the industrial users in Gorna Oryahovitsa is 22. The administrative users supplied from the 4 bar network with a capacity above 100 nm^3/h are equipped with GRGMPs 4/0.1 bar; their number depends on the disposition of boilers and operation conditions – approximately 23 pcs.

The technological flow chart of a GRGMP is shown on Fig.3. They are installed above ground on the users territory in metal cabinets upon concrete base equipped with ventilation plugs, lightening protection and grounding.

AGRS TECHNOLOGICAL SCHEME

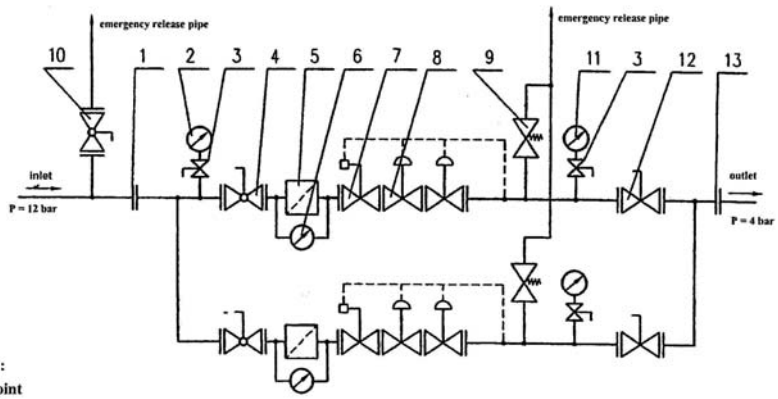


LEGEND:

1. Insulating joint
2. Manometer 160 bar
3. Valve
4. Valve
5. Filter
6. Manometer
7. Heat exchanger
8. Valve
9. Valve
10. Slam shut valve
11. Monitor-regulator
12. Valve
13. Manometer 16 bar
14. Valve
15. Valve
16. Gas meter
18. Temperature sensor
19. Corrector
20. Barriers
21. Insulating joint
22. Valve
23. Valve
24. Valve
25. Regulator equipped with over/under pressure slam shut valve
26. Valve
27. Manometer 100 mbar
28. Valve
29. Gas meter
31. Boiler

Fig. 1

GAS REGULATION POINT (GRP) - SCHEME



LEGEND:

1. Insulating joint
2. Manometer
3. Valve
4. Valve
5. Filter
6. Manometer
7. Slam shut valve
8. Monitor-regulator
9. Valve
10. Valve
11. Manometer 10 bar
12. Valve
13. Insulating joint

Fig.2

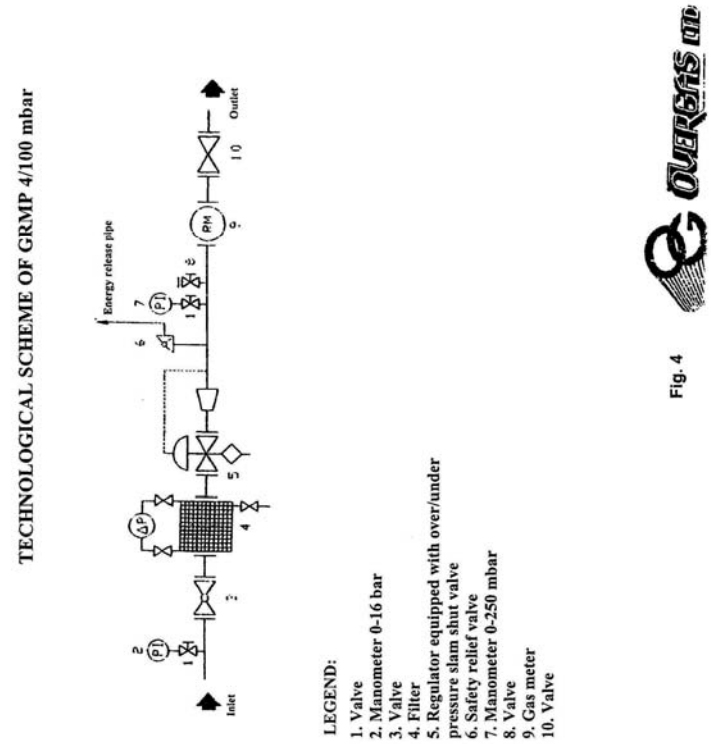

TECHNOLOGICAL SCHEME OF GRMP 4/100 mbar
Energy release pipe
Inlet
Outlet
LEGEND:
1. Valve
2. Manometer 0-16 bar
3. Valve
4. Filter
5. Regulator equipped with over/under pressure slam shut valve
6. Safety relief valve
7. Manometer 0-250 mbar
8. Valve
9. Gas meter
10. Valve

Fig. 4

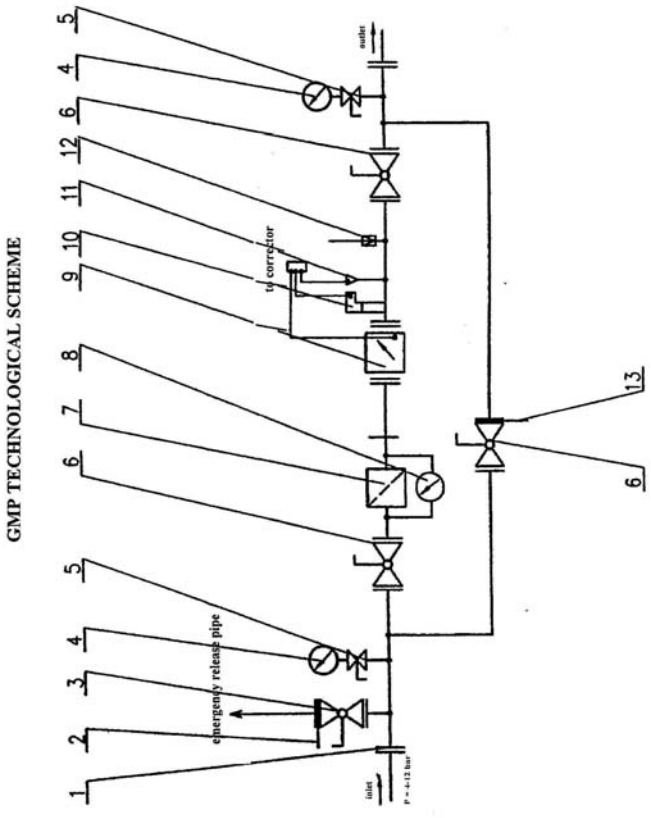

GMP TECHNOLOGICAL SCHEME
energenly release pipe
inlet
outlet
LEGEND:
1. Insulating joint
2. Plug
3. Valve
4. Manometer
5. Valve
6. Valve
7. Filter
8. Manometer
9. Gas meter
11. Pressure sensor
11. Temperature sensor
12. Temperature meter
13. Plug

Fig. 3

6.SCU - Stop-cock units

SCUs are installed on each gas pipeline connection before and after AGRS, GRP and GRGMP for gas flow distribution. They are equipped with couplings for gas pipelines purging and draining. In residential areas they are installed above ground in grounded metal cases. Corrosion protection is done by paint and lacquer coatings.

7.VP (ventilation plugs)

They are used for draining and ventilation of pipelines. They are installed on concrete base in the above ground equipment and the protection housings when crossing obstacles.

8. PH (protection housings)

When pipelines cross under railroads and roads they are installed in steel protection housings with a diameter min 200 mm larger than that of the pipeline. When crossing a railroad the lay-in depth is no less than 2 m from the rail base to the housing top, while for roads it is no less than 1.4 m.

9. Gas distribution network

The distribution gas networks provide continuous natural gas supply to users with safe operation, reliability and simplified maintenance. According to the authoritative project variant 3 levels of pressure regulation in the gas pipeline have been set:

- distribution gas pipeline – 12 bar;
- town distribution network – 4 bar;
- quarter distribution network – 4 bar and 100 mbar.

9.1 Sub-project: Distribution gas pipeline (12 bar) from AGRS to GRP-1 Town Section, GRP-2 Town Section and gas pipeline connections to users in the Industrial Zone

The main function of the 12 bar distribution gas pipeline is the natural gas supply to GRP-1 Town Section, GRP-2 Town Section and to users in the Industrial zone of the town of Gorna Oryahovitsa. The distribution gas pipeline originates from SCU-1 in the area of AGRS and continues to the west up to the Gorna Oryahovitsa town plan. It turns to the north in the area of "Betonstroi" AD parallel to the fence and after crossing the Gornooriahovsko ravine it splits into two along the fence of the military facilities along the service road. The southern branch goes round military unit 58950, crosses the railroad and the road under the ground in steel protection housings Ø426/7 mm, 12 m long with ventilation plugs Ø57 mm. It supplies GRP-2 Town Section in the area of the town site of "Bitova tehnika" via a town branch and continues to the northwest alongside the fence of the site. After that it enters the railroad station area where it supplies GRP- 7 Quarter Section and along the railroad administration reaches "Elektrosnabdiavane" AD. The northern branch rounds SSJPU and turns to the northeast along the road. After rounding the site of "Zaharni zavodi" AD the route continues to the west parallel to Sofia – Varna railroad on its southern side. In the area of the railroad region site of "Bitova tehnika" the route crosses the railroad and alongside its fence reaches Kaltinets quarter. It enters the latter supplying GRP-8 Quarter Section and continues to the west terminating at the Locomotive depot. The route crosses 3 railroad lines under the ground in steel protection housing Ø426/7 mm, 12 m long with ventilation plugs Ø57 mm. The Northern and Southern branches are connected in the area of Kaltinets quarter to the east of the railroad station. The total length of the distribution gas pipeline (12 bar) is 15592 m, of which: Ø273/6 mm – 1204 m; Ø219/6 mm – 5039 m; Ø159/4.5 mm – 3271 m; Ø108/4 mm – 1891 m; Ø76/4 mm – 726 m and Ø57/3.5 mm – 3461 m. The distribution gas pipeline route avoids the places with the greatest number of underground communications as determined .by the underground cadastre data and the busiest streets.

The 2100 m long distribution gas pipeline section Ø273/6 from the AGRS to the area of the town site of "Bitova tehnika" is situated on municipal agricultural land of Gorna Oryahovitsa and Lyaskovets municipality. The remaining parts of the distribution gas pipeline and town connections are situated within the town bounds.

Gas pipeline connections to users, 12 bar

- "Betonstroi" AD – 2000 nm^3/h; L = 315 m; Ø76/4 mm; P=12 bar;
- Military unit 58950 – 260 nm^3/h; L = 29 m; Ø57/3.5 mm; P=12 bar;
- SSJPU – 1450 nm^3/h; L = 96 m; Ø57/3.5 mm; P=12 bar;
- "Himsnab" EAD – 2000 nm^3/h; L = 108 m; Ø76/4 mm; P=12 bar;

- "Bitova tehnika" AD, town site – 2000 nm^3/h; L = 303 m; Ø76/4 mm; P=12 bar;
- GRP – 2 Town Section – 7000 nm^3/h; L = 229 m; Ø159/4.5 mm; P=12 bar;
- DAP – 160 nm^3/h; L = 23 m; Ø57/3.5 mm; P=12 bar;
- GRP – 1 Town Section – 11000 nm^3/h; L = 789 m; Ø159/4.5 mm; P=12 bar;
- Transport hospital – 180 nm^3/h; L = 8 m; Ø57/3.5 mm; P=12 bar;
- District administration Gorna Oriahovitsa railroad station – 50 nm^3/h; L = 8 m; Ø57/3.5 mm; P=12 bar;
- Railroad school administrative building – 100 nm^3/h; L = 155 m; Ø57/3.5 mm; P=12 bar;
- GRP – 7 Quarter Section – 1000 nm^3/h; L = 8 m; Ø57/3.5 mm; P=12 bar;
- ODZ "H.Stoyanov" and CDG "Bojur" – 100 nm^3/h; L = 153 m; Ø57/3.5 mm; P=12 bar;
- Locomotive depot – 1920 nm^3/h; L = 12 m; Ø108/4 mm; P=12 bar;
- Elektrosnabdyavane" AD – 230 nm^3/h; L = 312 m; Ø57/3.5 mm; P=12 bar;
- "Zaharni zavodi" AD – 11000 nm^3/h; L = 13 m; Ø159/4.5 mm; P=12 bar;
- "Mizia" ceramic plant – 1000 nm^3/h; L = 17 m; Ø57/3.5 mm; P=12 bar;
- ZRC – 1500 nm^3/h; L = 380 m; Ø57/3.5 mm; P=12 bar;
- GRP-8 Quarter Section – 1000 nm^3/h; L = 8 m; Ø57/3.5 mm; P=12 bar;
- ODZ "H.Stoyanov" and CDG "Bojur" – 100 nm^3/h; L = 153 m; Ø57/3.5 mm; P=12 bar;
- District administration Kaltinets quarter – 80 nm^3/h; L = 62+52 m; Ø57/3.5 mm; P=12 bar;
- Experiment station – 60 nm^3/h; L = 11 m; Ø57/3.5 mm; P=12 bar;
- "Rekord" OOD – 350 nm^3/h; L = 208 m; Ø57/3.5 mm; P=12 bar;
- "Rozahim" OOD – 350 nm^3/h; L = 111 m; Ø57/3.5 mm; P=12 bar;
- Transformer workshop – 60 nm^3/h; L = 224 m; Ø57/3.5 mm; P=12 bar;

Stopcocks and GRGMPs are installed at gas pipeline connections with 12 bar outlet pressure to industrial users for gas pressure regulation and gas flow commercial recording, installed on the user territory.

The distribution gas pipelines and the 12 bar gas pipeline connections are made of seamless steel pipes to BSS 6007-80 from material St.20 to BSS 5785-83 and of spiral welded pipes to BSS 10208-72 from C.St.3 material to BSS 2592-71. The gas pipeline protection housings are made of spiral welded pipes to BSS 14479-78 from C.St.3cn material to BSS 2592-71. Hot-drawn pipe bends type KGI90 to ON 1062645-86, smooth pipe bends 30-90º to ON 1062929-77 from St20 and cold-curved bends from seamless and spiral welded pipes to BSS 10208-72. Distribution gas pipelines and town connections are laid underground providing for a minimal coverage depending on the areas through which they pass (according to Ordinance N0.21/1990. The network is verified for seismic stability.

According to the requirements in Art.4 para.1 of Ordinance No.4/20.02.1995 "On monitoring and acceptance of gas supply systems in residential areas and natural gas facilities in buildings" delivered pipes and fittings are obligatorily accompanied by a manufacturer's certificate with guaranteed chemical composition and mechanical properties.

Welding and control of welding connections

The steel pipes and fittings are installed in a ditch by means of electric arc welding according to the requirements of Ordinance No. 21/1990 and Standard technological instruction (TTI-01-83) of DSO "Montazhi". The welded joints are checked by non-invasive methods according to the requirements of Ordinance 0-31 for work with radiation defectoscopes and Ordinance 0-35 for work with radioactive substances and other sources of ionizing radiation.

Corrosion protection

The steel pipelines installed under ground are protected from soil corrosion and stray currents according to BSS 15704-83 and BSS 15705-83.

Passive protection – insulation complex comprising glue ground coat 1019, isolation tape "Polican 980-25 – black" and protective tape "Polican 955-20 – white".

Active protection – electrochemical protection by means of cathode stations

The above ground pipeline sections before boilers and the above ground parts of the facilities in open air are treated with mercury primer and are painted twice with yellow automobile enamel paint.

9.2. Town Section gas distribution network (4 bar)

The medium pressure (MP 4 bar) town distribution network (TDN) is a closed loop covering the town area of Gorna Oryahovitsa. It originates from GRP-1 Town Section and GRP2-Town Section and forming a closed loop consisting of 2 rings supplies: 6 pcs GRP-Quarter Section (4/0.1 bar), all municipal and administrative buildings (22 pcs) and the residential buildings with a collective boiler. The route of the distribution network has been determined on the basis of the determined consumption and the positions of the two GRP Town Sections. The function of the network is to connect the users in a closed ring along the shortest way with the shortest possible connections to them.

- Northern town zone (NTZ) – supplied by 10 antennae (branched networks) with 4 bar pressure originating in the northern ring (4 bar) without GRPs Quarter Station;
- Southern town zone (STZ) – the network comprises two rings originating from GRP-2 Town Section and GRP-1 Town Section that avoid the places with the greatest number of underground communications. It includes 6 GRPs - Quarter Section (from GRP 1 - Quarter Section to GRP 2 - Quarter Section).

The TDN of both zones are interconnected thus ensuring their safe and reliable operation.

The town distribution network in NTZ and STZ has total length of 18070 m. It is made of high density polyethylene PE-HD to DIN 8075 pipes as follows: Ø63/5.8 mm – 10292 m; Ø110/10 mm – 2066 m; Ø160/14.6 mm – 5050 m; Ø200/18.2 mm – 637 m and Ø219/ – 25 m. The gas pipelines and connections are laid underground providing for a minimal coverage depending on the areas through which they pass (according to Ordinance No.21/1990) min 0.8 m in green areas and min 1.0 m under road surface. When the gas pipelines cross other engineering facilities the normative clearances between them (horizontal and vertical) are kept.

The network is verified for seismic stability.

Stopcocks are installed in all distribution points of the medium pressure network. Stopcocks are installed for all users connected to the medium pressure network. The fittings – T-joints, bends, reducers, couplings, etc. are made from PE-HD. The different parts are connected by face welding using a hot element or by means of couplings and fittings with a built-in electric resistant conductor in their inner part and connected by means of contact terminals. According to the requirements in Art.4 para.1 of Ordinance No.4/20.02.1995 "On monitoring and acceptance of gas supply systems in residential areas and natural gas facilities in buildings" delivered pipes and fittings are obligatorily accompanied by a manufacturer certificate with guaranteed chemical composition and mechanical properties.

The PE-HD pipes and fittings are corrosion resistant and do not need electrochemical protection.

Gas pipeline connections to users (4 bar)

The configuration of the GDN (4 bar) allows different technical possibilities for gas supply to users: direct connection to the network by means of antenna type gas pipeline connection with 4 bar pressure or by means of a quarter network with 100 mbar pressure. All administrative or residential users with existing local heating stations or boilers will be connected to a 4 bar network because of their large hourly consumption and close position to the network route. The connections (4 bar) for industrial plants and administrative and communal buildings in the town zone are with PE-HD pipes with diameters calculated for the maximal hourly consumption – Ø63 – 110 mm. The gas pipeline connections are connected to the distribution network by means of a branching element with a shut-down valve. A GRGMP is installed where a burner is the terminal element of the connection for pressure reduction and gas flow commercial recording. The total number of GRGMP (4 bar/100 mbar) is 23 with individual flow rates 50 – 700 nm^3/h.

9.3. Town Section gas distribution network (100 mbar)

The quarter low pressure (LP 100 mbar) distribution network is a closed loop as well. It originates from the relevant GRPs-Quarter Section and supplies the necessary amount of gas to each user. Mainly residential buildings are connected to it. It is constructed from high density polyethylene (PE-HD to DIN 8075) tubes. The constructed mbar network has a total length of 57083 m as follows: downtown area – 34320 m including Ø63/5.8 mm – 24861 m; Ø110/10 mm – 4079 m; Ø160/14.6 mm – 5326 m; Ø200/18.2 mm – 54 m; Kaltinets quarter – 10601 m including Ø63/5.8 mm – 9295 m; Ø110/10 mm – 1270 m; Ø160/14.6 mm – 36 m; Railroad zone – 12162 m including Ø63/5.8 mm – 11972 m; Ø110/10 mm – 190 m. Where possible medium pressure (4 bar) network routes duplication is avoided.

Gas pipeline connection to residential users

The natural gas enters in the residential and public buildings with a pressure of 100 mbar to 4 bar from the town distribution network. The connections are made in several variants depending on the location and type of users. They are made of PE-HD pipes connected to the distribution network by means of a welding coupling. The connection reaches to 0.5 m from the building and from this point begins the internal facility, made of PE coated steel or copper pipes. Stopcocks are not provided for in a low pressure network and shut-down is done by means of shutdown bags. A stopcock is obligatorily installed in the connection if the latter diameter is > 63 mm. Elastic compensators, linking the PE and the metal pipes are provided for in order to neutralize tensions in the pipes outside buildings due to soil subside, temperature variations and soil layers movement. Each connection is terminated by a gas metering panel for gas flow metering. The gas metering instruments are according to BSS 10809-73.

Internal gas pipeline installations and equipment

The internal gas pipeline facilities transport natural gas in the premises to the user combustion system where the combustion process is carried out related to flue gases emission. The formers are made according to individual designs for each user depending on the gas appliances used and the construction features. They begin from the gas metering panel and include horizontal and vertical PE coated copper or steel pipelines and a stopcock before each gas appliance. The premises are equipped with air vents and chimneys for ventilation and carrying away of natural gas combustion products. Five exemplary type designs of internal gas pipeline facilities are suggested depending on construction features and gas appliances used as follows:

- family houses (Fig. 6) – **I scheme** – gas heating boiler in the basement, gas water heater on the floor, gas cooking range; **II scheme** – gas heating boiler combined with water heater situated in the basement and a gas cooking range; III-rd scheme - gas heating boiler combined with water heater situated in a subroof area or on the floor and a gas cooking range;
- multifloor residential buildings (Fig. 7) - **I scheme** – gas heating boiler in the basement, on the roof or in a subroof area. It is advantageous when revamping the burner in an existing local boiler with constructed heat transfer network in the building. It is connected to a distribution network 4 bar at a flow rate above 400 nm^3/h and 100 mbar at a flow rate below 400 nm^3/h. The remaining gas appliances are connected to a separate low pressure gas loop. **II scheme** – gas heating boiler combined with water heater installed in the apartment and a gas cooking range connected to a low pressure gas loop.

Compulsory threefold exchange ventilation (continuous mechanical) and an emergency eightfold one are required for gasification of existing boilers in basements. The individual gas appliances for heating and hot water are often set up on closed or semi-closed terraces.

