CONTROL P EOOD
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ENVIRONMENT IMPACT STATEMENT ON PROJECT

"GASIFICATION OF THE TOWN OF LYASKOVETS"

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

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

November 1998

Sworn translator: Andrey Manov

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DOCUMENTS

ACCORDING TO THE REQUIREMENTS OF ART. 15 OF ORDINANCE No. 4/1998 ON THE ENVIRONMENT IMPACT ASSESSMENT

1. NON-TECHNICAL SUMMARY OF THE RESULT OF THE ENVIRONMENT IMPACT ASSESSMENT
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3. REPRESENTATIONS OF EXPERTS, IN CONJUNCTION WITH ART. 4, PARA. 2.
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ASSESSMENT OF THE ENVIRONMENT IMPACT OF THE PROJECT "GASIFICATION OF THE TOWN OF LYASKOVETS"

NON-TECHNICAL SUMMARY

The purpose of this report is, by the gasification of the town of Lyaskovets, including industrial enterprises zone (IZ), public and administrative and communal service building sector (PAS) and the households, to offer an alternative energy carrier to the now used carriers.

The need for this project has been dictated by the absence of a heating network system built in the town of Lyaskovets, and the potential danger of deterioration of the environmental components and the living environment, due to the use of conventional fuels.

The basic technological process which is the subject of this project is the supply of natural gas to the users. All operations related to it are automated. They are not a source of environmentally hazardous emissions.

Although they are not part of the user gas-supplying network, the gas appliances and equipment are regarded as its final element. In them, the technological process of combustion occurs, the exhaust gases of which have an effect on the environmental components.

The Project comprises:

- Gas Distribution Pipeline (GDP) from the Automatic Gas Regulation Station (AGRS) to Gas regulation Points - Town Section (GRP1-TS) in the northern urban part, GRP2-TS in the central urban part, GRP3-TS in the south-eastern urban part, and gasification of users in the industrial zone, including GRP1-TS, GRP2-TS and GRP3-TS;
- Town Section distribution network (100 mbar) and gasification of users in the Residential Housing Sector (RHS) of the town of Lyaskovets.

The subject of the project is directly related to the state of the atmospheric air and indirectly to the remaining environmental components and the living environment in Lyaskovets. In connection with the substitution of the conventional fuels with natural gas, prognostication was made for the expected changes of the state of the atmospheric air. Two hypotheses have been examined:

- **1st hypothesis** - the existing situation (using conventional fuels), without the implementation of the subject of the project - zero hypothesis;
- **2nd hypothesis** - complete gasification of the IZ, PABS and RHS.

The results of the investigations made in the EIS of the "Gasification of the town of Lyaskovets" force the following inferences:

1.The activities, subject of this project are related to the sustainable development and environmental reproduction. They envisage the substitution of the carbohydrate and liquid fuels in industries, in the administrative-communal services and the residential sectors in Lyaskovets with natural gas, which has the lowest emissions generating capabilities.

2.From the analysis made, the replacement of carbohydrate fuel and oil fuels in industry, in the administrative-communal services and the residential sectors in Lyaskovets it becomes clear that the total amount of the separated emission will reduce 9.7 times the separated emissions. The separation of sulphur oxides, dust and ashes from the organized sources shall be discontinued by nearly 100%. The quantity of nitrogen oxides shall grow 1.05 times, but their simulated dissipation indicates that the maximum concentration allowances shall not be exceeded. In the observation of the allowed emissions' standards, the quantity of CO is insignificant, as a result of the full-fledged combustion in the gas-fired heat and energy equipment. This shows the advantages of the use of natural gas before the remaining fuels and the topicality of the project for improving the ecological set up in Lyaskovets.

3.The location of the project and the activities, which are performed in it, are not in contradiction with the existing environment protection legislation, with the health and hygienic standards in the Republic of Bulgaria.

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4.The construction and the operation of the project shall have insignificant effect on the environmental components: air, surface and ground waters, soils, flora, fauna and humans. The implementation of this project shall improve the environmental conditions and the living environment in the town of Lyaskovets.

In conclusion, the team of independent experts of Control P EOOD suggest that the EEC of the District Institute of the Environment and Waters shall accept this EIS as final, in accordance with Art. 9 (2) of Ordinance No. 4/1998, and shall permit the implementation of this project in conjunction with Art. 20(2), pt. 2 and Art 20 (3), pt. 1.

Head of a team: (Assoc. Prof. Eng. K. Petrov)

Manager of CONTROL P EOOD: (S. Doncheva)

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AUTHORS OF THE ENVIRONMENT IMPACT STATEMENT (EIS)

The EIS on the "Gasification of the town of Lyaskovets" was developed by a team of experts of the CONTROL P EOOD Company, seated in Sofia 1421, 2, Dragan Tsankov Blvd., The University of Architecture, Civil Engineering and Geodesy, with Manager Stanka Doncheva.

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) /

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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, November 1998

Signed:

1. ……..
2. ……..
3. ……..
4. ……..

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1. GENERAL INFORMATION

1.1. Name of the project, address of the employer, person for contacts

- Design "Gasification of the town of Lyaskovets"
- Employer: Overgas Inc. AD, Sofia, 36, Dragan Tsankov Blvd.
- Designer: Overgas OOD, Sofia, 36, Dragan Tsankov Blvd.
- For contacts: Dip. Eng. Vanya Spassova, Overgas Inc.; tel. 02/971 21 59;
  Dipl. Eng. Dimiter Dimitrov, Rahovets Gas OOD, Gorna Oryahovitsa, tel. 0618/3 10 79; FAX 4 22 03.

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

According to data from the Employer (Annex 1), no physical persons are affected by the Design. The affected legal persons are:

- the Lyaskovets Municipality;

The track of the main pipeline connection from the Republican Gas Pipeline Network (northern semi-ring) for the area of Gabrovo and Veliko Tarnovo, as well as the site of AGRS-G. Oryahovitsa are subject of another design - "Main Gas Pipeline for the Veliko Tarnovo and Gabrovo Regions". For them a Plan for EIS has been developed, a decision has been issued by the Area Environmental Control and Water Department in Veliko Tarnovo No. 139/1996, the validity of which has been extended by letter No. 924/22.01.1998.