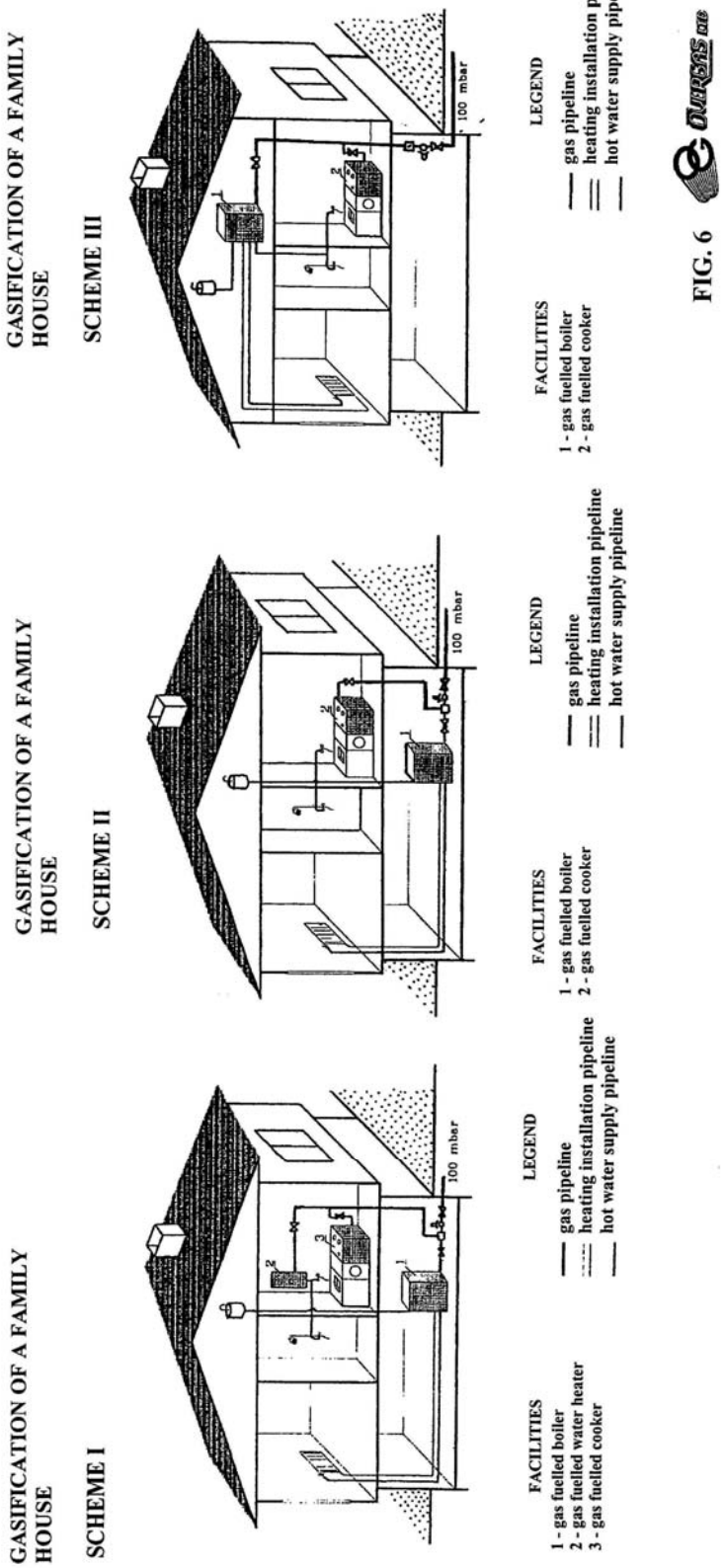

GASIFICATION OF A FAMILY HOUSE
SCHEME I
FACILITIES
1 - gas fuelled boiler
2 - gas fuelled water heater
3 - gas fuelled cooker
LEGEND
gas pipeline
heating installation pipeline
hot water supply pipeline
100 mbar
GASIFICATION OF A FAMILY HOUSE
SCHEME II
FACILITIES
1 - gas fuelled boiler
2 - gas fuelled cooker
LEGEND
gas pipeline
heating installation pipeline
hot water supply pipeline
100 mbar
GASIFICATION OF A FAMILY HOUSE
SCHEME III
FACILITIES
1 - gas fuelled boiler
2 - gas fuelled cooker
LEGEND
gas pipeline
heating installation pipeline
hot water supply pipeline
100 mbar

FIG. 6

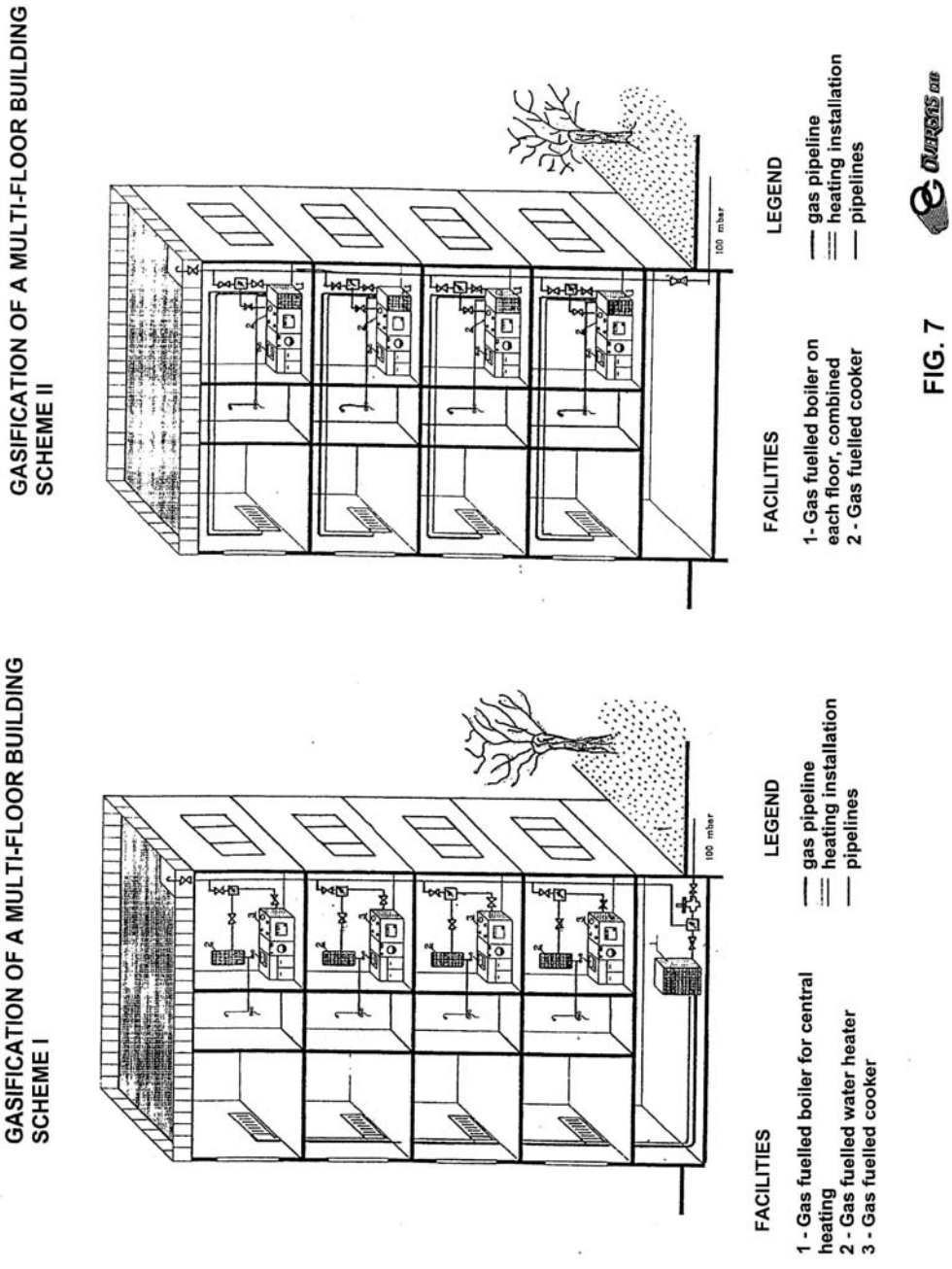

GASIFICATION OF A MULTI-FLOOR BUILDING
SCHEME II
100 mbar
LEGEND
gas pipeline
heating installation
pipelines
FACILITIES
1- Gas fuelled boiler on each floor, combined
2 - Gas fuelled cooker
GASIFICATION OF A MULTI-FLOOR BUILDING
SCHEME I
100 mbar
LEGEND
gas pipeline
heating installation
pipelines
FACILITIES
1 - Gas fuelled boiler for central heating
2 - Gas fuelled water heater
3 - Gas fuelled cooker

FIG. 7

A compulsory requirement is the construction of air vents and chimneys for flue gases.

10. Electrical equipment, instrumentation and automation

They are intended for automated process control in the gas distribution system and prevention of emergency situation. They include a power supply and gas metering panel (PSGMP), gas flow corrector CF300T2, impulse lines, intrinsic safety circuit to the corrector, transducer configuration, lighting, lightening protection and grounding system.

11. Technological communication network

The information control system of the gas supply system in Gorna Oryahovitsa has got the following functions: gas pressure and temperature control, gas flow rate recording, transmission of operative information for emergency situations. The system includes a control room and transmitters in definite network points connected automatically by a local radio network. The USW radio stations, data transmission and retranslation appliances are installed in the town zone.

2.2. Total required area (decares, farm land or forestry land, categories, stages of acquisition; nearness to protected territories)

The gas supply network of the town of Gorna Oryahovitsa is laid entirely under the ground along the town street network. It does not require area, does not restrict the use of the street network and of the facilities of the underground cadastre because it is laid according to the requirements of Ordinance No.3 (1995) while keeping the necessary vertical and horizontal clearances. The above ground facilities are AGRS, GRPs-Town Section, GRPs-Quarter Section and SCUs, which require area adjacent to the street network for installation as follows:

- AGRS – 1 site with dimensions 18x30 m – 540 m^2 (municipality of Lyaskovets);
- Road to AGRS 190 m long – 1600 m^2 (municipality of Lyaskovets);
- GRPs Town Section – 2 sites with dimensions 4.2x3.3 m – total 28 m^2 (town of Gorna Oryahovitsa);
- GRPs Quarter Section – 8 sites with dimensions 4.2x3.3 m – total 140 m^2 (town of Gorna Oryahovitsa);
- SCU before AGRS – Gorna Oryahovitsa 6.0x5.0 m – 30 m^2 (mun.Lyaskovets);
- SCU - Town – 49 sites 1.2x1.3 m – total 77 m2 (town of Gorna Oryahovitsa);
- SCU - Industrial – 37 sites 1.2x1.3 m – total 58 m^2 (town of Gorna Oriahovitsa);

The total necessary area for the above facilities is 2473 m^2. It is municipal property and its assignment does not affect physical or legal persons.

The distribution gas pipeline section from the AGRS to the Gorna Oryahovitsa town plan with a length of about 2100 m is located in agricultural land (municipal property). According to Ordinance No. 1 Art. 56(1) and (2) the route in agricultural lands is not alienated because the pipeline is laid at a depth min. 0.7 – 0.8 m. In this case the agricultural use of land is not altered but a restricted regime related to the safety of the facility is introduced in the stripes 10 m from both sides of the gas pipeline axis. In this aspect the area with restricted regime of land use is about 24 decares.

The project does not affect forest lands and protected reserve territories.

The route of the distribution gas pipeline from P1 to P5 with a length of 1050 m is determined by a commission appointed by order No. 834/1998 of the mayor of municipality of Lyaskovets and is approved by the Architectural and Town-planning Commission by minutes No.9/03.07.1998. The route section from V5 to V7 with a length of 1050 m is determined by a commission appointed by order No. 1308/26.05.1998 of the mayor of the municipality of Gorna Oryahovitsa and is approved by Architectural and Town-planning Commission by minutes No.10/02.07.1998.

2.3. Basic raw and other materials; natural resources and energy sources (type, stocks and resources, annual consumption)

The implementation of the "Gasification of Gorna Oryahovitsa" project does not incur the use of natural raw materials and resources. The main materials which are used for the construction of the gas supply network are pipes with different diameters, fittings and valves, standard facilities (AGRS, GRP, GRSP). The pipes are two types:

- Steel pipes – seamless steel ones to BSS 6007-80 from St.20 material to BSS 5785-83 and spiral welded ones to BSS 10208-72 from C.St.3 material to BSS 2592-71;
- PE-HD – high density polyethylene pipes to DIN 8075.

The only utility serving the technological processes in the gas supply network of the town of Gorna Oryahovitsa is electricity. It is used by the electric equipment, instrumentation and automation systems as well as by the electrochemical protection system, which are related to safety and reliability of the system as described in items 9.1 and 10.

The main function of the "Gasification of Gorna Oryahovitsa" project is natural gas transportation from the source to the users. Natural gas is a natural resource which is not produced in the Republic of Bulgaria.

Natural gas production in Bulgaria is only 1 % of the consumed amount according to "Overgas" data. Due to this fact after the construction of the trunk gas pipeline Russia – Romania – Bulgaria in 1974 the gasification in our country started entirely with natural gas imported from Russia. A trunk gas supply system has been built with a maximal pressure of 5.5 MPa in a ring-like form passing through North and South Bulgaria with branches to Turkey, Greece, Macedonia and Serbia. Natural gas enters the distribution gas pipeline network to users from the trunk gas pipelines through gas pipeline connections and AGRSs. Until now priority has been given to gasification of industrial enterprises and power utilities while the gasification of settlements is at an initial stage.

Physicochemical properties and toxicity of natural gas

The approximate composition of natural gas used in Bulgaria is the following: methane (CH_4) – 98.52%; ethane (C_2H_6) – 0.42%; propane (C_3H_8) – 0%, H-butane (C_4H_{10}) – 0.05%; N-butane (C_4H_{10}) – 0.03%; nitrogen (N_2) – 0.95%; CO_2 – 0.03%; hydrogen sulphide + mercaptanes – 21 mg/nm^3; density – 0.677 kg/nm^3; caloricity – 7943 Kcal/nm3; dew point – (-) 9 ºC.

Quantities, reserves and resources of natural gas

As currently natural gas is imported entirely from Russia its quantity, reserves and resources used by the Republic of Bulgaria are directly dependent on the intergovernmental agreements.

Natural gas source for the project "Gasification of Gorna Oryahovitsa"

The town of Gorna Oryahovitsa is situated near the route of the trunk gas pipeline of the national gas pipeline network northern semi-ring. From it a 55 bar gas pipeline branch (GPB) for gas supply of Gorna Oryahovitsa and the town of Lyaskovets is provided for supplying a joint 55/12 bar AGRS with 50000 nm^3/h capacity situated on a site in the municipal land of the town of Lyaskovets, which is municipal property.

Natural gas consumption in the Gorna Oryahovitsa gas supply system

According to the submitted projects the natural gas consumption is determined at the feasibility study stage for the three different types of users: industrial, public & administrative and residential. The maximal hourly consumption (Qmax, nm^3/h) and the annual consumption (W, nm^3) are determined depending on the validity in each of the following cases:

- the user has got his own utility station using solid or liquid fuel;
- the user has not got his own utility station but has got internal heat transfer system supplied by an external source;
- the user has neither utility station nor internal heat transfer system

Taking into account the Gorna Oryahovitsa development trends the natural gas consumption is determined as maximal hourly consumption (Qmaxh, nm^3/h) and annual consumption (W, nm^3) shown in Table 1.

Table 1. Natural gas consumption in the town of Gorna Oryahovitsa prognostication

No.	User	Qmaxh, nm^3/h	W, $nm^3.10^6$
1.	Industrial sector	22360	55,070
2.	Public and administrative sector	5140	2,915
3.	Residential sector	14965	15,620
4.	TOTAL	42465	73,605

2.4. Bondage to the technical infrastructure of the area (including accompanying activities and production)

The construction of the project as an entity is not bound to the technical infrastructure of the region. Due to the requirements of Ordinance No. 21(1990) all construction activities are carried out by a licensed construction organization and experts. All raw materials are delivered from an external warehouse so no auxiliary activities and production need to be done. The construction activities temporarily affect the road surface but it is restored. Local construction companies will be used for restoration of the road surface and the affected green areas.

During operation of the facilities the implementation of the technological processes is directly related to the electrical and communication networks in the town of Gorna Oryahovitsa. Because the gas supply network of the town of Gorna Oryahovitsa will deliver energy to users from the industry, the public and administrative sectors and the residential sector it becomes part of the power network of the region and the resulting links to the other elements of the technical infrastructure.

2.5. Social effect (manpower employment, social needs, social benefits), risky workplaces, provision of healthy and safe labour conditions)

Manpower employment

The gas supply system of the town of Gorna Oryahovitsa is done by a specialized organization according to the requirements of Ordinance No.21. In conformity with the social policy of the employer the restoration of the road surface is subcontracted to local construction companies.

The normal and safe operation of the system after commissioning is carried out by a gas company. A team of about 12 experts is formed carry out its activities.

Public necessity

The aim of the project is to offer an alternative energy source to the ones used until now in the industrial enterprises, public & administrative sector and the residential sector by a construction of a complete gas supply system of the town of Gorna Oryahovitsa. The capabilities and advantages of natural gas, expressed in the possibilities for implementation of new ecologically clean technologies, direct combustion in the user appliances, individual consumption metering and control, low costs as an energy source define it as a competitive energy source, suiting the trend towards sustainable development and reproduction of the environment.

The necessity for the project implementation is dictated by the absence of district heating and gas supply networks in the town of Gorna Oryahovitsa. The use of energy sources like fuel oil, kerosene and coal both in the industrial and the public and residential sectors conceals a potential hazard for deterioration of the sanitary and health conditions and pollution of air, waters and soils with anthropogenic products.

Possibilities for project implementation – the necessary energy, ecological, technical and urban planning prerequisites for effective gas supply to potential users are present in the industrial zone and the residential quarters of the town of Gorna Oryahovitsa, which are the subject of this study.

Social benefits

The town of Gorna Oryahovitsa is a municipal centre with 38914 inhabitants in 13000 households. A larger industrial zone is differentiated in the eastern part of the town (EIZ) and a smaller one to the northeast of the railroad station (NIZ). The total number of the industrial enterprises is 17 in different industrial branches. They are a major source of air pollution. The public administrative and municipal buildings are 31. Local boiler utilities are installed in all of them. The residential sector includes 1501 apartments in blocks, 1117 one floor houses, 223 two floor houses and 2285 three floor houses allocated in 3 main town areas: downtown area, Kaltinets quarter and railroad area. The buildings are in a good condition. The town has got central water supply and waste collection. There is no district heating network in the town of Gorna Oryahovitsa. The street network is more than 80% paved with asphalt and other durable pavements. In an urban planning aspect the town will grow on the presently occupied area by increasing the number of floors. The main stocks related to the town social infrastructure are from the spheres of housing, education, health, culture, state and municipal administration, commercial network, catering and public services.

The educational system has 18 schools and children's facilities available. The network is well developed and corresponds to the necessities of the population in the town and the region.

The health sphere in the town of Gorna Oryahovitsa is divided in dispensary and polyclinic establishments and prophylactic medical institutions. The town has got a municipal hospital, a transport hospital, a stomatology. The existing infrastructure is adequate for satisfying the health necessities of the population.

The cultural establishments are concentrated in the downtown area.

The town of Gorna Oryahovitsa is a municipal centre. As such it has got all the facilities necessary for the normal functioning of the town and the municipality.

The network of commercial, catering and public services establishments develops dynamically according to market principles. The local authorities set the restrictions with regards to construction, property and the way of using these establishments.

The availability of competitive energy source is a prerequisite for raising the living standard of the population – independence of planning and consumption of energy resources, reduction of heating and household expenses, facilitating household labour and more free time for social family life.

More favourable conditions are created for business development in the region of the town of Gorna Oryahovitsa.

The working conditions of the staff operating the boiler facilities of the industrial enterprises, the public and administrative and residential sectors are improved.

Risky workplaces

The project implementation and operation is not related to risky workplaces.

Provision of healthy and safe labour conditions

The gas distribution system process control is automated and is performed from a control room.

2.6. Stages in the project implementation

The project implementation is planned in a single stage according to a detailed engineering for construction organization, prepared by the contractor and approved by the employer.

2.7. Project costs

Project costs are submitted to the competent authority by the employer separately from the EIS.

3. ANALYSIS OF THE PRESENT STATE, PROGNOSTICATION AND ANALYSIS OF THE EXPECTED EFFECTS ON THE ENVIRONMENTAL COMPONENTS WHICH ARE EXPECTED TO BE AFFECTED BY THE IMPLEMENTATION OF THE PROJECT

3.1. ATMOSPHERIC AIR

3.1.1. Brief characteristics and analysis of climatic and meteorological factors affecting the concrete impact and quality of the atmospheric air

The condition of the atmospheric air in the settlements depends on the morphological characteristics and the meteorological factors in the region, the location, characteristics and capacity of pollution sources, the degree of urbanization. The facilities under "Gasification of Gorna Oryahovitsa" project are located over the whole area of the town of Gorna Oryahovitsa and the eastern suburbs. The town of Gorna Oryahovitsa is situated in the valley of the river Yantra in the Central part of the Dobrudja plain. The terrain is flat with undulations with an average height of 54 m above sea level. The area is surrounded by the Tarnovo heights (Arbanassi) to the South-West. To the North and East the area is open with a few low elevations.

The region of Gorna Oryahovitsa is assigned to the middle climatic region of the Danubean plain, which is included in the moderate-continental sub area of the continental European climatic area.

Features of the atmospheric circulation

The cyclone circulation (low pressure area) over Bulgaria is determined by passing of Atlantic cyclones during the whole year (up to 10) and of Mediterranean cyclones – predominantly during winter months (up to 18). Their duration is 156 days. They make winters milder and increase precipitation quantity and frequency. The anticyclone circulation (high pressure area) is with a duration up to 209 days and is under the influence of the following groups of anticyclones: northeastern group (16 annually); western and southwestern groups (summer dry spells); northeastern group (arctic – cause formation of local anticyclones and lowest winter temperatures). The atmospheric circulation is of anticyclone type and is related to active air transfer and has a purifying effect – refreshes the Bulgarian climate including the one of Gorna Oryahovitsa.

Effect of the meteorological conditions on the pollution of the atmospheric air under urban conditions

Thermal inversions and fog, wind and precipitation are meteorological factors which have the largest impact on air quality. Since the major emission sources in the towns are low a direct relation between the ingredients content in the air and ground inversions has been found out. The concentrations of NO_2, NO, SO_2, H_2S double in foggy days in comparison to clear ones. The concentrations of oxidants, formaldehyde, phenol and dust increase to a lower extent.

Wind affects mostly dust content.

Precipitation has a marked purifying effect. Considerable air purification has been found out in days with precipitation and this effect is most strongly expressed during winter and to a lesser extent during summer months.

Because the pollutants distribution in the atmosphere is a direct function of the meteorological conditions in the region the major meteorological elements rates are examined (Fig. 8) using multiyear data from Chemical and Meteorological Station (CMS) – Gorna Oryahovitsa (54 m above sea level).

1. Solar radiation

The quantity of direct radiation depends primarily on the sun's elevation, which determines the pattern of its daily and yearly rate. The maximum is respectively around noon and during June and July. The intensity of the direct solar radiation upon a horizontal surface in Bulgaria at noon is in the range 0.24 kW/m during winter to 0.70 kW/m during summer. The average yearly amount of sunshine for the examined region (according data from the CMS – Pavlikeni) is 2141 hours, the minimal being 1888 hours and the maximal 2339 hours. The maximum is during summer months (July – 308 hours) and the minimum during winter (December – 62 hours). The average yearly number of days without sunshine is 78, of them 40 during winter months.

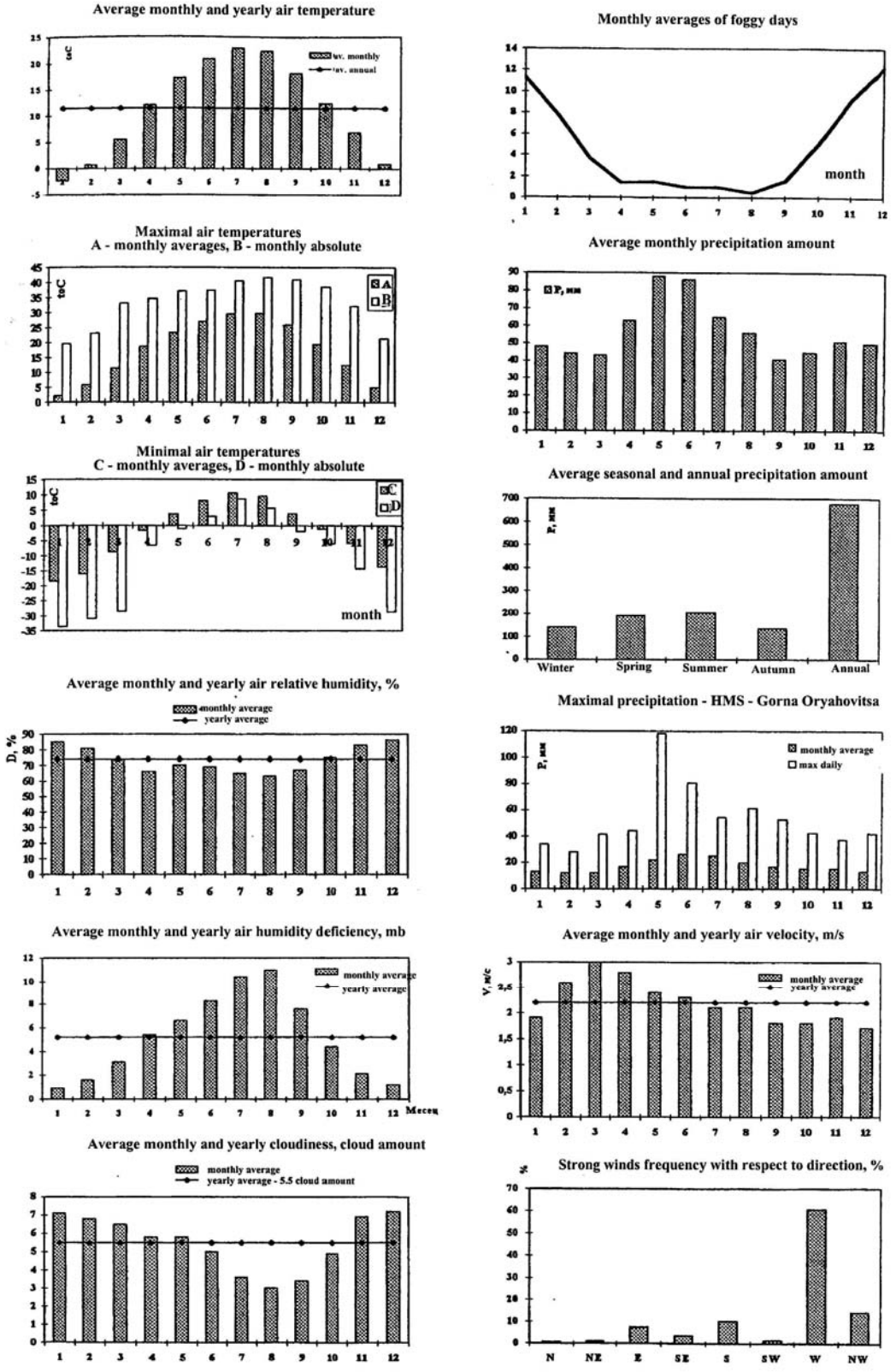


Fig. 8. Meteorological factors - the town of Gorna Oryahovitsa

2. Air temperatures

The average 24 hour daily air temperature in the region is 11.5 ºC. The monthly average temperature during the coldest month – January is about (-2.3 ºC). The extremal monthly air temperatures are shown on Fig.8. The yearly average maximal monthly temperature is 17.5 ºC, the minimal –2.5 ºC. The maximal average monthly temperature is 29.8 ºC (August), the minimal average monthly one is -33.7 ºC (January). The absolute maximal temperature is 41.8 ºC, the minimal – (-33.7 ºC). The average monthly air temperature amplitude is 12.2 ºC (8.2-15.3).

The mean date of the last spring frost is 12 April (27.03 – 05.05), of the first fall frost 21 October (28.09 - 29.11), which determines an average duration of vegetation period of 191 days.

The duration of the heating period is 185 days. Reference temperature for heating is minus 20 ºC, for ventilation minus 7 ºC, period with $t_{av} < 0$ ºC – 56 days, day/degrees – 2800.

3. Air humidity

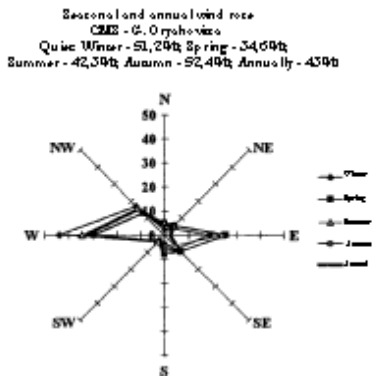
The atmospheric water content can be characterized in general by the relative humidity. The average air humidity deficiency is 5.2 mb, with maximal values during summer months (July – 10.4) and minimum during winter ones (January – 0.9 mb). The monthly average relative humidity is 74% (63-86%), with a maximum during winter months (January-December – 85 - 86%) and a minimum during August – 63%. The high air humidity during winter months helps for detaining the pollutants in the ground layer.

4. Precipitation

Precipitation is one of the major meteorological elements that influence comfort degree and self-purification mechanism of the atmosphere. The annual precipitation rate in the region has markedly continental character. The average annual precipitation amount is 680 mm. The average monthly precipitation amounts are shown on Fig. 8. The annual maximal precipitation amount is 118.1 mm (May). The distribution of the seasonal precipitation amounts in not uniform. There is maximal precipitation in spring-summer season – 193-207 mm and minimal during fall-winter months – 137-142 mm. There are two precipitation maximums: May – 88 mm and November 51 mm and two minimums: September – 41 mm and March 43 mm which is typical for the Danubean plain. The total number of days with precipitation is 137, of them 103 with rain (maximum in May 15 and minimum in September 7 days), 25 with snow (January 8 days), 7 with rain and snow (1 – 2 days during each winter month). The number of days without precipitation reaches maximum 114 per year (average 9.5 days/month). The maximal dry spell is during October – up to 13 days, the minimal during June – 6 days.

The average height of snow blanket is about 10 cm, the average annual number of days with snow blanket is 50.

The average annual number of foggy days is 56.4. Of them 49.5 are in the period October-March and 6.9 during April-September.



The average monthly and yearly total cloudiness is 5.5.

5. Wind

Quiet weather predominates in the region according data from CMS – Gorna Oryahovitsa – 43% (52.4% in fall and 51.2 in winter). The prevailing annual wind direction is West (33.5%). During heating period the west winds predominate: 30.3% in fall and 43.7% in winter.

During non-heating period the west winds are with the greatest frequency as well – 29.4% in spring, 34.4% in summer. The average yearly wind velocity is 2.2 m/s. Most frequent in the region are winds with velocity 0-1 m/s (53%) and 2-5 m/s (33.0%). The number of days with strong wind (V>14 m/s) is 11.3 which is below 5%.

Of strong winds west ones are predominant (60.7%), followed by northeast ones (14.4%).

The climatic characteristics of the town of Gorna Oryahovitsa are typical for the medium part of the Danubean plain and are characterized with prolonged windlessness, high air humidity during fall and winter, which determine high self-purification capacity and create prerequisites for lasting detention of air pollution caused by anthropogenic load.

3.1.2. Assessment of the quality of atmospheric air (based on available data)

The atmospheric air condition in given restricted areas is a result from local factors to a great extent. The concentration level of pollutants in the atmosphere is determined by several factors, affecting the conditions for their detention or dispersing as follows:

- the change in local climatic conditions due to morphographic characteristics of the region;
- the area distribution and the power of emission sources;
- character of urbanization.

According to Art.4 (1) of the atmospheric air purity law (SG issue 45/1996) the main indices characterizing the quality of atmospheric air in the ground layer are the concentrations of particles (aerosols, fog, smoke, dust); sulphur dioxide; nitrogen dioxide; carbon monoxide; ozone, lead (aerosol).

According to Ordinance No.14/23.09.1997 on standards for permissible concentration limits (PCL) of harmful substances in atmospheric air of settlements (SG, issue 88/1997) the standardized PCL of major pollutants are annual average, 24 hours daily average and maximal single (Annex No. 1 to Art.2, para. 1).

The town of Gorna Oryahovitsa is included in the National air monitoring network. Immissions are measured by RIEW – V.Tarnovo. The number of points is 1, situated in the centre of Gorna Oryahovitsa. The monitored indices are concentration values of: dust, SO_2, NO_2, H_2S.

According to the quarterly bulletins for the environment state, issued by the NCECR-MEW the $PCL_{24h\ d\ av}$ and the $PCL_{m\ av}$ of the monitored indices were not exceeded during the period 1996 – 1998. In connection with the present EIS generalized and processed data for the state of the atmospheric air in the town of Gorna Oryahovitsa for the period 1.09.1997 – 31.08.1998 have been presented. The following conclusions can be inferred on the basis of the emission control results, given on Fig.9:

- **Dust** – the established 24 hour dust concentration daily averages during the observed period (0.0496-0.0933 mg/m^3) do not exceed the $PCL_{24h\ d\ av}$ (0.25 mg/m^3) according to Ordinance No.14/1997. They are 5 to 2.7 lower than the $PCL_{24h\ d\ av}$; The maximal single concentration values are in the range 0.069 – 0.132, which is 7.2 to 3.8 times lower than the $PCL_{\ max\ single}$ (0.5 mg/m^3). There is no clear tendency of dust emissions distribution during seasons;
- **Sulphur dioxide** – the established 24 hour daily averages (0.0 - 0.0322 mg/m^3) are up to 4.7 times below the $PCL_{24h\ d\ av}$ (0.15 mg/m^3 according to Ordinance No.14/1997). The maximal single concentration values of SO_2 (0.0 – 0.246) do not exceed the $PCL_{\ max\ single}$ (0.5 mg/m^3) and are up to 2 times lower than the latter. There is an obvious tendency of an increase of SO_2 concentration during the heating period, which can be linked to the energy sources used;
- **Nitrogen dioxide** – the established 24 hour daily averages (0.067 - 0.0211 mg/m^3) are from 15 to 4.8 times below the $PCL_{24h\ d\ av}$ (0.1 mg/m^3 according to Ordinance No.14/1997). The maximal single concentration values of NO_2 (0.0122 – 0.116) do not exceed the $PCL_{\ max\ single}$ (0.2 mg/m^3) and are from 16.4 to 1.7 times lower than the latter. Again there is a tendency of an increase of NO_2 concentration during the heating period;
- **Hydrogen sulphide** – the 24 hour concentration daily averages are in the range 0.0 - 0.0011 mg/m^3, which is up to 7.3 times below the $PCL_{24h\ d\ av}$ (0.008 mg/m^3). The maximal single concentration values during the last 10 months of the observed period are below the $PCL_{\ max\ single}$ (0.008 mg/m^3), but during February and August 1998 the values are 0.0126 – 0.0117 mg/m^3, which is 1.6 – 1.46 times above the $PCL_{\ max\ single}$.

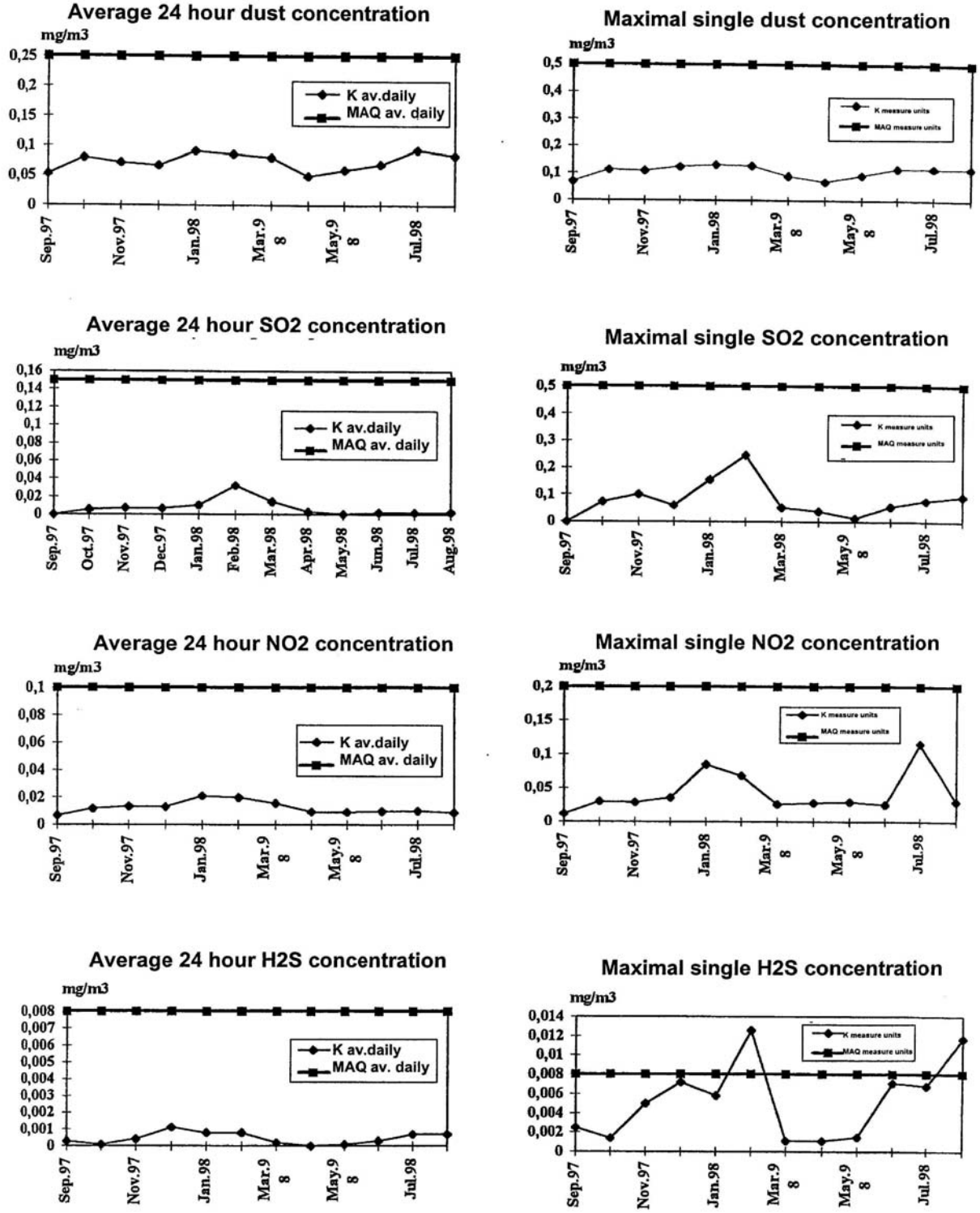


Fig. 9. Quality of the atmospheric air in the town of Gorna Oryahovitsa

A tendency of an increase of H_2S concentration during the heating period is noticed;

It is obvious from the above analysis that there is no lasting tendency of atmospheric air pollution in the town of Gorna Oryahovitsa during the heating season as well as beyond it. Dust pollution is the highest of the monitored indices (up to 2.7 times below the $PCL_{24h\ d\ av}$). The remaining indices are of insignificant values. The determined maximal single concentration values prove that H_2S pollution is the largest (1.6 times above $PCL_{max\ single}$), followed by NO_2 and SO_2.

Taking into account the noted tendency of increased SO_2, NO_2 pollution during the heating period given the climatic and morphographical conditions and the infrastructure of the town of Gorna Oryahovitsa it can be affirmed that a major source of air pollution are the conventional fuels used by the organized sources and to a lesser extent the automobile transport (NO_2).

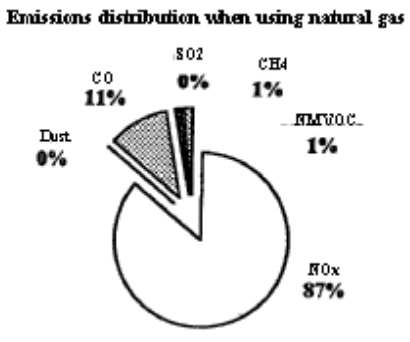
Taking into account the fact that the main technological processes in the "Gasification of Gorna Oryahovitsa" project are not a source of emissions to the environment the atmospheric air condition does not restrict the realization of the project.

3.1.3. Characteristics of the sources of pollution provided for in the project (quantity and concentration of pollutant emissions)

The technological processes of the gas supply system like delivery, transportation, distribution, pressure control and regulation, gas metering, natural gas purification and odourization are not a source of harmful emissions to the environment. They are implemented by means of a closed underground pipeline gas distribution network with aboveground facilities, which are fully automated and operate with guaranteed reliability and safety. In case of necessity, during maintenance and repair different gas pipeline sections are purged by means of the couplings of the stopcocks and the ventilation plugs which are above the ground. The natural gas discharged in the atmosphere in a controlled fashion (with a given flow rate) dissipates because it is lighter than air and does not represent a hazard to the people and the environment.

With the implementation of the "Gasification of Gorna Oryahovitsa" project the type of fuel used in the industry, the administrative and municipal and the residential sectors in the town of Gorna Oryahovitsa is changed. Solid and liquid fuels are substituted for natural gas, which generating capacity with respect to pollutants (emissions) from burning is considerably lower. The user burning facilities are the source of harmful emissions to the environment. By the introduction of natural gas as an energy source the emissions contents are changed – almost no dust, soot and SO_2 are emitted, NO_x, CO (depending on the quality of combustion), non-methane volatile organic compounds (NMVOC), CH_4 are given off. NO_x has a determining character of them. Taking into account the trends in the development of the town of Gorna Oryahovitsa and the determined natural gas consumption, shown in Table 1 the composition and quantity of the emitted harmful substances from the users burning facilities are prognosticated (Table 2).

No	Users	W $nm^3.10^6$	NO_x, t/year	CO t/year	NMVOC t/year	CH4 t/year
1.	Industrial zone	55.07	234.05	30.43	3.74	3.74
2.	Public and administrative sector (PAS)	2.92	12.39	1.61	0.2	0.2
3.	Residential sector (RS)	15.62	66.39	8.63	1.06	1.06
	Total	73.605	312.83	40.67	5.0	5.0



The total emissions amount is 363.5 t/year. The NO_x quantity is 86%, followed by CO – 11.3%. The total hydrocarbons quantity is 2.7%. As mentioned dust and SO_2 are not emitted. According to the distribution of natural gas consumption in industry, PAS and RS 13% of total emissions in the town of Gorna Oryahovitsa are discharged during summer

months and the remaining 87% during the heating period (winter). It is noteworthy that the Industrial zone is a major source of emissions – 74.8%, followed by the RS – 21.24% and the PAS – 3.96%.

3.1.4. Scrubbing equipment (type, scrubbing effect)

Of all technological processes in the gas supply network only natural gas purification from mechanical admixtures is realized by filters (screen or centrifugal type) which are accessories in the technological flow chart of AGRS, GRP-Town Section, GRP-Quarter Section and GRGMP. Their function is to guarantee the hydraulic pass ability of the network. Their purification effect is above 90%. Their cleaning is automatic.

The users industrial boiler plants are heating and with low thermal capacity (I group according Ordinance No.1/1997 for Operation of dust separators and gas purification facilities). Purification facilities for them are not installed because they are not required by technological or sanitary necessities.

3.1.5. Prognostication and assessment of the expected changes in the quality of the atmospheric air (atmospheric air pollution), including of the ground layer of the atmosphere, territorial range of zones of polluted air as a result of the project implementation

The effect of the "Gasification of Gorna Oryahovitsa" project should be examined during two periods – construction and operation ones.

Period of construction

During the construction period there is noise impact and atmospheric air dust pollution from the construction and installation activities and the operation of the construction mechanisms. The construction of the distribution gas pipeline from the AGRS to the town bounds is in agricultural lands outside settlements. A major part of the dust pollution is a result from excavations for installing the gas pipeline network in a settlement.

Operating construction mechanisms will release emissions typical of flue gases from internal combustion engines. According to Art. 12 of the Law for protection of air purity harmful substances in internal combustion engines exhaust gases are regulated for the following indices: smoke, carbon monoxide, nitrogen oxides and hydrocarbons content. The control authorities measure motor vehicles emissions minimum twice per year.

According to detailed engineering for construction organization and implementation (DECOI) developed for a similar project by the contractor construction company the necessary mechanization includes as a typical working unit the following: a single shovel excavator with a reversed 1.5 m^3 bucket; a bulldozer with a 3.20 m wide blade; a pipe carrier; a truck crane with 3 t rated load capacity – 2 pcs; a truck crane with 5 t rated load capacity – 2 pcs; an asphalt placer; a gasoline or pneumatic circular saw; a compressor; a mechanical rammer – 4 pcs. On-site refueling of motor vehicles is not planned so fuel fumes including: saturated hydrocarbons, benzene, toluene and xylene are not taken into account. The dispersing of exhaust gases within the site boundaries (up to 2.4 m) in the direction of the wind estimated by simulation shows that the emissions at this wind direction are within regulation limits ($PCL_{max\ single}$).

Cm '(M_{CO}) = 0.01 mg/m^3	$PCL_{max\ single}$	- 60 mg/m^3.
C '($M_{hydrocarbons}$) = 0.0016 mg/m^3		- not regulated
C '(M_{NO2}) = 0.00105 mg/m^3		- 0.2 mg/m^3
C '(M_{SO2}) = 0.00105 mg/m^3		- 0.5 mg/m^3
C '(M_{soot}) = 0.0009 mg/m^3		- 0.15 mg/m^3
C '(M_{Pb}) = 0.0000068 mg/m^3		-

When the wind blows perpendicularly to the source the $PCL_{max\ single}$ values are not exceeded as well.

Cm '(M_{CO}) = 0.13 mg/m^3	$PCL_{max\ single}$	- 60 mg/m^3.
C '($M_{hydrocarbons}$) = 0.0137 mg/m^3		- not regulated
C '(M_{NO2}) = 0.0206 mg/m^3		- 0.2 mg/m^3
C '(M_{SO2}) = 0.0137 mg/m^3		- 0.5 mg/m^3
C '(M_{soot}) = 0.00118 mg/m^3		- 0.15 mg/m^3
C '(M_{Pb}) = 0.00009 mg/m^3		-

It is evident from the obtained results that the impact of the construction mechanisms can be neglected given the nature of the construction and installation works and the scope of the group.