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

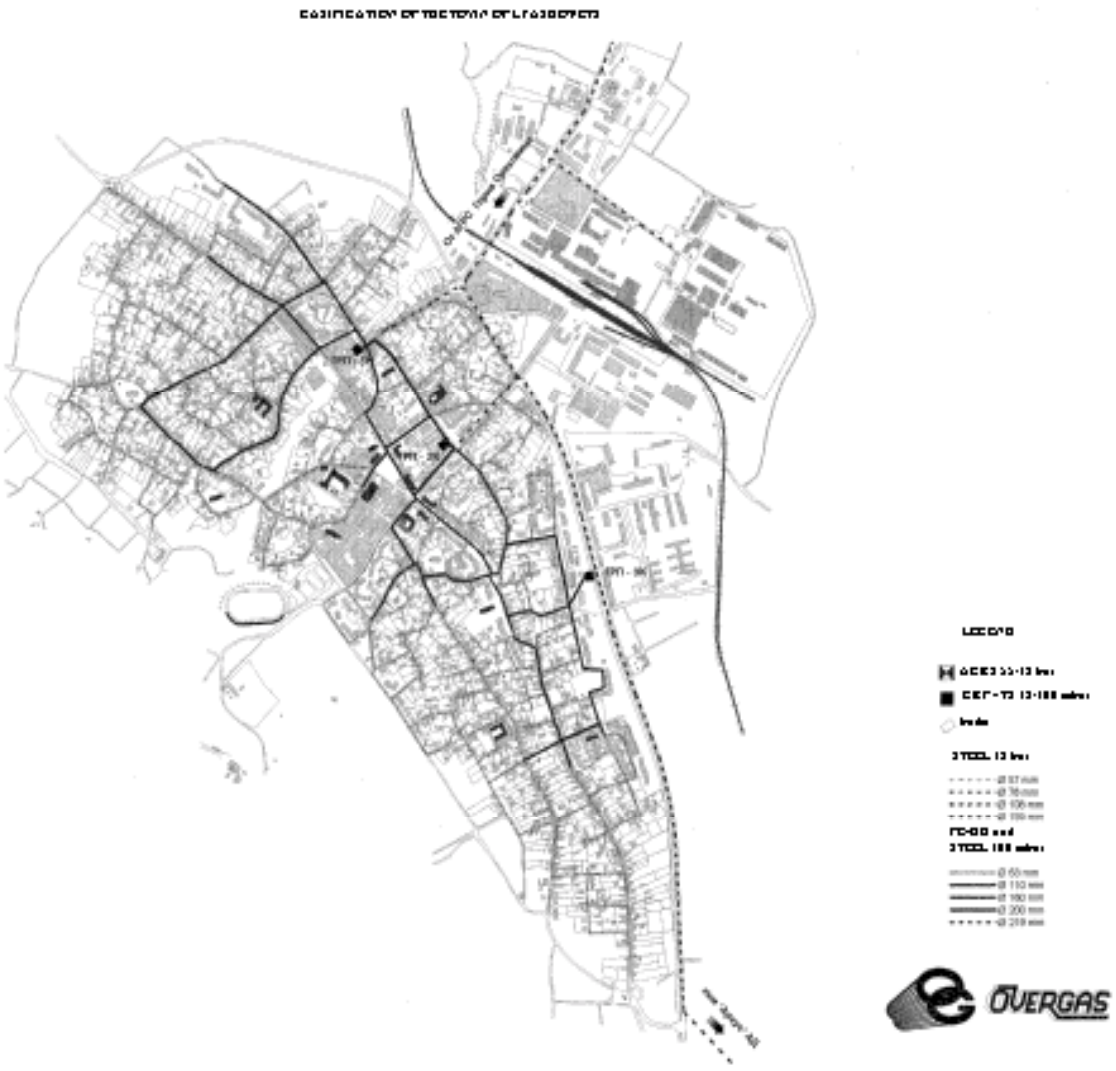
The project includes the whole area of the town of Lyaskovets, which is in the Central Northern Bulgaria in the valley of the Yantra River (Fig. 1). The town of Lyaskovets is 3 km south-east of G. Oryahovitsa and 2 km north of the E-772 Road, Sofia-Varna. In the northern part of the town runs the railway line G. Oryahovitsa-Elena. The relief is hilly-and-plain, 50-60 m above the sea level. To the southwest the area is bound by the Tarnovo height (Arbanasi). To the north and east the area is open, and low hilly formations occur. The gas supply system of Lyaskovets is supplied from the Northern Semi-Ring of the Republican Gas Pipeline Network by the gas connection and the AGRS "G. Oryahovitsa", being about 2.5 km from the town and its territory. The track of the Distribution Gas Pipeline from AGRS to the northern town part of Lyaskovets is along the road network and affects no farmland and forests (pt. 1.2). The remaining part of the Distribution Gas Pipeline to GRP1-TS, GRP2-TS and GRP3-TS, the equipment along it, the Town Section distribution network and the equipment along it are fitted underground along the street network of Lyaskovets, covering any potential consumers.

1.4. Legislative and institutional framework

The EIS has been developed at the request of the Employer in connection with the requirements of Art. 2 (1), pt. 4 of Ordinance No. 4 for EIA (7.07.1998).