Territorial envelope of the noise and dust effect within the site framework (considerably below the lowest degree of the criterion i.e. 5 km) – small;

degree of effect – negligible;

duration – short;

frequency – one time during the construction period;

possibility for restoration – yes;

cumulative effect – no.

Given a suitable choice of excavation technology the project effect on air, which is time and space restricted, can be ignored. There is no effect of the construction phase of the project upon features like air temperature, humidity deficiency, precipitation, winds.

Period of operation

As noted the main technological processes implemented in the "Gasification of Gorna Oryahovitsa" project like delivery, transportation, distribution, pressure control and regulation, gas metering, natural gas purification and odourization are not a source of harmful emissions to the environment and will not cause a change of the atmospheric air quality. In case of necessity, during maintenance and repair different gas pipeline sections are purged. The natural gas discharged in the atmosphere in a controlled fashion (with a given flow rate) dissipates because it is lighter than air and does not represent a hazard to the people and the environment.

In the same time the main aim of the project is by means of the offered alternative energy source to substitute the conventional fuels for natural gas in industry, PAS and RS of the town of Gorna Oryahovitsa. During the operation period sources of emissions affecting the characteristics of the atmospheric air are the heating and power facilities using natural gas (emissions from fixed sources) which are users property.

With reference to the above although the users heating combustion facilities are not a subject of EIS in order to fully assess the effect of the gasification of the town of Gorna Oryahovitsa on atmospheric air a comparison is made between two alternative hypothesis:

- 1st Hypothesis: existing situation (zero hypothesis) – use of conventional fuels as energy source and assessment of their impact on atmospheric air;
- 2nd Hypothesis: Realization of the project - use of natural gas as energy source and assessment of its impact on atmospheric air.

In both cases the contribution to air pollution of all emission sources related to the project has been analyzed. The automobile transport is not considered because it is subject to substitution of conventional fuels by natural gas.

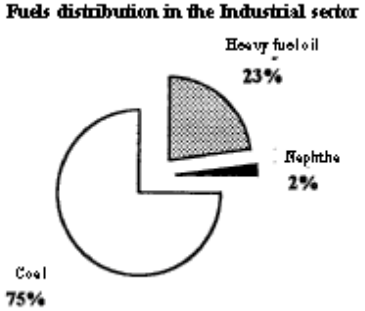
Existing situation (zero hypothesis) - conventional fuels

The main sources of emissions in the region of the town of Gorna Oryahovitsa which are subject to analysis and assessment are the following:

- industrial enterprises;
- public and administrative sector;
- residential sector.

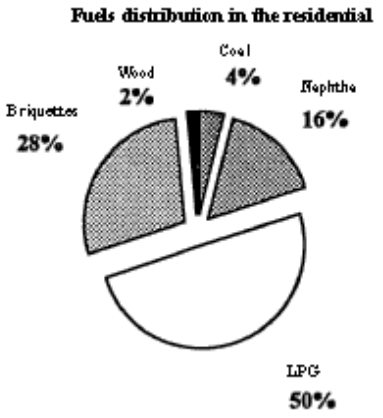
The harmful substances emitted from them are due exclusively to combustion of various fuels depending on their necessities.

Industrial zone – the large enterprises in Gorna Oryahovitsa are 17. They are concentrated in the industrial zone of the town, located in the eastern part and around the railroad station. They belong to different industrial branches. They are heated by means of their own boilers powered by solid, liquid fuels or electricity. The total fuel consumption in the industrial zone (in the enterprises included in the project) of the town of Gorna Oryahovitsa is the following: fuel oil – 15551.52 tonnes equivalent fuel (TEF); kerosene – 1631.5 TEF and coal – 51300 TEF. The coal consumption predominates – 75%, followed by fuel oil – 23% and kerosene – 2%. At present the industrial capacity is underused due to a



common fall in the economy. The location of the industrial zone in the town of Gorna Oryahovitsa is not beneficial from an urban development point of view – it is situated in the eastern and northwestern parts of the town. Considering the conditions of the climatic factors, especially wind (predominating direction west, followed by east – see wind rose) it can be presumed that the impact of the industrial zone (IZ) on the atmospheric air quality in the town part of Gorna Oryahovitsa is considerable.

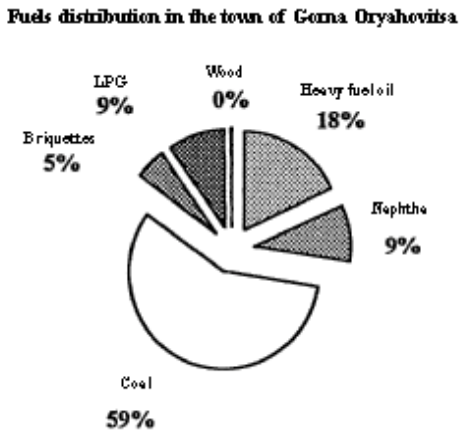
Town part – according to statistical data the number of inhabitants is 38914, comprising 13000 households. The PAS includes 31 buildings, located in different parts of the town. Of them 13 are administrative, health care and public buildings, while the remaining 18 are schools and children's establishments. All of them are centrally heated by means of local boiler utilities powered by liquid fuel according to heating schedule. Due to high fuel price most of the utilities in the PAS do not operate. The residential sector includes: family houses up to 2 floors – 2732; apartment blocks from 3 to 5 floors – 571; apartment blocks with more than 6 floors – 179. The town of Gorna Oryahovitsa is divided in 3 main areas (town parts), which are not equal with regards to area, inhabitants and built-up volume. These are Town part – downtown area, Kaltinets quarter and railroad zone. Low floor buildings predominate – 78% of all are up to 2 floors, the residential apartment blocks up to 5 floors are 16% and only 5.1% are with more than 6 floors. The central part has a good infrastructure. The commercial, administrative and catering buildings are centralized in the downtown area. In view of the economic situation building of a large number of new establishments in the administrative and municipal and buildings in the residential sectors is not anticipated. A reconstruction of the existing buildings is expected to a larger extent. With respect to urban development an increase of the number of floors is expected, not an increase of the built-up area. The situation in industry is similar. There is no district heating network in the town of Gorna Oryahovitsa.



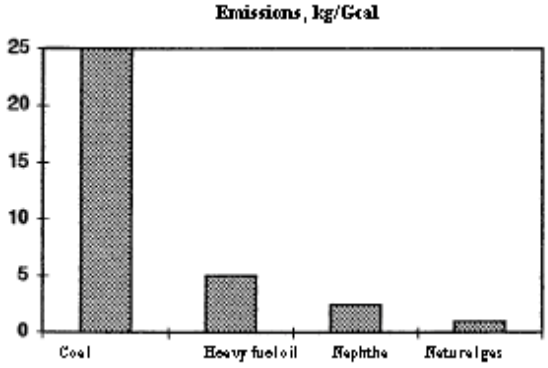
The total consumption of fuels in the PAS is the following: kerosene – 4144.4 TEF (86%) and fuel oil – 678.5 TEF (14%).

Fuel consumption in the RS is as follows: coal – 638.4 TEF, kerosene – 2767.76 TEF, LPG – 8485.7 TEF; briquettes – 4845 TEF and wood – 267.84 TEF.

In general for the town of Gorna Oryahovitsa the use of fuels which release harmful emissions in the atmospheric air predominates – coal and briquettes – 64%, fuel oil - 18%, kerosene – 9% (total 90%). The energy sources which do not pollute air such as wood and LPG total 10%.



The capability of the different types of fuel to generate harmful emissions is shown on the next figure. It is evident from the distribution of fuels that the fuels used are with a high emission potential. This is unfavorable to all components of the environment.



On the basis of the quantity of the consumed fuels the following quantities of harmful emissions have been determined according to the "CORINE AIR" method for determining of

combustion emissions in power, industry and residential heating (approved by the MEW) – Table 3.

Table 3. Composition of the emissions depending on utilized fuels

Fuel	**Emissions t/year**						
	SO_2	NO_x	Dust	CO	NMVOC	Methane	Total
Fuel oil	554.94	86.71	27.03	11.24	1.45	1.45	682.83
Kerosene	111.44	18.55	13.23	2.41	33.91	33.91	213.45
Coal	2915.84	135.56	182.24	18.07	14.62	14.662	3280.95
Briquettes	272	8.5	17	1,105	85	85	468.61
Wood	0	0.89	0.041	0.11	3.35	2.23	6.63
LPG	0	3.76	0	0.5	0.15	0.075	4.48
Total	3854.22	253.97	239.54	33.44	138.47	138.4	4656.95

The total quantity of individual emissions as a statistical parameter is 4656.95 t/year. The quantity of SO_2 – 83% is the biggest one, followed by dust – 5% and NO_x – 5%. With this distribution of utilized fuels by type and quantity the largest contributors in atmospheric air pollution are coal – 70.45%, fuel oil – 14.66%, briquettes – 10%, kerosene – 4.6%. The low content of released mechanical components (soot, dust) indicates that the cause of pollution in Gorna Oryahovitsa has to be looked for in the non-organized sources and the automobile transport (secondary dust pollution). The effect of the individual sources upon the composition of emissions is shown in Table 4.

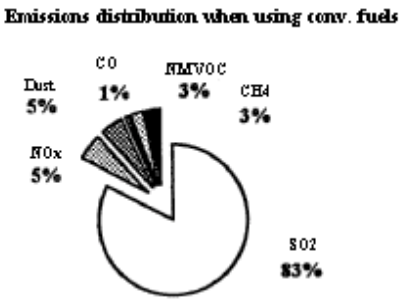
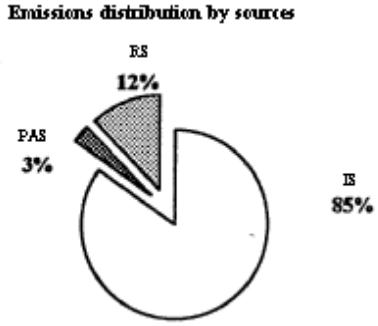


Table 4 Composition of emissions by sources, t/year

Source	SO_2	NO_x	Soot – dust	CO	NMVOC	Methane	Total
IZ	3433.02	222.12	208.43	29.3	24.41	24.41	3941.68
PAS	77.26	13.87	7.56	1.8	24.24	24.24	148.97
RS	343.94	17.99	23.57	2.35	89.83	88.64	566.33
Total	3854.22	253.97	239.54	33.44	138.47	138.4	4656.95

It is evident that the contribution of industry is a major one – 85%, that of PAS is 3% and of RS – 12%. Therefore the industrial sector is the largest emitter of harmful emissions in the atmospheric air of Gorna



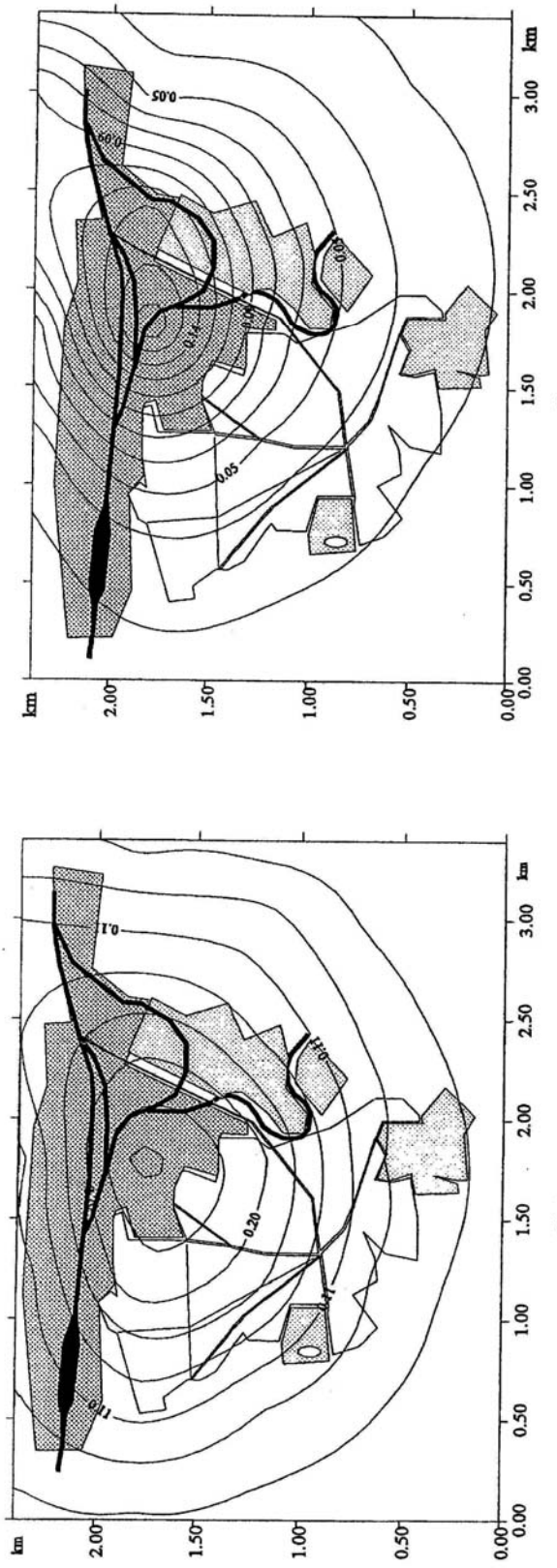


Fig.10a. The avarage monthly field of concentration of SO2 in the air when using conv.fuels

Fig.10b. The avarage monthly field of concentration of SO2 in the air when using conv.fuels

Oryahovitsa given this distribution of utilized fuels by type and quantity. Its impact is intensifying. Although the contribution of the PAS and the RS is only 15% their impact is intensifying due also to the fact that low floor houses predominate in the town of Gorna Oryahovitsa. The low height of flue gases discharging is a prerequisite for their superposing upon those from non-organized sources (automobile transport) and their detention in the ground layer of the settlement.

Simulation of the emissions distribution in space

The space distribution of harmful emissions is of special importance for atmospheric air quality assessment in order to outline the zones with unfavorable characteristics and their range. Besides using simulation all sources are placed in equivalent energy conditions with regards to use of conventional fuels and natural gas. In this way only the change of the atmospheric air state when substituting conventional liquid and solid fuels for natural gas can be correctly prognosticated.

A stationery numerical method for calculation of environmental load caused by the main point and area sources has been used. Data of their main parameters: flue height, diameter, temperature t ºC of gases, velocity of gases, flowrate of gases, emissions output has been put in the model. Results from calculations of the total air pollution field caused by the main organized sources on the territory of the town of Gorna Oryahovitsa are presented in order to identify the effect of the type of utilized fuel upon the degree of ground air layer pollution.

An area with dimensions 3.2x2.4 km covering the territory of the town of Gorna Oryahovitsa has been selected in which a Cartesian coordinate system is fixed with an origin in the southwestern corner. A network with a step (x=600)/(y=600) m has been implemented in the points of which the concentrations of the pollutants are calculated. When representing the fields the isolines are drawn after network points interpolation. The ground fields are given in mg/m^3.

Monthly average values of air temperature, precipitation quantity and duration and wind frequency by direction and velocity taking into account the percentage of calm weather determined from multiyear observations at CMS – Gorna Oryahovitsa are used as meteorological information. January and July are chosen as representative months of the heating and non-heating seasons.

When using liquid fuels (fuel oil and kerosene) and solid fuels (coal, briquettes, wood) the main pollutants discharged in the atmosphere are sulphur dioxide, nitrogen oxides and dust, which are regulated under Ordinance No.14/1997. The mean pollution field for each of these ingredients during January and July has been calculated (Fig. 10-11). The zones with polluted air, their territorial range and degree of pollution are shown on the figures.

The average 24 hours daily PCL typical for the relevant month is used for reference. Cases of extreme conditions (volley emissions) are not considered here.

Sulphur dioxide

During the heating season the calculated concentrations are within a range of 0.021-0.27 mg/m^3. The maximal simulated concentration is 1.8 times greater than the $PCL_{24h\ d\ av}$ (0.15 mg/m^3). The whole territory of Gorna Oryahovitsa is enclosed by an isoline 0.03 mg/m^3 (Fig. 10a). The region south of "Zaharni zavodi" between the military establishments and the site of "Bitova tehnika" is the most affected one with simulated concentration above 0.2 mg/m^3. In summer the simulated concentration is within a range of 0.007-0.17 mg/m^3. Only in the area of "Zaharni zavodi" the exceeding is 1.13 times above the $PCL_{24h\ d\ av}$. In winter the unfavourable effect zone is larger, while in summer it shrinks in a close proximity of the sources. During both seasons the effect centre shifts to the industrial zone, situated in the northeastern part of Gorna Oryahovitsa. This is due to the fact that in summer the PAS and the RS do not consume conventional fuels, while "Zaharni zavodi" use fuels for process needs. The seasonal distribution of SO_2 shows a high generating capacity of the solid and liquid fuels used during the heating period.

Nitrogen dioxide

During both seasons under consideration the model fields show NO_2 concentration lower than $PCL_{24h\ d\ av}$ (0.1 mg/m_3) in a region similar to that for SO_2 – Fig. 11a. During January the maximal simulated concentration is 0.092 mg/m^3 (0.9 times the $PCL_{24h\ d\ av}$) and 0.06 mg/m^3 during July (0.6 times the $PCL_{24h\ d\ av}$). The NO_2 air pollution zone in winter is wider and

shifted in west direction. In summer it is shrunken around the industrial zone. The area south of "Zaharni zavodi" between the military establishments and the site of "Bitova tehnika" emerges as a centre of the zone.

Dust (soot)

As evident from the enclosed drawings (Fig.10b) the air dust content caused of the simulated sources is not considerable. The maximal calculated concentration in winter is 0.12 mg/m^3 (2 times lower than the $PCL_{24h\ d\ av}$ - 0.25 mg/m^3), in summer 0.107 mg/m^3 (considerably below $PCL_{24h\ d\ av}$). The distribution of dust pollution is over the entire territory of the town of Gorna Oryahovitsa, but the above mentioned region is with the highest values.

On the basis of the results from the simulation of atmospheric air state in the region of the town of Gorna Oryahovitsa impacted by the current situation the following is determined:

- the range of the effect is upon the entire town territory;
- during both seasons the area south of "Zaharni zavodi" between the military establishments and the site of "Bitova tehnika" emerges as a centre of the zone with unfavourable atmospheric air characteristics;
- of the monitored indices SO_2, NO_2 and dust above standard concentrations are prognosticated for SO_2, the highest values above $PCL_{24h\ d\ av}$ being in the above mentioned endangered regions – up to 1.8 times the $PCL_{24h\ d\ av}$;
- the effect duration is long during the heating period;
- the effect frequency is constant especially during the heating period;
- because the simulated concentrations when using conventional fuels exceed the $PCL_{24h\ d\ av}$ for SO_2 in a restricted region the cumulative effect is to be expected only within it.

2nd Hypothesis: Implementation of the Project (alternative hypothesis - natural gas)

After the implementation of the project for "Gasification of the town of Gorna Oryahovitsa" the number of users, described in the "zero hypothesis", remains the same, only the type of fuel used in industry, the administrative and municipal and the residential sectors of the town of Gorna Oryahovitsa changes. The solid and liquid fuels are substituted for natural gas which generating capacity with regards to pollutants (emissions) is considerably lower.

By the introduction of natural gas as an energy source in the town of Gorna Oryahovitsa the emissions contents are changed – almost no dust, soot and SO_2 are emitted, NO_x, CO (depending on the quality of combustion), NMVOC, CH_4 are given off NO_x has a determining character of them.

Taking into account the trends in the development of the town of Gorna Oryahovitsa and the determined natural gas consumption, shown in Table 1 the composition and quantity of the emitted harmful substances from the users combustion facilities are prognosticated (Table 2) – item 3.1.3. The total emissions amount is 363.5 t/year and this is a 13.2 times less than the one when using conventional fuels – 4656.95 t/year. The quantity of nitrogen oxides, which are the determining pollutants, increases 1.23 times, NMVOC and CH4 decrease considerably – 27.7 times. CO increases 1.21 times and sulphur oxides, dust soot are completely removed.

According to the distribution of natural gas consumption in industry, PAS and RS 13% of total emissions in the town of Gorna Oryahovitsa are discharged during summer months and the remaining 87% during the heating period (winter). It is noteworthy that the Industrial zone is a major source of emissions both when using conventional fuels and after their substitution for natural gas – 75 - 85%, while the share of PAS and RS falls to 25-15%.

Depending of the combustion quality (incomplete or complete combustion) CO or CO_2 are released in the atmosphere. The world experience shows that only CO_2 is released when we have a complete combustion, which is not regulated under our ecological legislation.

According to Ordinance No.2/19.02.1998 for standards of permissible emissions (concentration in flue gases) of harmful substances released in the atmosphere from fixed sources (SG, issue 51/1998) Art.22 para. 1 and Annexes No.4-1 and No.4-2 the standards for emissions depending on the thermal capacity of heating facilities combusting gas fuel are given in Table 5 for oxygen concentration in flue gases of 3% by volume.

Table 5

Thermal capacity	Dust, mg/m^3	Sulphur oxides, mg/m^3	Nitrogen oxides, mg/m^3	CO, mg/m^3
Above 500 MW	10	35	350	100
100-500 MW	10	-	350	100
50-100 MW	10	-	350	100
0.5-50 MW	-	-	250	100

When utilizing natural gas in a quantity of 73,605.10^6 nm^3/year in compliance with the above regulations up to 7.36 t/y of CO will be released in the atmosphere, which is 2.1 times less compared to combustion of conventional fuels by users with the same thermal capacity. This shows the exclusive importance of proper combustion control. For users up to 50 MW, as those in the town of Gorna Oryahovitsa are, the quantity of nitrogen oxides would be only 18.4 t/y, which is 6.5 times less than when using conventional fuels by users with equivalent thermal capacity.

All technical means for lowering of the nitrogen oxide quantity know for conventional fuels are also applicable when using natural gas. Technological solutions may be used as well:

- correct operation – 15 – 20% reduction of nitrogen oxides;
- variable air supply – 15 – 30% reduction;
- low nitrogen oxides burners – 40 – 50% reduction;
- combined burners with variable supply of air and fuel – 75% reduction;
- catalytic reduction of nitrogen oxides (denitrification) – 50-80% reduction.

The environment loading, caused by the main point (organized) and area (living quarters) sources in the town of Gorna Oryahovitsa using natural gas (Variant 2), is determined on the basis of the simulation. When using natural gas nitrogen oxides are released in the atmosphere as major pollutants. The zones with polluted air, their territorial range and the pollution degree are shown on Fig.13.

Nitrogen dioxide

When using natural gas as a fuel a certain increase of the pollution level is noticed which is expressed in a maximal simulated concentration during January of 0.1 mg/m^3, which is equal to the $PCL_{24h\ d\ av}$ and is 1.07 times higher than that of conventional fuels (Fig.11b). In summer the extremal simulated values in this case are 0.09 mg/m^3 (1.32 times lower than those of conventional fuels). When using natural gas it is noticed that although the values of NO_2 are insignificantly higher in winter the effect zone is narrower compared to the one when using conventional fuels and is shifted in western direction. During summer months it shrinks in the proximity of the industrial zone. During both seasons the $PCL_{24h\ d\ av}$ is not exceeded.

The advantage of using natural gas in the industry as well as in the PAS and the RS is evident from the simulation results.

Sulphur dioxide

No sulphur dioxide is emitted when using natural gas

Dust (soot)

No dust and soot are discharged when using natural gas.

On the basis of the results from the simulation of atmospheric air state in the region of the town of Gorna Oryahovitsa impacted by the implementation of the project the following is determined:

- the range of the effect is upon the entire town territory;
- during both summer and winter the degree of the impact is most strongly expressed in the region described under the “zero hypothesis”;

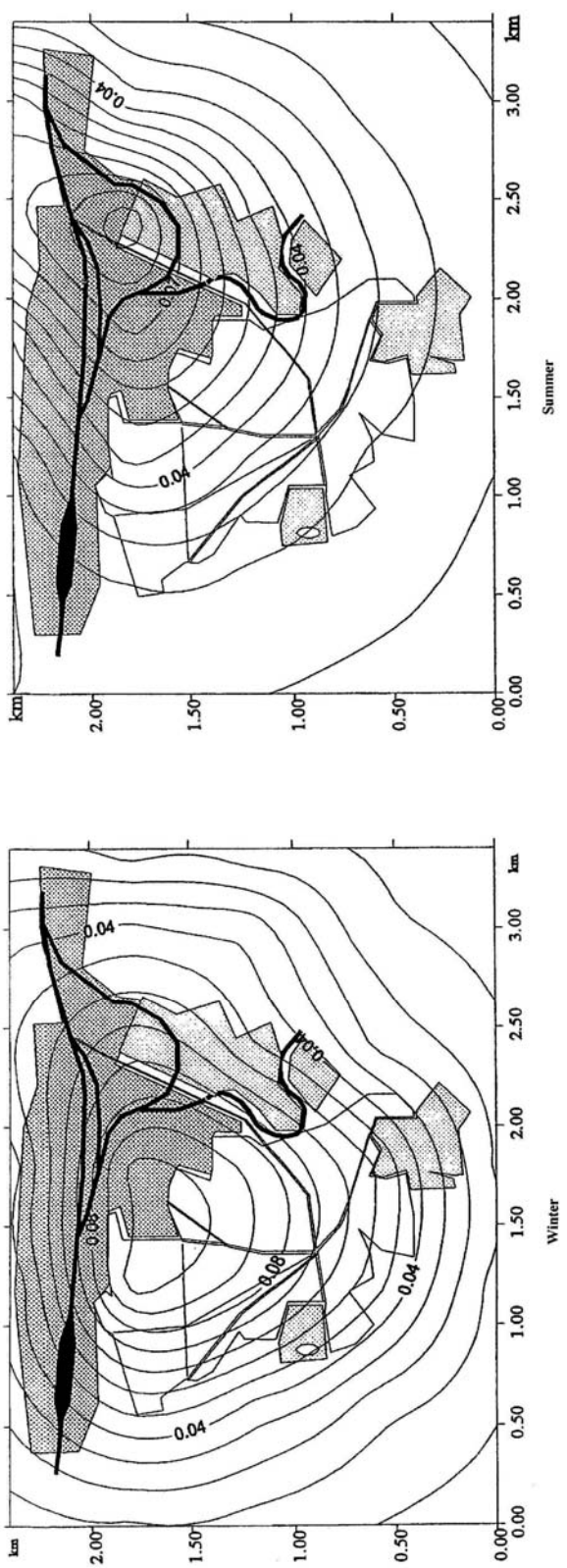


Fig. 11a. The avarage monthly field of concentration of NO2 in the air when using conv.fuels

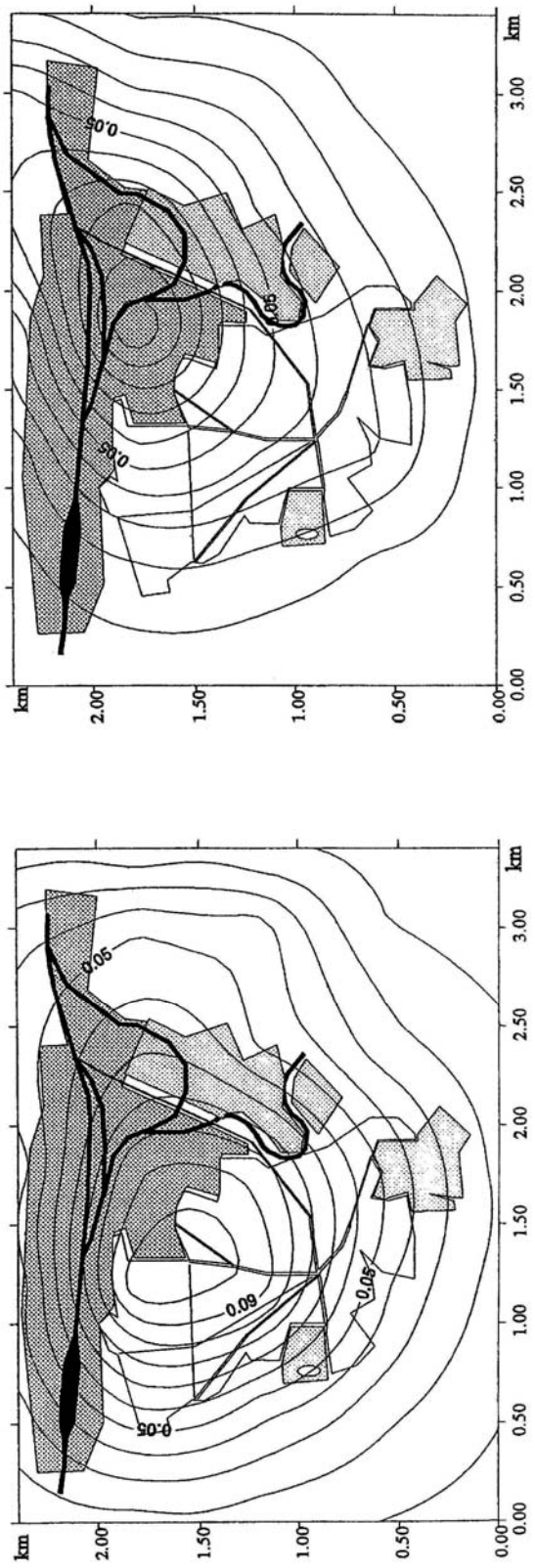


Fig. 11b. The avarage monthly field of concentration of NO2 in the air when using natural gas

- of the monitored indices SO_2 and dust are not emitted, while above standard NO_2 concentrations are not prognosticated;
- the effect duration is long during the whole year, the intensity being higher during the heating season (87% of the effect);
- the effect frequency is constant;
- because the simulated concentrations are substantially lower than the $PCL_{24h\ d\ av}$ a cumulative effect is not expected.

From the comparison between the two hypotheses it is evident that the state of the atmospheric air improves significantly with the implementation of the project. This will affect indirectly all environmental components, but most markedly soils, vegetation, animal species and the living conditions of people in the region of the town of Gorna Oryahovitsa.

3.1.6. Assessment of the effect on the atmospheric air in accordance with the standards and norms for content allowance operating in this country, and in case of non-existence of such standards and norms - in accordance with the accepted criteria

It is evident form the analysis of the substitution of solid and liquid fuels in industry, the PAS and RS of the town of Gorna Oryahovitsa for natural gas that the total emissions amount rises 13.2 times. The quantity of CO and nitrogen oxides increases 1.21 – 1.23 times but sulphur oxides, dust, soot are entirely removed. When observing the content allowance regulations the quantity of CO is insignificant as a result of complete combustion in the heating and power facilities using natural gas.

During the heating season the 24 hour daily average concentration of the determinant pollutant NO_2 in the region of the IZ is equal to the $PCL_{24h\ d\ av}$, while in summer – only to 0.9 times the $PCL_{24h\ d\ av}$. In both cases the concentration is simulated for a restricted region. This complies with the requirements in Ordinance N0.14/1997 and shows the advantage of natural gas to the remaining fuels and the actuality of the project for improvement of the ecological situation in the town of Gorna Oryahovitsa.

3.2. SURFACE AND GROUND WATERS

3.2.1. Hydrogeological and hydrological conditions and factors, affecting the quantity and the quality of the surface and ground waters

The hydrogeological and hydrological conditions, affecting the formation and the condition of the surface and ground waters in the region of Gorna Oryahovitsa are the following:

Surface waters

The town of Gorna Oryahovitsa is situated in the main river valley of Yantra, which flows north of the town. The hydrographical and hydrological conditions are characterized by the following indices:

Density of river network: 0.4 – 0.5 km/km^2.

The modulus of the annual surface flow is very low – 2 – 3 l/s/km^2. It is divided into: winter<2 l/s/km^2; spring 1 – 2 l/s/km^2; summer 0.4 l/s/km^2 and autumn – 0.4 l/s/km^2.

The variation coefficient of the surface flow is 0.7-0.8 and the flow coefficient is 0.1.

The average duration of the high water is 7 months, the mean date of its occurrence is during December and its termination – during June. The region is characterized by an unstable period of high water. The flow volume during a period of high water is 60 – 70% of the annual one.

The average duration of the period of low water is 3 – 4 months (July – November). The flow volume during a period of low water is up to 10% of the annual one. The duration of dryness of the surface waters in the region of the river Yantra is 45-75 days per annum.

The modulus of the absolute minimal flow is 0.3/l/s/km^2 and is characterized by a variation coefficient of 1.0 – 1.25. It occurs around 1-10 September or 10 November with diversions in July and October.

The mean annual temperature of the river water is 8-10 ºC (April 10 ºC; July 21 ºC; October 12 ºC).

The water turbidity in the river flow is 1000 – 2500 g/m^3, the floating alluvium being 100 – 500 t/km/y.

The total dissolved solids are 300 – 400 mg/m^3 at spring high water and 300 – 400 mg/m^3 at summer low water. Their hardness is respectively 8.4-12.6 ºH at high water and 8.4-12.6 ºH at low water.

The waters are not aggressive to concrete. There are not natural lakes in the region. According to geological division into districts the surface waters are with a precipitation feed and an unstable phase distribution of flow under the influence of the European continental climatic conditions.

Ground waters

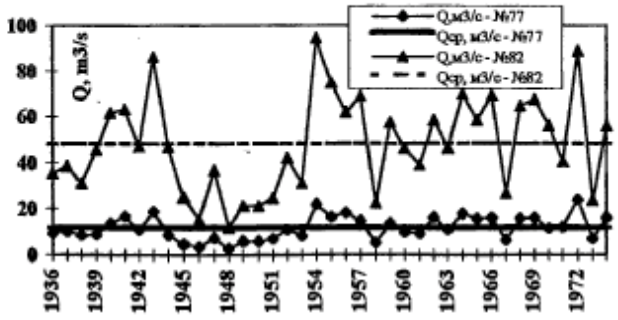
In the region between the town of V.Tarnovo and the village of Samovodene the valley of the river Yantra is excavated in sandstone and limestone. The wide part of the valley between the village of Samovodene and the village of Draganovo spreads over marls covered by alluvial materials with a depth of 5 – 7 m. The alluvium is formed by a lower gravel layer with a depth of 0.8 – 3 m and an upper sandy clay layer with a depth above 4 m. The depth of occurrence of ground waters on the territory of the town of Gorna Oryahovitsa is 0.5 – 5.0 m. In the alluvial deposits pressureless ground waters have been formed, which are in direct hydraulic link with ground river waters. The regime of the ground waters level, which is of a "hydrological type" depends on the spring high water, caused by spring snow thaw and on the autumn low water (September-October). During spring high water the level of ground waters in alluvium reaches up to 0.5-1.5 m from the terrain, while during autumn low water it reaches up to 6.0-7.0 m from the terrain. By "total mineralization" the ground waters are classified as "fresh", by "total hardness" – as "soft" and by "predominating ion content" – as "hydrocarbonate-sulphate-calcium-magnesium". The pleiocene clays serve as a confining layer for the alluvial ground waters. The water carrying layers are subject to anthropogenic impact. A composition similar to that of surface waters can be prognosticated due to their direct link. The ground waters in the region of the towns of Gorna Oryahovitsa and Lyaskovets are used for water supply. Water catchment facilities with a total flowrate of 80 l/s have been built.

No Karst regions, Karst ground waters with deep circulation, or thermal waters have been found in the close proximity of the town of Gorna Oryahovitsa. There are such south of the town in the region of Lyaskovets and to the west in the region between V.Tarnovo and Sevlievo.

3.2.2. Quantitative and qualitative characteristics of the water resources in the territory of the project and categories of the water intakes

The "Gasification of Gorna Oryahovitsa" project covers the entire territory of the town of Gorna Oryahovitsa. The water resources in the region include the river Yantra and the ground waters in its ledge. It flows to the north of the town of Gorna Oryahovitsa in a close proximity. River Yantra is included in the hydrometric network of the National Institute of Meteorology and Hydrology (NIMH) and in the monitoring network of NCECR – MEW (National Automated System for Ecological Monitoring - NASEM) but there is no CMS and NASEM points in the region of Gorna Oryahovitsa. In view of above data from CMS No.77 – Cholakovtsi and CMS No.82 – Karantsi for the quantitative characteristics of the river Yantra (a major water source and intake) are shown. The first is situated ahead of, the second after the town of Gorna Oryahovitsa. Its catchment basin is with an average altitude of 449 m (545 – 440 m). The catchment area is 55% afforested. According to data from CMS No.77 for a 40 years period for a catchment area of 1289 km^2 the average monthly flow is 11.9 m^3/s, the modulus of flow is 9.23 l/s/km^2, flow volumes are 375.3 million m^3, the variation coefficient is 0.434.

The quantitative characteristics of the Yantra River in HMS No. 77 - Cholakovtsi, and HMS - No. 82 - Karantsi



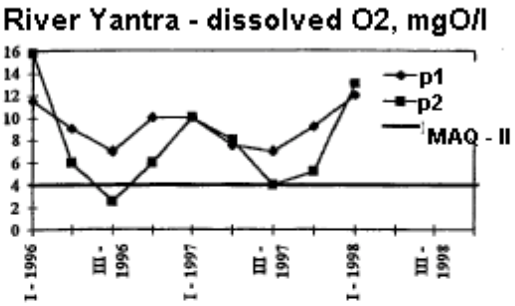
According to data from CMS No.82 for a 40 years period for a catchment area of 6860 km^2 the average monthly flow is 48.2 m^3/s, the modulus of flow is 7.03 l/s/km^2, flow volumes are 1520 million m^3, the variation coefficient is 0.434. A hodograph

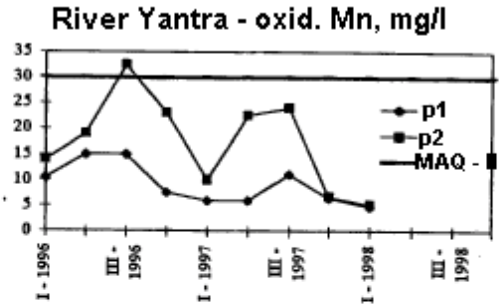
of the natural flow in both locations is shown on the Figure compared to the average multiyear one. According to ECO for CMS No.77 – $Q_{50\%}$ = 11.5 m^3/s; $Q_{75\%}$ = 8.01 m^3/s; $Q_{95\%}$ = 3.93 m^3/s. For CMS No. 82 - $Q_{50\%}$ = 46.5 m^3/s; $Q_{75\%}$ = 32.5 m^3/s; $Q_{95\%}$ = 16.0 m^3/s.

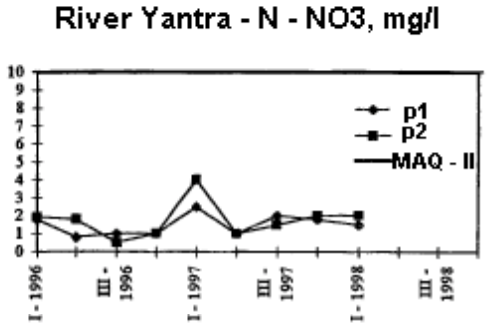
River Yantra and its tributaries are a major water source for water supply of the settlements in the upper course and for irrigation of the agricultural land around them. Its natural flow to the mentioned locations is interrupted by a number of water intakes and pump stations allocated for irrigation. More than 15 small dam lakes with a total volume above 3.7 million m3 have been build during the same period in this part of the river course.

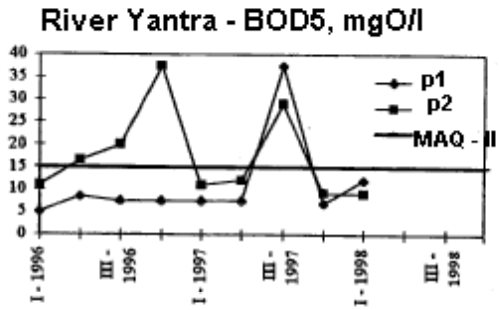
The quantitative characteristics of the river Yantra course by main indices in front of and after Gorna Oryahovitsa – P1 – village of Samovodene, P2 – village of Varbitsa are shown on the following figures. The quantity of waters in this section is formed mainly by the impact of the town of Gorna Oryahovitsa.

The waters of the river Yantra in the region of Gorna Oryahovitsa are not used for water supply, only for irrigation of agricultural land and for domestic animals. The ground









waters from its ledge are used for industrial water supply of Gorna Oryahovitsa, Lyaskovets and drinking water supply of the villages of Pisarevo, Varbitsa, D.Oryahovitsa, Dobri dijal and Kozarevtes with a population of 10500. The town of Gorna Oryahovitsa is supplied with drinking water mainly from "Iovkovtsi" water supply system (250 – 300 l/s), which was put in operation after 1982 and has "Iovkovtsi" dam lake as a main water source. Waters are purified in a two stage water treatment plant with a capacity of 2.5 m^3/s. Ground waters from the ledge of the river Yantra are used as well – total 81 l/s. Company-owned water sources with a flowrate of 98 l/s are used for industrial water supply. "Zaharni zavodi" use 9 company-owned water sources.

The River Yantra is a water intake for the residential and industrial waste waters. There is no waste water treatment plant in the town of Gorna Oryahovitsa. All waste waters – industrial, utility and rain waters are debouched in river Yantra via a common sewage system. A feasibility study and a partial detailed engineering (mechanical stage) have been developed for a town waste water treatment plant (TWWTP) with a capacity of 50920 m3/day to serve Gorna Oryahovitsa and Lyaskovets. Construction has not begun. The sewage system is 90% built with a usability degree of 96%. The feed header of the TWWTP is 4000 m long and is 25% built. The category of the water intakes in the region of Gorna Oryahovitsa is IIIrd at the village of Samovodene (before Gorna Oryahovitsa) and IInd at the village of Varbitsa (after Gorna

Oryahovitsa). "Zaharni zavodi" is a major polluter (with waste water flowrate of 18000 m3/day) of the industrial enterprises in the town.

3.2.3. Characteristics of the water sources and the water consumption at the project

The technological processes taking place in the project "Gasification of the town of Gorna Oryahovitsa", comprising: transportation, distribution, pressure reduction and regulation in the gas pipeline network, natural gas purification and metering do not consume water for technological and utility necessities and are not a source of waste water.

3.2.4. Sources of pollution provided for in the project - quantity and quality of the waste waters (by technological flows, and generally), methods for their treatment

According to the technological flow chart of the project and realized technological processes, described in item 2.1 and to the above mentioned in item 3.2.3 no sources of pollution of the surface and ground waters are provided for in the project and no waste waters that require treatment are discharged.

3.2.5. Technological flow chart of the water treatment and equipment

The "Gasification of Gorna Oryahovitsa" project is not directed towards impact upon water resources and in accordance with item 3.2.4 does not require water treatment facilities.

3.2.6. Forecasts and assessment of the expected changes in the regime of the water flows and ground waters as a result of those provided for in the project: water consumption, river bed correction, hydrotechnological equipment, etc., as well as their effect on the quantitative regime and qualities of the ground waters, the general state of the water ecological systems and the process of self-treatment under the conditions of normal and dry years

The "Gasification of Gorna Oryahovitsa" project is not a hydrotechnical one, does not consume water for technological needs, consequently it does not discharge waste water and products, that pollute surface and ground waters, In this aspect the project does not affect the regime of water streams and ground waters, does not impact directly the quality of water resources and the general state of water ecosystems.

3.2.7. Prognostication and assessment of the expected changes in the quality of the water intakes as a result of the implementation of the project

Period of construction

Excavation works for the laying of the gas pipeline network have got the biggest share of the construction activities related to the project implementation. Along the route from the GARS to the town bounds of Gorna Oryahovitsa the former will have no negative effect on surface waters because there are no such along the route of the Distribution gas pipeline (the river Yantra flows outside of the town). A temporary pollution of surface waters with soil precipitations via the rain sewage can be expected during the earth works for laying of the town gas pipeline network.

During the construction period the technology of implementation provides for minimal quantity of wet processes related to covering of the sites of GRPs-Town Section, GRPs-Quarter Section, SCUs, monitoring metering column of electrochemical protection system with concrete. The different types of building mortars are delivered from off-site bases. A pollution of flowing rain waters is possible but the size of the sites is such that this does not affect the quality of surface waters.

On the basis of exploration drilling exploitations it is determined that the ground waters in the region of the gas pipeline routes are accumulated in gravel deposits and have a direct hydraulic link to the river Yantra. This determines the direct effect of the water positions in the river upon the ground waters level. A seasonal variability of 0.5 - 1.8 m of the ground water level is prognosticated. Ground water influx in the construction is expected during excavation works along streets in the northwestern part of the town. This will lead to a necessity to drain the construction ditches and to a rise of the inert pollutants in the water intake.

The prognostication for the project effect on surface and underground waters when carrying out the construction works is local by place, with a low degree of impact, one time during the period of construction, with a possibility of restoration and a lack of cumulative effect.

Period of operation

The technological processes of operation of the "Gasification of Gorna Oriahovitsa" project are not related to water consumption, no technological products, related to a potential danger of changing the regime and the quality of surface and ground waters, are discharged.

The project implementation in accordance to its function does not affect the regime of surface and ground waters.

The impact of the project upon general condition of the water ecosystems is exceptionally beneficial. The substitution of the solid and liquid fuels that are currently used by the industry and the population for natural gas eliminates the necessity of the existence of a large warehouse base, unloading sites and servicing automobile and railroad transport, the operation of which objective conditions exist for pollution of the surface and ground waters with petroleum products, coal dust and miscellaneous pollutants.