The Design relates to a project which it includes in Section 3. Energy Economy, pt. 3.3 - transportation of gases and liquids in pipelines and technical servicing of oil and gas pipelines which are over 1 km in length of Appendix No. 1 and 2 to Art. 20, para. 1, pt. 1 of the Law for Environment and Waters (LEW) (published in State Gazette, No.86, amendment in No. 90 of 1991; amendment and addenda in No. 100 of 1992, No. 31 and No. 63 of 1995, amendments in No. 13 and No. 85 of 1997).

A Preliminary EIS has been developed in accordance with the provisions of Art. 9(1), pt. 1 of Ordinance No. 4 for EIA (7.07.1998).



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1.5.Information supply

1.Design of the "Gasification of the town of Lyaskovets" project, phase preliminary preparation was developed by Overgas OOD, June 1998.

2.Climatic References for PR of Bulgaria, vol. 1,2, 3 and 4, publication of BAN-NIMH, 1983-1990.

3.Geomorphology of Bulgaria, D. Kanev, 1989, "Kliment Ohridski" publishers.

4.Chronological Atlas of Medicamentous Plants in Bulgaria, Prof. M. Drinov Publishers, 1995.

5.Hydrological Reference Book of Rivers in Bulgaria, v. II-V; NIMH-BAN, 1981-1984.

6.Annual Book about the Environmental Conditions of Republic of Bulgaria (Green Book), Sofia, 1992.

7.The State of Environment in the Republic of Bulgaria, Annual Bulletin 1996. NCOSUR, Sofia, 1997.

8.Quarterly bulletins about the state and the environment, NCOSUR, Sofia, 1996-1998.

9.Penkov, M., Land Reclamation Soil Science, Tehnika, Sofia, 1986.

10.Georgiev G. National Parks and Reserves in Bulgaria, Prosveta, 1993.

11.Petkov, P., Alichkov, D, Gas Supply, UASG Base Publishers, 1997.

12.Reference Book on existing methods for the evaluation and prognostication of environmental effects. MOSV, 1997

13.Reference book from the Lyaskovets Municipality on the declared monuments of culture in Lyaskovets.

14.References for registered diseases by classes, for 1997, by the V. Tarnovo Health Centre.

15.References of the Lyaskovets Municipality for the inner urban greenery and protected natural sites.

16.Minute for the selection of tracks and sites for the equipment - No. 1

17.Preliminary EIS on the "Main Gas Pipeline for the Veliko Tarnovo and Gabrovo Regions" project, Stroycomplect-PEK V. Tarnovo, 1996.

18.Own Archives of the CONTROL P EOOD Company.

2. PROJECT ANNOTATION

The project was developed by OVERGASD OOD, Sofia, on the basis of technical assignment of the Employer - OVERGAS INC. AD of 1998, and includes:

- Distribution Gas Pipeline (DGL) from AGRS to GRP1-TS in the northern town part, GRP2-TS in the Central Urban Part, GRP3-TS in the South-Eastern Urban Part, and user gasification in the Industrial Zone, including GRP1-TS, GRP2-TS and GRP3-TS
- Town Section Distribution Network (100 mbar) and user gasification in the RS (residential) part on the town of Lyaskovets.

The project is in conformity with the requirements of: Ordinance No. 2 for Fire and Civil Engineering-and-Technical Standards, Ordinance No. 21/1990 for the construction and safe operation of gas equipment and installations, Ordinance No. 3/20.02.1995(State Gazette No. 24/1995) for designing of gas supply systems in urban areas and gas installations in buildings, operating with natural gas, and the secondary legislation acts laying down requirements to the gas supply systems and installations - for problems which have not been resolved in the standards, as per pt. 1 of Ordinance No. 3.