3.2.8. Determination of the environmental components on which any changes of the hydrological and hydrogeological conditions and any changes of the quality of waters would offer considerable effect

The hydrological and hydrogeological conditions in the region of the town of Gorna Oryahovitsa do not change with the implementation of the project for "Gasification of the town of Gorna Oryahovitsa". Indirect positive effect can be expected for the water intake condition by elimination of warehouse bases for conventional fuels, which are a potential source for pollution of surface and ground waters.

3.3. WASTES

3.3.1. Expected quantity of generated wastes (names, codes, quantities)

The main technological processes provided for in the project "Gasification of the town of Gorna Oryahovitsa" such as transportation and distribution of natural gas, gas network pressure control and regulation, gas purification from mechanical admixtures, odourization, gas flow variables measurement do not generate wastes. Natural gas combustion in the users combustion facilities does not release wastes. In this respect, the project implementation will help to eliminate all wastes related to utilization of solid and liquid fuels in the different sectors of the town of Gorna Oryahovitsa.

A major share of the construction belongs to the gas distribution network underground laying along the town's streets. According to the technology of execution of asphalt and asphalt-concrete road surfaces, the excavation has the same width as the ditch. The side pavement is not broken during the excavation works. The excavated material of broken pavement is transported and disposed of at a site indicated by the Employer and the local authorities. The earth material that is fit for subsequent filling up depending on the location of the excavation along the entire route is piled up alongside the ditch. Therefore, given the technical parameters of the project, construction wastes (code 21414) with a volume of 9075 m^3 can be expected.

3.3.2. Collection and shipment (description of the system, storage premises)

Construction wastes (unfit street pavement) will be collected at the time of their generation and transported by automobile transport to the disposal site.

3.3.3. Waste treatment before shipping it for final decontamination

The separated unfit street pavement is not treated before disposal.

3.3.4. Waste storage

The town of Gorna Oryahovitsa has one waste storage site in operation. It is located in Bavenets locality 3 km northwest of the town on the land of the village of Parvomajtsi. Its area is 150 decares of which 45 decares are exhausted and their recultivation is impending.

As mentioned above, the excavated material of broken pavement is transported and disposed of at a site indicated by the Employer and the local authorities. The storage site of the town of Gorna Oryahovitsa can be used or the construction wastes can be utilized for filling up at other construction sites, of old excavations or at leveling works.

3.3.5. Other forms of decontamination

No other forms of decontamination besides waste storage are envisaged.

3.3.6. Wastes handed over/produced for treatment/decontamination to/from other enterprises or from import/export

The "Gasification of the town of Gorna Oryahovitsa" project does not envisage any wastes to be transferred or exported for treatment or ones to be received or imported for treatment from other sources. At the same time by limiting the use of coal and briquettes, the release of cinders (code 11504) from their combustion is eliminated.

3.4. HAZARDOUS SUBSTANCES (based on UN classification)

3.4.1. Toxic substances - sources, toxic characteristics

No use of toxic substances according to the UN classification, which could be dangerous to the environment and the living conditions in the region, is planned during the construction and operation of the "Gasification of the town of Gorna Oryahovitsa" project.

3.4.2. Other hazardous substances - sources, types, characteristics

The main function of the gas supply system of the town of Gorna Oryahovitsa is to supply natural gas to users. Natural gas has specific features such as fire hazard, explosion hazard and toxicity, which render it hazardous in cases of incorrect operation and emergencies. Its composition is given in item 2.3, while the characteristics of potential hazards are considered in item 4.2. The unfavourable characteristics of natural gas are reduced to minimum when the requirements of Ordinance No.21/1991, Ordinance No.3/1995, Ordinance No.4/1995 and Ordinance No.2 for PSST are observed.

Several harmful emissions such as NOx and CO, the emissions and immissions of which are regulated by Ordinance No.2/1998 for standards for permissible emissions (concentrations in waste gases) of harmful substances released in the atmosphere from stationary sources (SG, issue 51/1998), Art. 22, para. 1 and Annexes No.4-1 and No.4-2 and Ordinance No.14/1997, are released in the atmosphere when burning natural gas in the users combustion facilities. These pollutants can be classified as potentially hazardous according to the assessment and prognostication made in item 3.1.

3.5. HAZARDOUS PHYSICAL FACTORS

3.5.1. Existing sources of hazardous physical factors and information about their effects

The main sources of noise load and vibrations for the town of Gorna Oryahovitsa are the automobile transport and the industrial enterprises. There are no data that noise maps of the town have been made. The downtown area is space limited with an intensive traffic, with public and administrative buildings close to roadways. This leads to continuous loading of the buildings with traffic noise and vibrations. The terrain conditions do not allow a construction of noise protection facilities and vegetation remains the only factor for restriction of the harmful impact. It is inadequate in this part, which makes it inefficient. The intra-quarter spaces, the town park and the adjacent pedestrian zones are slightly affected.

No harmful radiation sources have been identified in the town of Gorna Oryahovitsa. No permanent or temporary NASEM stations for measuring the gamma radiation background, atmospheric radioactivity and ionizing radiation are installed in the region. The power of the equivalent dose of the radiation background in Central North Bulgaria (data from Pleven

station) during 1997 – 1998 is 0.1 - 0.15 ìSv/h, which corresponds to the average values measured in permanent monitoring stations elsewhere in the country. No sources of high pressure have been identified in the town.

3.5.2. Sources of hazardous physical factors, provided for in the project

No sources of hazardous physical factors are provided for in the Gasification of the town of Gorna Oryahovitsa project. The gas distribution pipe network is laid under the ground. Only the gas regulating stations equipped with instrumentation and automation systems for process control and monitoring are installed above the ground. The latter are installed in metal cabinets and are not a source of noise and harmful radiation. The welded joints are checked by non-invasive methods according to the requirements of Ordinance 0-31 for work with radiation defectoscopes and Ordinance 0-35 for work with radioactive substances and other sources of ionizing radiation.

3.5.3. Forecasts and assessment of the expected effects of hazardous physical factors

During the project implementation the construction mechanisms, that carry out earth works (excavations, embankment, transportation of materials) within the bounds of the town of Gorna Oryahovitsa are a major source of harmful physical factors such as noise, vibrations and dust pollution. It was determined in item 3.1.5 that the emissions released from the construction mechanisms after their dispersion conform to the requirements of Ordinance No.14 (1997). The construction activities are performed in succession in restricted town areas (streets) and after full completion they proceed to another site. With reference to the above the territorial range of dust and noise impact is local – within the framework of the site (considerably lower than the lowest criterion level of 5 km) – small; degree of impact – inconsiderable; duration – short-term; frequency – one time during the period of construction; restoration possibility – yes; cumulative effect – no.

During project operation, no sources of harmful physical factors are provided for and such effects are not expected.

3.6. LAND AND SOILS

3.6.1. Characteristics of the condition of soils and forecasts and assessment of the effect on the soils, including disturbed land in the territory of the project and in adjacent lands to it, by degrees and zones of disturbance

Soils have been formed under the influence of forest deciduous and grass vegetation. The diverse terrain, the climate, the soil-forming rocks, the vegetation and miscellaneous conditions for soil formation determine the availability of the following natural soils with economic significance in the region of the town of Gorna Oryahovitsa: rendzina (humus-carbonate) and grey forest soils. They are divided into regions by common origin, soil forming conditions, mechanical composition and similar agrotechnical and meliorative measures.

Rendzina (humus-carbonate) – border with alluvial field soils in the ledges of the river Yantra and its tributaries, brown forest soils and brown forest soils with rendzina in foothill and mountainous areas. The structure of the profile and the morphological characteristics of these soils depend largely on the terrain character. In low accumulative terrain formations, where weathering is more intense the rendzina have got heavier mechanical composition, they are richer in pre-precipitated clays and are saturated with a greater number of chemical elements. The soils upon the quaternary river terraces are light and medium sandy clay ones according to their mechanical composition. They have been formed upon hard carbonate rocks under the effect of grassy vegetation. The profile of these soils is represented by A horizon with a thickness of 15 – 20 cm bounded by hard rock. In some places rocks come out to the surface and tear the soil cover. The rendzina is dark brown, not thick with well express grained-mould structure. The organic fraction content is high 5.5 – 7.0%. Carbonates settle from the surface in rather large quantities. These soils are alkaline. The silt fraction predominates – 40 – 46%. They have no large reserves of fixed nitrogen (0.40%) and phosphorus (0.23%) and

have low productivity. Their high carbonate content blocks the absorption of microelements like iron and manganese and vegetations suffers from chlorosis.

Grey forest soils – cover the heights in the outskirts of the town to the west and the terrains east of Gorna Oryahovitsa to the ledge of the river Djuliunitsa. This type of soil is characterized by a differentiated profile. The pseudo-podsolic horizon is with a width of 20 – 40 cm. The volume density at FFH is 1.2 – 1.3 g/cm^3. The silt content is 10 – 20%, the physical clay one – 20 – 40%. FFH= 12 – 15% (at pF = 2.5 – 2.7), VTZ = 5 – 8% (at pF = 4.2). The filtration coefficient cf = 0.7 – 0.13 m/24h. The illuvial-metamorphic horizon is with a width of 60 – 90 cm. The volume density at FFH is 1.5 – 1.6 g/cm^3. The silt content is 30 – 55%, the physical clay one – 55 – 75%. FFH = 30 – 35%, VTZ = 15 – 20%, cf = 0.01 – 0.05 m/24h. These soils are characterized by very low natural fertility. The humus content is 1.0 – 1.5 to 2.5%. The quantity of total nitrogen is 0.10 – 0.12%.

The projected gas pipelines routes pass through plain terrain made up of quaternary alluvial clays, sands and gravel. There are no physical geological phenomena like landslides, landslips, poor soils, erosion, etc. which can endanger the safety of the projected gas pipeline. The foundations for the gas pipeline and its facilities can be made in all lithological varieties with the exception of the soil layer. The surveyed region has an intensity degree of I = VIII and seismic coefficient Cs = 0.15 in seismic respect.

Disturbed lands on the territory of the project and land adjacent to it

The entire gas distribution network with the exception of part of the Distribution gas pipeline from the AGRS to the town bounds is located under the street network in the towwn of Gorna Oryahovitsa. Under the impact of urbanization and intensive industrial activity, the soils in the region of the project have transformed into anthropogenic ones. When harmful materials or solid admixtures go in the soil the normal interaction among different ecosystems (soil – vegetation – waters) is disturbed. In these conditions soils slowly but progressively are exhausted and polluted and alter in negative direction compared to their initial natural state. The soils in the region of the project belong to non-disturbed ones i.e. they have normal morphological structure but aggravated soil-forming process due to the road pavement. They are above all exhausted and are moderately altered with respect to the expression of this tendency.

According to "Year-book for the state of the environment in the Republic of Bulgaria" there are no soils polluted with heavy metals in the region of the town of Gorna Oryahovitsa. In Decree No. 50/SG issue 24 dated 26.03.1993 of the Council of Ministers for the approval of Ordinance for the application of Art.10, para. 10 of the Law of ownership and use of agricultural lands and Annex No.1 to it no ecologically polluted lands from industrial activities are registered.

3.6.2. Disturbance or change of the category of land depending on the degree of pollution or damaging the soil; changes in soil fertility

Period of construction

As shown in items 1.2 and 2.1 the route of the Distribution gas pipeline from the AGRS to the town bounds of Gorna Oryahovitsa with an approximate length of 2100 m is situated in agricultural land (municipal property) of the municipalities of Gorna Oryahovitsa and Lyaskovets. According to Ordinance No.1 for assignment, approval and confirmation of routes and areas for linear facilities and the law for preservation of cultivated land and pastures, Art.56 (1) and (2) the 2100 long route is not expropriated because the pipeline is laid down at a depth of min. 0.8 m > 0.7 m. The excavation works will be carried out in accordance with the requirements of the construction and technical regulations and Ordinance No.26 for recultivation of damaged terrain, improvement of low productivity land and utilization of humus layer (SG, issue 89/1996). According to Section II, Art.7 (1) construction on I – VII category lands is performed only after taking humus layer off. According to Art. 8 (3) when laying down underground pipelines the taken off humus layer is used for recultivation after filling them up. A zone around the gas pipeline with a width of 10 m (20 m totals) on both sides along the axis has been envisaged for temporary storage of the taken off humus layer and of the construction

soils. The humus layer thickness after recultivation is no less than 30-35 cm after it subsides in order to retain the agricultural use of the lands. As mentioned above the soil fertility does not alter regardless of chosen variant, while a restrictive regime of land use is introduced.

The excavation works within the town plan of Gorna Oryahovitsa are carried out mainly along the street network. Upon asphalt and concrete-asphalt pavements, the excavation is with the width of the ditch. During excavation works the side surface is not broken. The excavated material of broken pavement is transported away and disposed of at a site indicated by the Employer and the local authorities. The earth material that is fit for subsequent filling up depending on the location of the excavation along the entire route is piled up alongside the ditch. All excavation works are carried out under supervision for observance of project parameters, levels, clearance from other engineering facilities and safety regulations. After the pipelines are laid down, they are filled in by layers from 10 cm to 15 cm above the keystone and 20 – 50 cm from it upwards depending on the capabilities of the mechanisms. Pavement defects due to construction works on streets and sidewalks are removed on the account of the organization that has carried out the works.

Within the zone of passing through a grass plot in the project the vegetation is removed and the soil is cut off to a depth of 0.2 m and a width of the ditch only. The uppermost humus layer is disposed separately and when filling the ditch up is used as a last finishing one. The humus layer thickness after the recultivation is not less than 30 – 35 cm after it subsides in order to retain the use of the lands for grassing.

The impact of construction upon soils is local by place, with a low degree of affect, one-time during the construction period, with a possibility for restoration and with no cumulative effect.

Period of operation

Unfavorable impact upon the soils and soil fertility is not expected during operation of the project. After the construction of the pipeline the following restrictions are regulated for the agricultural lands in the pipeline zone according to Decree No.38/1977:

- the stripes of cultivated land at 10 m on both sides of the gas pipeline to be sowed with one year cultures at a cultivation depth up to 30 cm;
- planting of orchards and other gardens with trees that have large root system is prohibited at a distance less than 10 m on both sides of the gas pipeline;
- fire making and burning of areas after harvest at a distance less than 20 m from the gas pipeline and less than 30 m from shut-down valves and ventilation plugs are prohibited.

Sulphur oxides and dust are completely eliminated by the substitution of conventional fuels for natural gas, which is especially beneficial to the state of the soils in the region of the project. The elimination of dust depositions diminishes secondary dust pollution of the surface soil layer by anthropogenic products. At the same time are eliminated the warehouses and transport vehicles that serve the utilization of conventional fuels, which are a source of soil pollution by petroleum products, coal dust, wastes.

3.7. EARTH GROUND

3.7.1. Geological base

Characteristics of the geological base and forecasting its changes

The rock complexes that form the morphological zone of the foothills of the Balkan mountain are presented by old volcanic and sedimentary rocks known by the names diabase-phylitoid formation, Paleozoic granitoides, conglomerates, sandstone, limestone and dolomites of different phases and age. Cemented sedimentary rocks (low cretaceous limestone, marl, sandy limestone, sandstone), non-cemented rocks (quaternary materials – sands, clays, loess and alluvial sediments) that are corrosion resistant prevail in the middle area of the zone in the region of the town of Gorna Oryahovitsa. The pleiocene are presented by sands and clays and cover vast areas of river valleys. Loess covers almost all plains in the zone. It is unfold as loess-like deposits with a depth up to 1 – 5 m. Loess is characterized hydrogeologically by high water absorption, strong capillary evapouration, low content of underground waters and insignificant

water loss. The alluvial deposits are composed of boulders, sands and clays with cross lodgement. Their depth is largest in the river valleys – up to 8-12 m. They are not cemented and are rich in ground waters.

Engineering-geological and hydrogeological characteristics of the town of Gorna Oryahovitsa

Based on geological-lithological structure, hydrogeological conditions and physical geological processes manifested pleiocene and quaternary sediments prevail in the town of Gorna Oryahovitsa are as follows:

Quaternary – presented by brown sandy clays, variegated, gray-whitish and gray-beige dusty sandy clays with tiny carbonate gravels, dark brown ton red clay – eluvium, alternated by lighter diluvial seams. In the low part of the town of Gorna Oryahovitsa (around the river) quaternary is presented by alluvial deposits – gravels with sandy filler with average depth of 3 m. Total depth of the quaternary complexes varies widely but is in the range 5 – 7m. The underground waters level in the region is determined at a depth of 0.5 – 5 m from the surface. The large seasonal fluctuation (rise) reaching 1 – 1.5 m is characteristic of the level in the ledges.

Pleiocene – presented by characteristic clay marls, which are highly weathered in their upper parts and pass into gray – blue marls in places. The pleiocene sediments serve as a lower confining layer for the accumulated ground waters.

The construction and operation of the project is not related to changes in the geological base and terrain in the region of the town of Gorna Oryahovitsa.

Prognostication and assessment of any expected effects of the changed geological base on the existing structures, other environmental projects and components

Since the geological base does not change with the project implementation by laying the gas pipeline network down at a depth of 0.8 – 1.0 m from terrain surface it is not possible to expect impact upon the existing construction sites in the region of the town of Gorna Oryahovitsa as well as upon the environmental components directly linked to the former.

3.7.2. Underground mineral resources

The implementation of the "Gasification of the town of Gorna Oryahovitsa" project is not related to utilization of the underground mineral resources. Natural gas as an underground mineral resource is produced outside the borders of the Republic of Bulgaria.

3.8. FLORA AND FAUNA, PROTECTED TERRITORIES OF NATURE

3.8.1. Characteristics of the present state and forecasts of any effects on the vegetation - of dominant and endangered vegetative species; changes in their conditions due to the implementation of the project

The climatic factors, the terrain and the soils in the surroundings of the town of Gorna Oryahovitsa create certain conditions for growth of different types of plants.

Natural vegetation

The town of Gorna Oryahovitsa is located in the central part of the Danube plain. Agricultural areas formed in the place of mixed forests of oak (Quercus cerris) and Hungarian oak (Q. frainetto Ten) cover the territory around the town. North from the town the agricultural areas have formed in the place of forests of Dutch elm (Ulmus minor Mill), Raywood ash (Fraxinus oxycarpa Willd), long-thorned oak (Quercus pedunculiflora), etc.

Crops

The vegetation in the town area is a park one – lawns sown with rye-grass and street plants mainly of trees variety: sycamore, ash, lime-tree, poplar, birch, horse chestnut tree, plane-tree, white hellebore, veimotov pine, silver and common spruce, black and white pine, etc. Annual grain fodder crops and vegetables with varying constituents according to the market situation are cultivated on the agricultural areas.

Destruction of agricultural production is possible during the construction works during the vegetation period of agricultural cultures along the route of the Distribution pipeline from

the AGRS to the bounds of Gorna Oryahovitsa for which the employer pays compensation to the owners for damages caused. The pipeline route does not affect permanent plant species. It is advisable to carry our construction in this section during September – April period, when the agricultural production is already collected.

The construction of the project will impact unfavourably temporarily the existing vegetation in urban lawns. Planting of deep-rooted tree species during restoration of the decorative vegetation and greenery areas is not permitted in the gas pipeline zone.

The operation of the project is not related to unfavourable impact upon natural and cultivated plant species in the region of the town of Gorna Oryahovitsa. The main technological processes do not have a direct or indirect impact upon vegetation. Only planting of permanent deep-rooted plant species is restricted in gas pipeline zones with regards to the requirements of Decree No.38 for safety of the gas supply system.

Nitrogen oxides are the determining emission from the users combustion facilities. The maximum concentration of NO_2 emitted from the users combustion facilities is in the range of 0.9 – 1.0 times the PCL 24h $_{daily\ av}$ (Ordinance No.14/1997) during the heating season and 0.9 times the PCL 24h $_{daily\ av}$ outside it. This effect covers a limited area in the IZ. The impact is considerably below the PCL 24h $_{daily\ av}$ in the remaining part of Gorna Oryahovitsa. This determines the impact upon the town vegetation as insignificant.

The impact of construction upon soils is local by place, with a low degree of affect, one-time during the construction period, with a possibility for restoration and with no cumulative effect.

With regard to this the impact of the project upon the flora can be assessed as: local by territorial range, insignificant by degree of affect, of short duration during the construction period, one-time; with a possibility for restoration and without cumulative effect.

The function of the project related to substitution of solid and liquid fuels by natural gas improves atmospheric air quality, expressed in the elimination of sulphur oxides and inert particles (dust, soot). This will have a favourable effect upon the greenery in the town area and the vegetation in the suburban zones.

3.8.2. Characteristics of the present state and forecasts of the impact on the fauna - of dominant and endangered animal species; migration corridors; changes of their state as a result of the implementation of the project

Birds are represented in several main groups: Crow family (Corvidae), Wagtail family (Mothacillidae), Emberizids family (Emberizidae), etc. Representatives of Dove family (Colubidae), Swallow family (Hirundinidae), kites, sparrows, etc. are found in near habitats.

Mammals – mainly small mammals and mouse-like rodents, hares, foxes, etc. are found in habitats near the town, which are characteristic of the climatic conditions and altitude.

The construction and operation of the project is not related to unfavourable impact upon natural and bred animal species in the region of the town of Gorna Oryahovitsa.

3.8.3. Characteristics of the present state and forecasts and assessment of the impact on the protected territories of nature and subjects, and any changes of their state as a result of the implementation of the project

There are no registered natural sites and nature reserves on the territory of the project.

The following sites are situated in proximity to the town:

- Nature reserve “Bojur poliana” – 4 km eastern from the town, declared a natural reserve with the purpose to protect a habitat of red peony (Order No.1573/1968, area – 19.6 decares);
- Historic site “Trigradie” – near to “Bojur poliana”, declared by Order No.92/1982, area – 1.1 decares.

The gas pipeline network does not affect the above mentioned areas.

3.9 LANDSCAPE

3.9.1. Brief description of the main features of the structure and the operation of landscapes in the area under examination and assessment of the potentials for the attaining the aims and objectives; any changes in the structure and functioning of landscapes

All environmental components are landscape elements as well and form an interconnected and interdependent unity. The hierarchical ladder of landscape elements is the following: geological structure – lithology – terrain – climate – waters – soils – vegetation – animal world. The landscapes subjected to one or another degree of anthropogenic impact are transformed or cultivated.

By quantitative and qualitative indices the landscape system is divided into landscape subsystems and landscape regions. Some of the defined conditional borders of landscape subsystems and districts are overlaid by the boundaries of physical geographical districts, sub districts and regions. Gorna Oryahovitsa is situated in the Balkan mountain landscape system (II), which covers an area of 23660 km^2 in the indicated conditional borders (that accounts for 21.4% of the country's territory), Middle northern Balkan landscape region (II_2) with a territorial span of 5860 km^2. According to the topological landscape division the region of the town of Gorna Oryahovitsa includes the following types of landscape: agrarian landscapes – 58% of the territory; forest landscapes – 6% of the territory; anthropogenic landscapes – 36% of the territory.