2.1. Characteristic of the technological processes

General technological flow chart of the gas supply systems

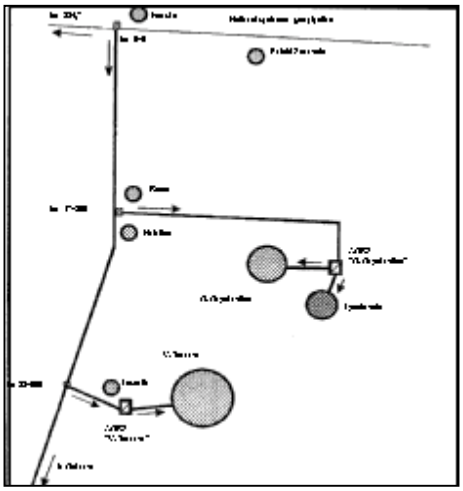
Each gas supply system is a complicated complex of gas pipelines and equipment, comprising the following basic elements:

- Source of natural gas - main gas pipeline;

- Gas transportation connections, connecting the main gas pipelines with gas regulation and gas metering stations, supplying the entire gas supply system;
- Industrial, town and town section gas distribution networks of high, medium and low pressure and their appurtenant pieces of equipment;
- Gas regulation and gas metering points, supplying the gas distribution networks;
- Internal gas transportation installation and combustion equipment;
- Technological communication connections.

General Technological Processes in the Gas Supply Systems

The technological processes, which are realized in the gas supplying systems - industrial and for the urban area, are the following:



- Natural gas transportation by means of surface and underground gas pipelines, adjustment of pressure and its maintenance (increasing or reducing it);
- Scrubbing the natural gas from mechanical impurities;
- Odouring of natural gas for residential needs;
- Distribution of natural gas to users;
- Metering of natural gas temperature and its discharge rate;

All technological processes are monitored and controlled automatically. They are effected in an underground laid, closed, tubular gas supply network. The basic technological processes are not a source of environmental hazardous emissions.

Although they are not part of the gas supply network developed in the design, the gas appliances and equipment are its final elements. The technological process of combustion, residual gases, which have adverse effect on the environmental components, are carried out in them.

Technological flow chart of the gas supply chart of the town of Lyaskovets

In the process of the development of the flow chart for the gasification of Lyaskovets, multiple variants have been examined and compared, out of which those having the best feasibility characteristics have been selected for complete development. In the EIS, the approved alternative for the "Gasification of Lyaskovets" was examined and analyzed (in accordance with the Preliminary Design), the total flow chart of which comprises the following basic element:

1.**Initial Section -** supplying natural gas from the Northern Semi-Ring of the Republican Gas Pipeline Network for the town of G. Oryahovitsa and Lyaskovets by Gas Connection (GC) (P = 5.5 MPa = 55 bar), supplying the AGRS Gorna Oryavovitsa.

2.**AGRS** (Automatic gas regulation station) - 1 psc.

The natural gas is supplied to the users at a specific pressure depending on the conditions of its utilization. By the AGRS, reduction of pressure from 55 to 12 bars is effected, as well as the maintenance of this level, regardless of its consumption and pressure fluctuations, before and after the AGRS. In order to achieve safe gas supply (with no interruptions), the AGRS includes several regulation lines and a bypass connection. Simultaneously with the pressure reduction, in AGRS gas scrubbing is effected from mechanical impurities, and the input and output pressure and temperature metering occurs, the consumption is metered and protection of the gas pipeline network is made from any pressure increase or decrease. All AGRS processes are automated. For the Lyaskovets gas supply, AGRS with a capacity of 50,000 nm^3/h shall be used, which shall be built on a site, located on municipal land in the grounds of the town of Lyaskovets, about 2.4 km away, north of the town. It shall also supply natural gas to the town of Gorna Oryahovitsa. The technological flow chart of AGRS with the said parameters is shown in Fig. 2.

3.**GRP-TS** (gas regulation points, Town section - No. 3)

The Town Section GRPs reduce the natural gas's pressure, arriving from the distribution gas pipeline of 12 bar to 100 mbar in the town distribution network. In these points gas scrubbing also occurs. In order to avoid any discontinuation of the gas supply, the separate regulation lines are envisaged in the GPR-TS. Measuring of the gas consumption is not made in the GRS-TS. According to the authentic variant in the gas supply network of Lyaskovets building of No 3 GRP-TS is envisaged. Two of them shall have the capacity of 2000 nm^3/h each shall serve the Northern and Central Town Part (GRP1-TS to GRP2-TS), and 1 shall have the capacity of 1000 nm^3/h (GRP3-TS) serving the Southern Town Part. The technological flow chart is shown in Fig. 3. They shall be mounted on the surface in steel cabinets on concrete foundations, which are equipped with ventilation plugs, thunderbolt protection and earthing connection.

4.**GRMP** (Gas regulation and metering point), No. 3 (12 bar/100 mbar)

In the sections of the gas supply network of high and low pressure, wherein the respective torch is the final component of the branch, a GRMP is fitted the objective of which is to reduce the pressure and meter the gas consumption for commercial purposes. A basic element of these points is the gas consumption corrector. It is designed for converting in measurements, by means of a flow meter, the volume consumption of the gas under different conditions to standard units.

The number of GRMP depends on the number of industrial and public-administrative users which are to be connected to the network. The number of GRMP for the industrial enterprises of outlet pressure of 12 bar in Lyaskovets is 4. The PABS users, supplied from the 100 mbar network with capacity over 100 nm^3/h shall be equipped with 0.1 bar GRMP, their number depending on the position of the boiler rooms and the modes of operation, approximately No. 18.

The flow chart of GRMP is shown in Fig. 3. They are assembled on the surface in the territory of the users, in steel cabinets on concrete foundations, and are equipped with ventilation plugs, thunderbolt protection and earthing connection.

5.Stop Cock Units (SCU)

SCUs are fitted at each gas supply connection, before and after AGRS, GRP and GRMP for the distribution of the gas flow. They are equipped with pipe couplings for blowing and emptying the gas pipelines. In the urban areas, steel cabinets are mounted on the surface and underground, which are earthing-connected. The corrosion protection is made by means of painting and lacquer coating.

6.Ventilation plugs (VP)

They are used for emptying the gas pipelines and their ventilation. They are mounted on a concrete site to the surface equipment and the protection casings when crossing obstacles.

7. **Protection casings (PC)**

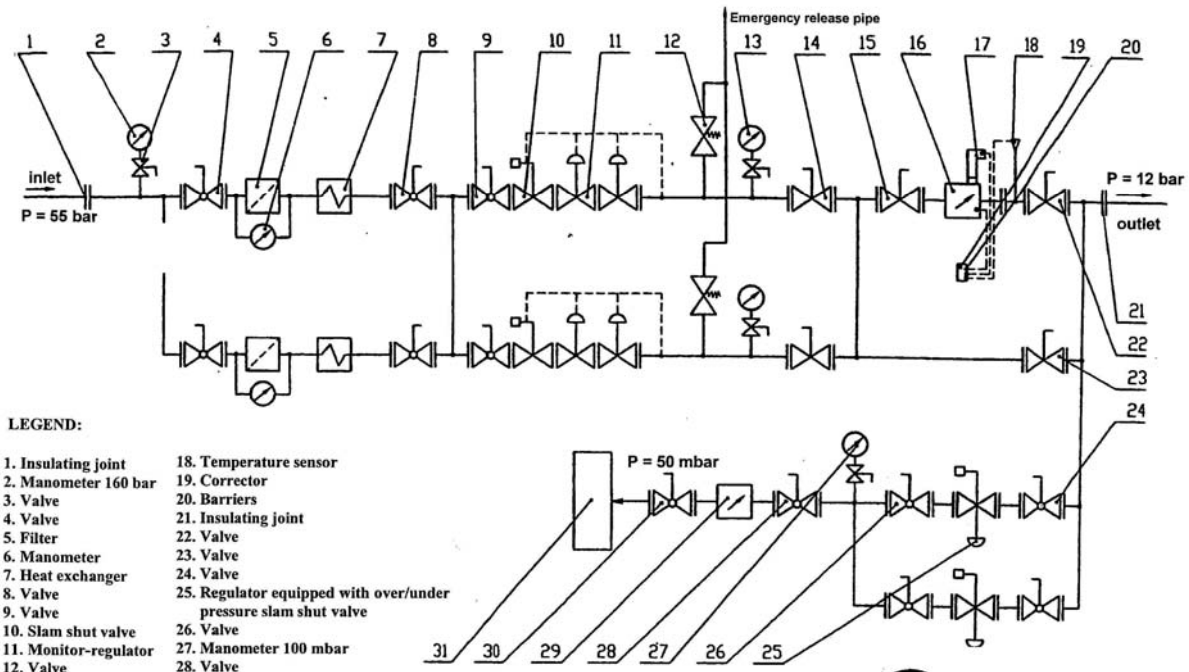
When gas pipelines pass under railway lines and roads they are mounted in protection steel casings of diameters min 200 mm larger than the diameter of the gas line. When crossing a railway line, the depth of laying should be no less than 2 m from the base of the rail to the top of the casing, and for roads this shall be no less than 1.4 m.