The terrain in the region of Gorna Oryahovitsa is plain hilly. It belongs to the transition from the Danube morph structural zone – medium district to the Northern Balkan morph structural zone – medium district, but formally is assigned to the latter. The low mountain terrain prevails; the mountain elevations have formed in parallel to the Balkan mountain chain. Anticlinal and monoclinal elevations and synclinal valleys prevail in the terrain. A large part of the gorges is tectonically determined. The Northern Balkan is formed chiefly of limestone rocks with predominantly normal folds. The low mountain terrain is linked to normal plicated structure. The average altitude of the zone is 364 m. The hilly belt occupies 89.6% (14390 km^2); the mountain ridges with altitude of 600 – 1500 m occupy the remaining 10.4%. The valley network has formed in a grill-like way. Valley asymmetry has local distribution. Soil erosion along slopes of the river valleys is very large due to terrain features, altitude, rock padding, exposition and inclination of slopes.

The project is situated in an anthropogenic landscape – the town environment of the town of Gorna Oryahovitsa, which is suitable for implementation of the project objectives without altering the landscape structure and functioning.

The construction and operation of the project does not impact the landscape and does not alter its classification.

3.9.2. Analysis and assessment of the landscape pollution migration

The specific character of the technological processes of the "Gasification of the town of Gorna Oryahovitsa" project is not related to release of emissions harmful to the environment. The contribution of natural gas users to atmospheric air pollution has been clarified in details in item 3.1.5. Nitrogen oxides are the primary pollutant. The range of migration is within the framework of the anthropogenic landscape (Fig.11). The impact intensity is low – considerably below $PCL_{24h\ daily\ av}$ according to Ordinance No.14/1997. The impact centre is located in the area of the industrial zone at the most unfavourable conditions of quiet weather. At wind velocity above 2.0 m/s and prevailing western direction of strong winds the pollutants will be carried away in eastern direction, where the industrial zone of Gorna Oryahovitsa is located, followed by agrarian landscapes. The pollutants migration is an air one with a low intensity and does not impact on the landscapes structure and functioning.

3.9.3. Assessment of the potential for self-purification and self-restoration of landscapes

Sulphur oxides and dust from conventional fuels combustion and related wastes will be completely eliminated by the project implementation. The total quantity of emissions decreases 13.2 times. This is exclusively favourable to self- purification and self-restoration of landscapes;

moreover the anthropogenic loaded is substantially reduced by the introduction of natural gas as an energy source and remains within the regulations range.

3.9.4. Prognostication and assessment of any expected violation of landscapes in accounting for their resistance to the specific type of effect

The landscape classification, structure and functional parameters are not altered by the construction and operation of the project.

3.10. CULTURAL HERITAGE

3.10.1 Availability of historical, archaeological and architectural monuments

The town of Gorna Oryahovitsa originated during the second Bulgarian kingdom near the old Ryahovets fortress, the ruins of which are preserved at 4 km northwest from the town.

The following monuments of culture on the territory of the town of Gorna Oryahovitsa have been declared by resolutions of the National Institute for Monuments of Culture (NIMC):

St. Athanasius's church – 7 Tolbuhin Str., s. 194, p. 4666;
Jordan Nikolov's house – 81 P.Tzvikev Str., s. 109, p. 2710;
Holy Virgin's church – s. 104, p. 2677;
St. Nicolas's church – 25 Tsar Asen Str., s. 172;
Monastery school at Holy Virgin's church – s. 104, p. 2677;
Ilya Argirov's house – 1 F.Totyo Str., s.165, p. 3323;
Sider Voivoda's house – 3 S.Voivoda Str., s.204, p. 2603;
St. George's church – 33 G.Dimitrov Str., s. 175, p. 2427;
Hristina Hadjisavova's house – 5 Bratia Miladinovi Str., s. 282;
Panajot Hadjigrigorov's house – Rakovski Str.;
Blaga Ivanova's house – 11 G.Izmirliev Str., p. 2429, s. 75, p.2424;
Nikola Denev and Mita Simeonova's house – 16 G.Izmirliev Str., s. 56, p. 2424;
Panajot Georgiev's house – 13 G.Izmirliev Str., s. 82, p.2465;
Anton Mihajlov's house – 11 G.Izmirliev Str., s. 82, p.2465;

Birth house of Vicho Grancharov – s. 75, p. 2429 – historical monument of national liberation movements.

3.10.2. Prognostication and assessment of the effects on the state of historical, archaeological and architectural monuments as a result of the implementation of the project

The project construction and operation does not affect the cultural historical heritage of the town of Gorna Oryahovitsa. The elimination of sulphur oxides and dust creates more favourable conditions for conservation of open-air monuments of culture.

4. ENVIRONMENTAL HEALTH AND HYGIENIC ASPECTS

4.1.Determination of the potentially affected population and territories, zones and projects having specific hygiene protection status or subject to health protection, depending on the envisaged territorial range of the environmental component effects

The "Gasification of the town of Gorna Oryahovitsa" project covers the entire territory of the town. In this aspect the entire population of the town of Gorna Oryahovitsa is subject to the impact of the emissions from natural gas combustion in the users combustion facilities. This impact has been determined in item 3.1 as insignificant and within the framework of the requirements of Ordinance No.14/1997. The project location and the activities carried out in it do not contradict to the requirements of Ordinance No.21/1990, Art.7, item 5 for security zone around the AGRS (100 m from the project boundary) and Annex 6 of Art. 26 for minimal distance from the AGRS to settlements, industrial enterprises and miscellaneous facilities (max 100 m). The activities, listed in Art.4 of Decree 38/1977 are prohibited in the protection zone, while those stipulated in Art. 3 and 5 of the same Decree are permitted. The GRPs, which are

installed on distribution gas pipelines in settlements and on the territory of physical and legal persons conform to the requirements of Ch.4, Section I, Art. 67 to Art. 83 of Ordinance No.21/1990. The project is not at variance with the permissible noise pressure level limits on different territories and settlements (SG, issue 16/1975). The emissions, released into the air during the project construction and operation do not exceed the regulated PCLs of harmful substances in atmospheric air in settlements stated in Ordinance No.14/23.09.1997 (SG, issue 88/1997). Temporary depots for excavated earth and humus will be recultivated. Broken street pavement and damaged lawns will be restored. Project operation is not related to consumption of natural resources, discharge of waste waters and wastes requiring treatment and deposition.

The sanitary conditions of the living environment are improved by the elimination of harmful sulphur oxides and dust depositions.

4.2. Identification of the risk factors on the impairment of human health

Natural gas composition varies (primarily by sulphur content). It is almost two times lighter than air, which predetermines its accumulation in the upper parts of covered premises in contrast to LPG. It is not accumulated at open sites and their microlowerings. Natural gas is odourless. It is not odourized in industry where its presence is determined by gas analyzers. Natural gas is odourized in the public and residential sectors on a compulsory basis. It is sensed at concentration in the air of up to 1%. Natural gas burns in the form of air-gas mixture. Its ignition temperature is 650 ºC, while ignition time at this temperature is 10 sec, at t=1000 ºC – 1 sec, at 2000 ºC – immediately. The explosion concentration is 5-15 % by volume in relation to the air. Explosion occurs at: presence of gas-air mixture with explosion concentration; ignition source with necessary temperature; possibility for pressurization. Construction structures collapse at explosion wave pressure above 0.035 MPa. Natural gas toxicity is related to the methane content. Breathing difficulties occur at oxygen content in gas-air mixture below 20 % vol, while oxygen content below 12 % vol is lethal.

4.3. Characteristic of the individual factors concerning their effect on human health and their comparison with the acting hygienic standards and requirements. Determination of the leading risk factors by their significance

The technological processes implemented in the “Gasification of the town of Gorna Oryahovitsa” project are not related to harmful impact upon human health when observing safety technique as the pipeline network in under the ground and the gas regulating stations are installed in open air. According the requirements of Ordinance No.21/1991 all covered premises, in which gas appliances are installed are equipped with air-vents or forced ventilation, which provide for adequate air exchange, as well as with facilities to take away combustion products in the atmosphere. The instrumentation and controls provided for reduce to a minimum the possibilities for emergencies related to unfavourable impact upon human health.

4.4. Assessment of the possibilities for combined, complex, cumulative and remote effect of the established factors

In accordance with item 4.3. no complex or cumulative effect of the potential factors is expected.

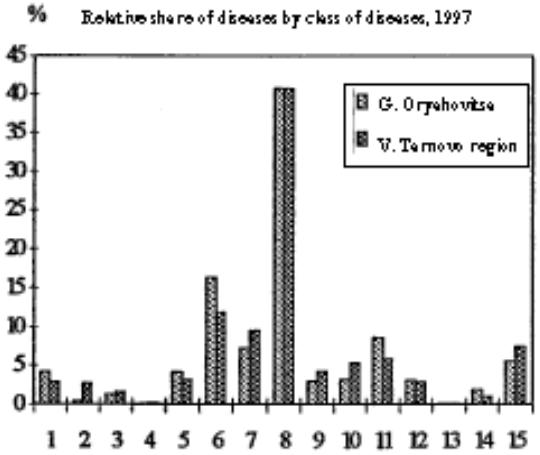
4.5. Exposure characteristics

The technological processes implemented in the “Gasification of the town of Gorna Oryahovitsa” project are not a source of harmful emissions requiring exposure analysis. The character of exposure, examined as range, duration and intensity in item 3.1. is retained with substitution of conventional fuels by natural gas, but the elimination of harmful sulphur oxides and inert pollutants improve the sanitary conditions of the living and working environment in the town of Gorna Oryahovitsa.

4.6. Health condition of the affected population

The disease rate of the population in the town of Gorna Oryahovitsa is formed under the impact of the working, living, social and surrounding environment.

The distribution of registered diseases in Gorna Oryahovitsa municipality and in the region of Veliko Tarnovo by illness classes for 1997 is presented according to information from the Regional Health Centre (RHC) – Veliko Tarnovo.



LEGEND:

1. Infectious diseases and parasites; 2. Neoformations; 3. Diseases of the endocrine glands, digestion, metabolism and immunity; 4. Blood diseases and blood organs; 5. Psychic disorders; 6. Nervous system and sensory organ diseases; 7. Blood circulation diseases; 8. Respiratory system diseases; 9. Diseases of the digestive tract system; 10. Urology and gynecology diseases; 11. Skin and subcutaneous tissue diseases; 12. Osteoporosis and muscle system diseases; 13. Congenital diseases; 14. Symptoms, indications and poorly diagnosed conditions 15. Traumas and poisoning.

In Gorna Oryahovitsa municipality respiratory disorders have the largest share (40.79%), followed by nervous system disorders (16.35%), skin and hypodermic tissue diseases (8.54%) and circulation disorders (7.27%). The relative share of respiratory diseases in the municipality is comparable to that in the region of Veliko Tarnovo (40.75%). It is noticed that the shares of nervous system disorders and skin and hypodermic tissue diseases in Gorna Oryahovitsa municipality exceed those in the region of Veliko Tarnovo.

Respiratory diseases among children and adult population correlate with air pollution by dust and sulphur gases released primarily when using conventional fuels as energy sources. Children are affected most of all. During 1997 the registered respiratory disorder rate among 0-17 years old children is 2.93 times higher than that among adults.

The same pollutants due to their irritating effect show a reliable correlation with eye inflammatory diseases and skin disorders.

4.7. Assessment of health risks, measures for health protection and risk control

The elimination of pollutants such as dust and sulphur dioxide and the diminishing of the total quantity of harmful emission in the atmosphere will lead to improvement of the sanitary conditions, living and working environment in the town of Gorna Oryahovitsa.

5. LIST OF THE EMPLOYED METHODS FOR THE ASSESSMENT AND PROGNOSTICATION OF ENVIRONMENTAL EFFECTS

1. Methods for determination of emissions from combustion processes in power, industry, heating and domestic sector and from technological processes, approved by the minister of environment, 1992, extended and supplemented in 1994, included in List of existing methods for assessment and prognostication of environmental effect – a MEW publication.

2. PLUME models – for calculation of dispersion of gases and aerosols - included in List of existing methods for assessment and prognostication of environmental effect – a MEW publication, page 20, No.8, No.9, No.10, No.11, No.12.
3. Methods for calculation of concentrations in air of harmful substances present in emissions from enterprises – CIS 86, Gidrometeoizdat, 1986.
4. Instruction [1] RD-00-11/1994 of the Ministry of agriculture (MA) for determination of the type and degree of agricultural lands pollution by territories and mode of use – bulletin of MA, 1994.

6. POSSIBLE WAYS AND MEANS FOR ATTAINING THE PROJECT PURPOSES

6.1. Availability and characteristics of the possible ways and means for the implementation of the project - location, technological facilities, capacity

The source of natural gas for the "Gasification of the town of Gorna Oryahovitsa" project has no alternative with respect to location, technological capabilities and capacity. With regards to technical implementation of the gas supply network three main ways are feasible: closed, branched and mixed networks, made of steel or PE-HD pipes. The facilities related to technological processes implementation in the gas pipeline network, such as: AGRS, GRP, GRGMP, SCU, gas metering panels, etc. are standard ones and are supplied by reputable companies, accompanied by a suitability certificate.

Three principal variants of project implementation have been examined at the feasibility study stage:

- I variant – two stage pressure regulation – 12/0.1 bar. All users from the industrial and public and administrative sectors as well as 10 GRPs-Town Section, where pressure is reduced to 100 mbar are supplied from the Distribution gas pipeline /DGP/ (steel, 12 bar, length 24303 m), originating at the AGRS. The town and quarter networks are integrated in a common low pressure (100 mbar) network originating at GRPs-Quarter Section and covering all the users. It is 74262 m long, made of PE-HD (polyethylene). The DGP and the distribution network are laid down under the ground mostly along the street network of the town of Gorna Oryahovitsa. The distribution network is ring-like including 3 independent parts – downtown area, Kaltinets quarter and the railroad zone.
- II variant – three stage pressure regulation –12/4/0.1 bar. The users from the industry, 2 GRPs-Town Section, where pressure is reduced to 4 bar and 2 GRPs-Quarter Section 12/0.1 bar are supplied from the DGP (steel, 12 bar, length 15592 m), originating at the AGRS. The town medium pressure (4 bar) distribution network, which supplies the users from the PAS with existing boiler facilities and 6 GRPs-Quarter Section originates at GRPs-Town Section. It is made of PE-HD with a length of 18070 m. In the GRPs-Quarter Section pressure is reduced from 4 to 0.1 bar and gas enters quarter low pressure (100 mbar) distribution network. All users from the RS are connected to the latter. It is 57083 m long made of PE-HD.
- III variant – three stage pressure regulation –12/4/0.1 bar. The route and the technical parameters of the DGP (steel, 12 bar, length 15592 m) are identical to those in variant II. The medium pressure (4 bar) gas distribution network made of PE-HD originates at both GRPs-Town Section. It is in the form of branched network including 47 antennae with a total length of 47991 m. A 100 mbar gas pipeline network is constructed in Kaltinets quarter and the railroad zone with parameters like those in variant I – PE-HD with a length of 22673 m and 2 GRPs-Quarter Section 12/0.1 bar.

Due to the advantages of the second variant, which enables to ensure fulfillment of consumption requirements, network expansion without changing gas pipeline diameters, multiplication construction effect and lower initial capital expenditure, the internal technical council of Overgas Inc. has endorsed it as the authoritative one for detailed engineering. On the basis of the authoritative variant documentation has been prepared for approval of the routes of the gas pipeline network by the ATPC of Gorna Oryahovitsa municipality. The DGP route from

the AGRS to the bounds of the town of Gorna Oryahovitsa is approved by the ATPC of Gorna Oryahovitsa and Lyaskovets municipalities.

6.2. Analysis of the alternatives affecting their environmental effect, including the analysis of the "zero" alternative

The three variants of the project implementation have different technical characteristics, but they do not differ with regards to the impact upon the environment components. As already mentioned the main purpose of the project is the substitution of conventional energy sources by natural gas. With regard to this the number of users, the quantity of substituted fuels as well as the consumption of natural gas are the same for the three variants. In item 3.1.5 the environmental impact of the “zero hypothesis” (existing situation) is compared to that of the authoritative variant of the project implementation. The assessment and prognostication made are for the full load and capacity of the combustion facilities both when combusting liquid and solid fuels and natural gas. A change of some design elements during construction is possible but it cannot be considered as alternative to the project main design and does not alter the findings and conclusions about the positive effect upon the environmental components, made in the EIS.

It is evident from the analysis of the substitution of solid and liquid fuels in industry, PAS and RS of the town of Gorna Oryahovitsa that the total quantity of released emissions decreases 13.2 times. Discharge of sulphur oxides, dust and soot from the organized sources ceases almost 100%. The quantity of nitrogen oxides increases 1.23 times but the simulation of their dispersing shows that the PCLs are not exceeded. When the regulations for permissible emissions are observed CO quantity is insignificant due to complete combustion in the heating and power facilities, using natural gas. This demonstrates the advantage of natural gas in comparison with the other fuel types and the actuality of the project for improvement of the ecological situation in the town of Gorna Oryahovitsa.

The assessment made definitely demonstrates the insignificant impact and the positive effect upon the environmental components and the health of the people due to the substitution of the utilized conventional fuels by natural gas and determines the purpose of the project as ecological and social. On the basis of the contemporary forecast methods based on mathematical statistics, probability and numerical modeling taking into consideration the tendencies of development of the town of Gorna Oryahovitsa the forecast validity has been reliably determined regardless of changes of the concrete technical solutions that might occur during construction.

With reference to the above it can definitively be claimed that the “Gasification of the town of Gorna Oryahovitsa” project has no alternative of its function given the geographical location, the climatic, natural, social and economical conditions, that determine the present state of the environmental components.

6.3. Characteristics of the possible ways of achieving the project objectives, taken into consideration during its preparation, and reasons for which they have not been accepted

The three investigated variants of project implementation are not alternative with regard to environmental impact but have different technical and economical parameters, safety and gas supply reliability. The rejected variants have got lower complex ratings.

7. MEASURES FOR THE REDUCTION OF ANY NEGATIVE CONSEQUENCES

The project implementation is not related to unfavourable impact upon the environmental components that would lead to permanent and irrevocable damages.

Construction works in agricultural lands must be carried out in out of vegetation period of the agricultural crops in order to avoid destruction of the agricultural produce.

In order to reduce the quantity of nitrogen oxides and carbon monoxide released from natural gas combustion it is necessary to maintain the high quality of combustion and to observe

the restrictions in item 4.1. (Standards for permissible emissions (concentrations in waste gases) of harmful substances released in the atmosphere (SG, issue 81/1991), Art.20, para. 1, 2, 3, 4).

8. ASSESSMENT OF THE PLANNED ACTIONS IN EMERGENCY SITUATIONS AND SALVO POLLUTIONS (prepared on the base of an emergency plan, containing:)

8.1. Assessment of the risk of the emergency and salvo discharge of pollutants for environmental and human health impairment

Possible emergencies in gas supply systems are related to the risks of uncontrolled gas release leading to a formation of fire, explosion or toxic hazardous concentration.

The main physicochemical properties of natural gas are discussed in item 2.1 and an analysis of different types of potential hazards when an emergency occurs is done.

The experience of countries with developed gas supply of settlements demonstrates that the most frequent cause of emergency and volley releases of natural gas is puncture or tear of gas pipelines. The cause is the failure of field joint welds or of a production ones, defects in the basic pipe metal due to metal exfoliation, nonmetal inclusions, deep injuries or corrosion. An intolerable pressure rise or outside interventions like a blow by an excavation machine or miscellaneous mechanism can be causes as well.

When gas leaks in open air there is no danger of explosion, because it is lighter than the air and disperses in the atmosphere. When gas leaks are small there is a danger of covered premises gas flooding. Explosion hazard can occur only in covered premises when the explosion concentration limits, indicated in item 2.1 are reached.

8.2. Measures and means for the prevention, limitation and elimination of emergency discharge of pollutants

The safety of gas supply is guaranteed when all legal provisions, regulating engineering, construction, commissioning and operation of gas supply systems are observed such as: Ordinance No.3 for engineering of gas supply systems of settlements and of gas facilities in buildings using natural gas, Ordinance No.21 for structure and safe operation of gas facilities, Ordinance No.4 for control and commissioning of gas supply systems of settlements and gas facilities in buildings, Ordinance No.2/1987 for PSTN, Rules for set-up of electrical facilities, 1981, BSS 15704-83 - Corrosion protection. Underground metal facilities. Common technical requirements, BDS 15705-83 - Corrosion protection. Underground metal facilities. Methods for measurement and control.

All processes in the gas supply system of the town of Gorna Oryahovitsa are automated, equipped with the necessary instrumentation, information and communication network. The necessary measures for lightning protection and grounding of equipment are provided for. The automatic action of GRS control lines can be given as an example, where in case of an outlet pressure rise (i.e. disconnection of a large user) and inability of the main controller to react due to a given reason the monitor starts acting when pressure reaches 1.1 Pout. If for some reason the monitor cannot reduce the pressure as well at 1.25 Pout the safety valve releases gas in the atmosphere through the ventilation plug. If pressure reaches 1.3 Pout a shut-off valve closes and inlet pressure falls. When 0.9 Pout is reached the back-up line is opened. If pressure climbs again the shut-off valve of the back-up line closes at 1.5 Pout. The supply of gas to the users is stopped. When the pressure in the main line falls to 0.9 Pout the back-up line controller opens. If pressure falls to 0.5 Pout gas supply to the users is stopped.

For prevention, restriction of emergency emissions of natural gas according to Art. 409 (1) of Ordinance No.21/1990 the actions for elimination of accidents are carried out according to special instructions worked out during gas facilities commissioning by their owner or operator. The basic principles of the actions in an Emergency plan, developed by the Employer is given below in the present item as follows:

1. Announcement – the following are announced: individuals in the accident region (radius of 50 – 100 m); persons on duty at endangered facilities; Civil Defense; First Medical Aid; the Gas Supply company, the Bulgargas dispatcher on duty; Regional Service for Fire

Protection (RSFP) – tel.: 160, Rescue Squad; Traffic Control – tel.: 166; Overgas Engineering OOD – tel.: 046/3 52 03;

2. Immediate actions for stopping the natural gas leakage by the Emergency department of Rahovetsgas in the town of Gorna Oryahovitsa and giving first medical aid to the victims.
3. Restricting the access of people and vehicles to the accident region by the security authorities.
4. Restoration works:
   - Starting of the restoration works on the gas pipeline and its facilities;
   - Quick restoration of the gas supply with observance of all safety requirements;
   - Building up of necessary materials and equipment for timely restoration of the damages which resulted due to the emergency;

The fulfillment of this complex of tasks necessitates training of management authorities, the Civil Defense contingent and the municipality population for acquiring and rationalization of protection methods and carrying out of rescue and emergency activities in an environment of explosion and fire hazards. In training of the population, the efforts should be concentrated in formation of behaviour of action in the event of uncontrolled natural gas leakage.

The resources of the Gas Supply Company (Rahovetsgas) should be capable of stopping of natural gas leakage within 30 minutes and of restoring the supply of natural gas in the emergency sector within 24 hours.

9. PLAN FOR OWN MONITORING

The main technological processes in the gas distribution system of settlements are transportation of natural gas, gas distribution and gas metering, which are not sources of harmful environmental emissions. The emissions are released from the user combustion facilities which are not property of the gas distribution network operator and therefore are not a subject of this Report. In this situation there is no need to provide for an own monitoring system beyond the means for technical monitoring and control, ensuring normal operation and safety of the gas distribution network, regulated in the legal provisions for engineering, construction, commissioning and operation of gas supply networks in settlements.

According to the requirements of Ordinance No. 21/1990 for the structure and safe operation of gas facilities preventive maintenance of underground gas pipelines and auxiliary equipment is performed by patrolling the route at periods which ensure their safe operation (Art. 330).

When patrolling the route gas presence is checked for in all shafts and control piping along the gas pipeline, as well as shafts (water supply, sewing, heating system, etc.), headers, buildings basement premises, shafts of bridge stays, etc., which are found within a distance of 15 m of both sides of the gas pipeline (Art. 334).

The monitoring of the state of the air (gas presence) in the headers, sewages, technical corridors, basements, covered trestles and other premises is made by automatic gas analyzers, which transmit a signal to control rooms, etc. with a 24 hour duty of servicing personnel or by periodic inspections for gas at periods which ensure safe operation (Art. 332, para. 2).

The project for gas supply of the town of Gorna Oryahovitsa is a large-scale infrastructure one, aiming substitution of conventional fuels by natural gas. Natural gas is supplied by the gas supply network to the three types of users: industrial enterprises, PAS and RS, which are situated on the entire territory of the settlement. When natural gas is combusted in the user power and heating appliances and facilities the basic pollutants, subject to monitoring are NOx and CO. In the context of the above mentioned the owners of combustion facilities bear all responsibility for their state and environmental impact. The relevant authorities will supervise the observance of the legal provisions for protection of the atmospheric air purity within the framework of the emission and immision monitoring. The designation of the project, its capacity and degree of impact on the environmental components does not motivate any need for the monitoring of the state of the remaining environmental components: waters, geological base, terrain, soils, flora and fauna.

10. CONCLUSIONS

10.1. Inferences

The results from the analysis in the present EIS of the "Gasification of the town of Gorna Oryahovitsa" project impose the following inferences:

1.The project has got an ecological purpose. It provides for the substitution of solid and liquid fuels used in industry, the public and administrative sector and the residential sector of the town of Gorna Oryahovitsa by natural gas, which has the lowest emission generation capability.

2.From the analysis made for the substitution of solid and liquid fuels in industry, the public and administrative sector and the residential sector of the town of Gorna Oryahovitsa, it is evident that the total quantity of released emissions is reduced 13.2 times. The release of sulphur oxides, dust and soot from organized sources is nearly 100% terminated. The quantity of nitrogen oxides increases by 1.23 times, but the simulation of their dissipation indicates that the permissible concentration limits are not exceeded. When the standards of the permissible emissions are observed, the quantity of CO is insignificant as a result of complete combustion in the gas-fired heating and power-facilities. This shows the advantage of natural gas to the remaining types of fuels and the actuality of the project for improving the ecological state in the town of Gorna Oryahovitsa.

3. The location of the project and the activities performed in it are not in contradiction with the existing legislation in the field of environmental protection, the sanitary and construction standards in the Republic of Bulgaria.

4. The construction and the operation of the project will have no negative impact on the environmental components: air, surface and ground waters, soil, flora, fauna and human health; on the contrary, it will improve the state of the surrounding and living environments in the town of Gorna Oryahovitsa.

10.2. Conclusion

The conditions for engineering and construction of gas supply systems in settlements became regulated with the coming into force of Ordinance No. 3/20.02.1995 for the design of systems for gas supply in settlements and gas facilities in buildings that use natural gas and Ordinance No. 4/20.02.1995 for supervision and commissioning of gas supply systems in settlements and gas facilities in buildings that use natural gas. By their character these are large-scale infrastructure projects, the designing of which undergoes two phases: feasibility study (FS) and detailed engineering (DE).

During the development of the EIS of the "Gasification of the town of Gorna Oryahovitsa" project the individual subprojects have been examined in their common technological interrelation with a view to make more complete assessment of the overall environmental impact. The EIS is developed in accordance with the requirements of Art. 9 (1), pt. 1 of Ordinance No. 4 for EIA (7.07.1998) as a preliminary one. The assessment, the prognostication of project impact and the conclusions are made according to the requirements of the norms and standards as per Art. 2 of the law for environmental protection (LEP), and in a scope provided for in Annex No. 2 to Art. 13, para. 1, item 2 of Ordinance No. 4 for a final report. The assessment made definitely proves the insignificant impact and the positive effect on the environmental components and human health, due to the substitution of the conventional fuels used for natural gas and determines the designation of the project as ecological and social. On the basis of contemporary prognostication methods made, based on mathematical statistics, probability and digital modeling and taking into account the development trends of the town of Gorna Oryahovitsa, the prognostication validity is reliably determined regardless to changes of certain concrete technical solutions which would occur during the construction.

In conclusion, the team of independent experts of CONTROL P EOOD proposes to the EEC of the RIEW to accept the present EIS as final according to Art. 9 (2) of Ordinance No. 4/7.07.1998 and to give permission for the implementation of the project in accordance with Art. 20 (2), item 2 and Art. 20 (3), item 1.

M I N U T E S

Today, 02 July 1998 in the town of Gorna Oryahovitsa on the grounds of Art.29 of the Rules for the Application of the Law for Protection of Agricultural Lands (RALPAL) for designation, co-ordination and approval of linear facilities and Ordinance No. 1308 / 26 June 1998 of the Mayor of GO municipality a commission held a meeting, attended by:

CHAIRPERSON: Dobrinka Radkovska –Regional Office "Land and landed property", Veliko Tarnovo

AND MEMBERS:

1. Dipl. Eng. Henrieta Paricheva – municipality of Gorna Oryahovitsa
2. Dipl. Eng. Mosko Moskov – municipality of Gorna Oryahovitsa
3. Simeon Simeonov – Technical bureau, municipality of Gorna Oryahovitsa
4. Dipl. Eng. Mariana Pehlivanova – Land commission, Gorna Oryahovitsa
5. Dipl. Eng.Ilija Sirmov –WSS (Water Supply and Sewage), Gorna Oryahovitsa
6. Dipl. Eng.Dragomir Tanev – TVD, Gorna Oryahovitsa
7. Dipl. Eng.K.Genchev – Electricity Supply, Gorna Oryahovitsa region
8. Stoyan Stoyanov – LKS, Gorna Oryahovitsa
9. Georgi Hristov - LKS, Gorna Oryahovitsa
10. Marin Trivonov – TVD, Gorna Oryahovitsa
11. Dipl. Eng. Dimitar Dimitrov – "Rahovetsgas 96" AD, Gorna Oryahovitsa
12. Major Georgi Todorov – RSPAB, Gorna Oryahovitsa
13. Dipl. Eng. Nadka Boicheva – RIEW, Veliko Tarnovo
14. Dipl. Eng. Yosif Vasilev - "Overgas Inc." AD, Sofia

WITH AN ASSIGNMENT: To approve a variant of a gas pipeline connection route from the AGRS on the land of the town of Lyaskovets to the town of Gorna Oryahovitsa.

After making itself familiar with the submitted project documentation and making a round of the route the Commission took the following

RESOLUTIONS:

Determines the route of the gas pipeline branch of "Distribution gas pipeline from the AGRS to Gorna Oryahovitsa – variant I" project from B5 to B7 on the land of the town bourd of Gorna Oryahovitsa.

The total length of the gas pipeline is 1050 m.

The Employer should co-ordinate the design of the accepted variant with the authorities, designated by legislation according to the RALPAL.

COMMISSION: Chairperson**:** (Signed) /Dobrinka Radkovska/

1. Dipl. Eng. Henrieta Paricheva (Signed)
2. Dipl. Eng. Mosko Moskov (Signed)
3. Simeon Simeonov (Signed)
4. Dipl. Eng. Mariana Pehlivanova (Signed)
5. Dipl. Eng.Ilija Sirmov (Signed)
6. Dipl. Eng.Dragomir Tanev (Signed)
7. Dipl. Eng.K.Genchev (Signed)
8. Stoyan Stoyanov (Signed)
9. Georgi Hristov (Signed)
10. Marin Trivonov (Signed)
11. Dipl. Eng. Dimitar Dimitrov (Signed)
12. Major Georgi Todorov (Signed)
13. Dipl. Eng. Nadka Boicheva (Signed)
14. Dipl. Eng. Yosif Vasilev (Signed)

GORNA ORYAHOVITSA MUINICIPALITY **Architectural Town Planning Commission**
Transcript – excerpt
of minutes No.10
dated 02.07.1998

Today, 02.07.1998 in execution of Ordinance No. 23 / 9.01.1998 and Ordinance No. 416 / 16.03.1998 of the Mayor of Gorna Oryahovitsa the Architectural and Town-planning Commission of the municipality held a meeting, attended by:

CHAIRPERSON OF ATPC: OGNIAN YORDANOV KARASTOIANOV, Architect – Chief architect of the municipality

SECRETARY OF ATPC: STOYANKA IVANOVA BONEVA – expert in TSU and KRVP department

and Members:

1. ATALIJA IGNATOVA BRATANOVA, Architect – head of TSU and KRVP department
2. NIKOLA HRISTOV PUJCHEV – municipality lawyer
3. Dipl. Eng. HENRIETA ATANASSOVA PARICHEVA – head of TTIK department of the municipality.
4. Dipl. Eng. SVETLA ILYEVA ZAREVA – head of ASK and EIA department of the municipality
5. Dipl. Eng. MIGLENA ATANASSOVA KOTSEVA – expert in TSU and KRVP department of the municipality
6. Dipl. Eng. IVAN DIMITROV NIKIFOROV – expert
7. ENCHO SAVOV GIGIMOV – Hygienic Epidemiological Inspectorate, Gorna Oryahovitsa
8. First lieutenant Dipl. Eng. SASHO GEORGIEV ALEXANDROV – RSPAB, GO.
9. IRA KANEVA, Arch. – ZRP designer.

The following design documents, developments and correspondence have been discussed during the meeting:

1. …….

12. CHOICE OF A GAS PIPELINE ROUTE – FEASIBILITY STUDY (FS)

PHASE: FS

EMPLOYER: “Rahovetsgas 96” AD, GO

DESIGNER: Overgas OOD, Sofia

Dipl. Eng. Dimitar Yordanov Dimitrov, representative of RAHOVETSGAS OOD, Gorna Oryahovitsa, presented the design. Arch. Bratanova, Arch. Karastojanov, Arh. Radev, Arch. Georgiev, Dipl. Eng. Nikiforov, N.Pujchev, Dipl. Eng. Zareva expressed their own attitudes.

CONCLUSIONS:

The design is developed by employer's request. Three variants are given, of which in the first variant the route passes only through municipal territory and through territory of "Zaharni zavodi" and has been co-ordinated with their management.

After discussions attitudes expressed the Architectural and Town-planning Commission took the following

RESOLUTION No. 72:

ACCEPTS the first variant as a choice of a route for the "Distribution gas pipeline from the AGRS to the town of Gorna Oryahovitsa" project as the most economical and expedient one and as passing only through municipal territory.

CHAIRPERSON OF ATPC: (Signed, stamped)

/Arch. Og.Karastoyanov/

CORRECT TO THE ORIGINAL, SECRETARY OF ATPC: (Signed)

/St. Boneva/

LYASKOVETS MUNICIPALITY, LOVETCH DISTRICT

M I N U T E S

Today, 02.07.1998 in execution of Ordinance No. 834/1998 of the Mayor of the Lyaskovets Municipality a Commission held a meeting, attended by:

CHAIRPERSON: DOBRINKA RADKOVSKA – expert in RSZPS, V.Tarnovo

AND MEMBERS:

1. Dipl Eng. DIMITRINKA TODOROVA DIMITROVA – head of IJS department of Lyaskovets Municipality
2. Arch. ANELIA STEFANOVA DIMOVA – Chief architect of the municipality
3. Dipl Eng. NADKA BAICHEVA – RIEW, V.Tarnovo
4. Dipl Eng. SVETLA KARAZAHOVA – head of the Land commission, Lyaskovets
5. Dipl Eng. TSANKO TODOROV ZHABILOV – WSS (Water Supply and Sewage), Lyaskovets region
6. Dipl Eng. KOSTADIN KIRILOV GANCHEV – deputy manager of Electrical Supply, Gorna Oryahovitsa region
7. Dipl Eng.DIMITAR YORDANOV DIMITROV – executive director of "Rahovetsgas 96" AD, Gorna Oryahovitsa
8. Dipl Eng. YOSIF VASILEV – "Overgas Inc." OOD, Sofia
9. Dipl Eng. YANKO RUSKOV – design bureau of "Overgas Engineering", Sofia
10. STOYAN STOYANOV – LKS, Gorna Oryahovitsa
11. Dipl Eng. DRAGOMIR TONEV – TVD, Gorna Oryahovitsa
12. Dipl Eng. GEORGI GEORGIEV GOSPODINOV – SOD, V.TARNOVO

with an assignment to make a choice of a route for the "Gasification of the town of Gorna Oryahovitsa" project, subproject "Distribution gas pipeline AGRS, Gorna Oryahovitsa" for the section from B1 to B5 on the land of the town of Lyaskovets.

After examination of the necessary documentation and of the submitted variants the Commission chose variant I, passing through the land of the town of Lyaskovets from B1 to B5 as the most expedient. The total length of the gas pipeline is 1050 m.

The gas pipeline in the first variant originates at the AGRS site, located on the land of the town of Lyaskovets, tract 47, estate 20, property of the municipality of the town of Lyakovets. After the AGRS the gas pipeline route turns west along the newly designed agricultural road with cadastral No. 203, serving the plots in tracts 47 and 48, crosses the

gully with cadastral No. 591, overgrown with shrubs and trees and continues along the agricultural roads with cadastral numbers 204 and 205 (serving the plots in tracts 45-46).

The route in its section, located on the land of Lyaskovets does not pass through state-owned forest stock and private agricultural possessions, does not cross engineering infrastructure facilities – electric lines, water supply pipelines,LKS, TVD and SOD. The design documentation is approved by the LKS by letter No. 80/26.06.1998, the TVD by letter No. 1395/08.07.1998 ã., WSS by letter No. 1514/18.06.1998 ã., "Electrosnabdijavane" by letter No. 01 00 K 847/19.06.1998 ã.

RESOLUTION:

THE COMMISSION ACCEPTS VARIANT I, PASSING THROUGH LAND OF THE TOWN OF LYASKOVETS FROM B1 TO B5.

Commission:

CHAIRPERSON: (Signed)

/D.Radkovska/

AND MEMBERS:

1. (Signed)
   /Dipl Eng. D.DIMITROVA/
2. (Signed)
   /Arch. A. DIMOVA/
3. (Signed)
   /Dipl Eng. N. BAICHEVA/
4. (Signed)
   /Dipl Eng. SV. KARAZAHOVA/
5. (Signed)
   /Dipl Eng. TS. ZHABILOV/
6. (Signed)
   /Dipl Eng. K. GANCHEV/
7. (Signed)
   /Dipl Eng.D. DIMITROV/
8. (Signed)
   /Dipl Eng. Y. VASILEV/
9. (Signed)
   /Dipl Eng. Y. RUSKOV/
10. (Signed)
    /ST. STOYANOV/
11. (Signed)
    /Dipl Eng. DR. TONEV/
12. (Signed)
    /Dipl Eng. G. GOSPODINOV/

LYASKOVETS MUNICIPALITY **Transcript – excerpt**
APPROVED BY: (Signed)
MAYOR OF THE MUNICIPALITY (Dipl. Eng. D. Dervishev)

LYASKOVETS MUNICIPALITY, LOVETCH DISTRICT

M I N U T E S

No. 9

Today, 03.07.1998 the Architectural and Town Planning Commission held a meeting in the Municipality of Lyaskovets, attended by:

CHAIRPERSON: Arch. ANELIA STEFANOVA DIMOVA – Chief architect of Lyaskovets municipality

AND MEMBERS:

1. Dipl Eng. DIMITRINKA TODOROVA DIMITROVA – head of IJS department of Lyaskovets Municipality
2. Arch. LACHESAR VASILEV LALEV – SAB, Veliko Tarnovo
3. Dipl. Eng. LEFTER DIMITROV LEFTEROV – cadastre and town planning expert in MTRS
4. STEFAN NEDIJALKOV MANAHOV – chief lawyer of the municipality
5. IVANKA IVANOVA DIMITROVA – expert in IJS department of Lyaskovets municipality.

with the following agenda:

…

VIII. DISTRIBUTION GAS PIPELINE FROM THE AGRS TO THE TOWN OF GORNA ORYAHOVITSA – CHOICE OF A ROUTE

…

THE FOLLOWING DEVELOPMENTS HAVE BEEN EXAMINED DURING THE MEETING:

…

VIII. DISTRIBUTION GAS PIPELINE FROM THE AGRS TO THE TOWN OF GORNA ORYAHOVITSA – CHOICE OF A ROUTE

Designer: Dipl. Eng. St. Genkov

Employer: "OVERGAS INC" AD
Contractor: "OVERGAS" OOD
Phase: detailed design GO-01-A
Reports: Dipl. Eng. Dimitrov

The present design is developed in accordance with the Law for protection of agricultural lands and the rules for its application to be used for appointment of a commission for alteration of the designation of agricultural land and for determination of a gas pipeline route and adjacent sites. The proposed site for an AGRS is located in tract 47, plot 20 according to the land distribution plan of Lyaskovets municipality in execution of Resolution No. 264/23.10.1997 of the Municipal council of Lyaskovets. Three variants have been submitted for a route of the distribution gas pipeline in its section from the AGRS to the outset of Gorna Oryahovitsa as follows:

- the straightest way is proposed in the first variant. The latter is consistent with the land distribution plan of the town of Lyaskovets and does not pass through private agricultural possessions.
- in the second and third variants ways have been sought to put the route along the terrain horizontals. The routes are considerably longer. The gas pipeline passes through private agricultural possessions.

The agricultural land within 10 m from the gas pipeline axis is stipulated to be with a restricted regime of use for which the owners of all affected possessions should be informed.

After discussions the ATPC took the following

RESOLUTION No.8:

THE ATPC APRROVES THE FIRST VARIANT FOR A ROUTE OF THE DISTRIBUTION GAS PIPELINE FROM THE AGRS TO THE TOWN OF GORNA ORYAHOVITSA.

Of the Architectural and Town Planning Commission:

CHAIRPERSON: (Signed)

/ Arch. A. DIMOVA /

AND MEMBERS:

1. (Signed)
   /Dipl Eng. D.DIMITROVA/
2. (Signed)
   /Dipl. Eng. L. LALEV/
3. (Signed)
   /Dipl Eng. L. LEFTEROV/
4. (Signed)
   /Dipl Eng. STEFAN MANAHOV/
5. (Signed)
   /IV. DIMITROVA/

TRUE TO THE ORIGINAL: (Signed, Stamped)

ENVIRONMENTAL IMPACT STATEMENT OF THE "GASIFICATION OF THE TOWN OF GORNA ORYAHOVITSA" PROJECT

NON-TECHNICAL SUMMARY

The purpose of the present project is by means of gasification of the town of Gorna Oryahovitsa, including industrial enterprises, public and administrative and municipal buildings and residential sector to propose an alternative energy source to the ones used so far.

The necessity of the project is dictated by the absence of a district heating network in the town of Gorna Oryahovitsa and the potential danger of deterioration of the components of the surrounding and living environment due to the use of conventional fuels.

The principal technological process which is a subject of the project is supply of natural gas to users. All operations related to it are automated. They are not sources of harmful emissions to the environment.

Although not part of the gas supply network the users gas appliances and facilities are regarded as its terminal element. In them the technological process of combustion is implemented, the flue gases of which impact the environmental components.

The project comprises the following:

· Distribution gas pipeline (12 bar) from the AGRS to GRP-1 Town Section and GRP2-Town Section in the town area, including GRP-1 Town Section and GRP2-Town Section and gas pipeline connection to the users in the Industrial Zone;

· Town distribution network (4 bar) and gas pipeline connection to the users in the town area, including 6 GRP-Quarter section

· Quarter distributions network (100 mbar) and gas pipeline connection to the residential users, including 2 GRP-Quarter section

The subject of the project is directly related to the state of the atmospheric air and indirectly to the remaining components of the surrounding and living environment in the town of Gorna Oryahovitsa. With regard to a substitution of conventional fuels by natural gas a prognostication for the anticipated alteration in the state of atmospheric air has been made. Two hypothesis have been examined:

· I hypothesis – existing situation (use of conventional fuels) without project implementation – zero hypothesis;

· II hypothesis – complete gasification of IZ, PAS and RS – a hypothesis which is a subject of the project.

CONTROL P EOOD
1421 Sofia, 2 Dragan Tsankov Blvd., tel.: 658 175

The results from the investigations in the EIS of the "Gasification of town of Gorna Oryahovitsa" project impose the following conclusions:

1. The activities, which are subject of the present project are related to sustainable development and reproduction of the environment. They envisage a substitution of the solid and liquid fuels, currently used in the industry, public and administrative and residence sectors of the town of Gorna Oryahovitsa by natural gas, which has the lowest emission generation capability.
2. From the analysis made for the substitution of solid and liquid fuels in industry, the public and administrative sector and the residential sector of the town of Gorna Oryahovitsa, it is evident that the total quantity of released emissions is reduced by 13.2 times. The release of sulphur oxides, dust and soot from organized sources is nearly 100% terminated. The quantity of nitrogen oxides increases by 1.23 times, but the simulation of their dissipation indicates that the permissible concentration limits are not exceeded. When the standards of the permissible emissions are observed, the quantity of CO is insignificant as a result of complete combustion in the gas-fired heating and power-facilities. This shows the advantage of natural gas to the remaining types of fuels and the actuality of the project for improving the ecological state in the town of Gorna Oryahovitsa.
3. The site of the project and the activities on it do not run counter to the current legislation in the areas of environmental protection, sanitary, hygiene and construction standards in the Republic of Bulgaria.
4. The construction and operation of the project has insignificant effect upon the environmental components – air, surface and ground waters, soil, flora, fauna and humans.

In conclusion, the team of independent experts of CONTROL P EOOD proposes to the EEC of the RIEW – Veliko Tarnovo to accept the present EIS as final according to Art. 9 (2) of Ordinance No. 4/7.07.1998 and to give permission for the implementation of the project in accordance with Art. 20 (2), item 2 and Art. 20 (3), item 1.

Head of Team:
/Kr. Petrov, Assoc. Prof./

General Manager of CONTROL P EOOD:
/S. Doncheva, MSc (Eng.)/