8. Gas Distribution Network.

The gas distribution networks secure the gradual supply of natural gas to the user at safe operation, reliability and simplified servicing. In accordance with the authentic variant of the Design, 2 degrees of pressure regulation in the gas transportation network are specified.

- distribution gas pipeline - 12 bar;
- town section distribution network - 100 mbar.

AGRS TECHNOLOGICAL SCHEME

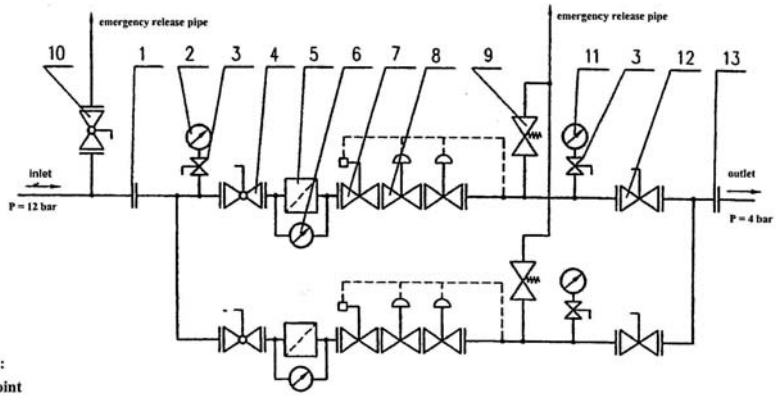


LEGEND:

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

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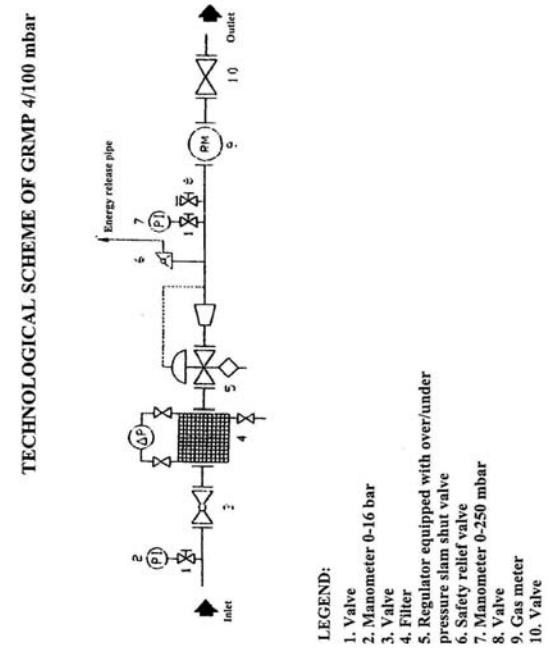

Fig. 4

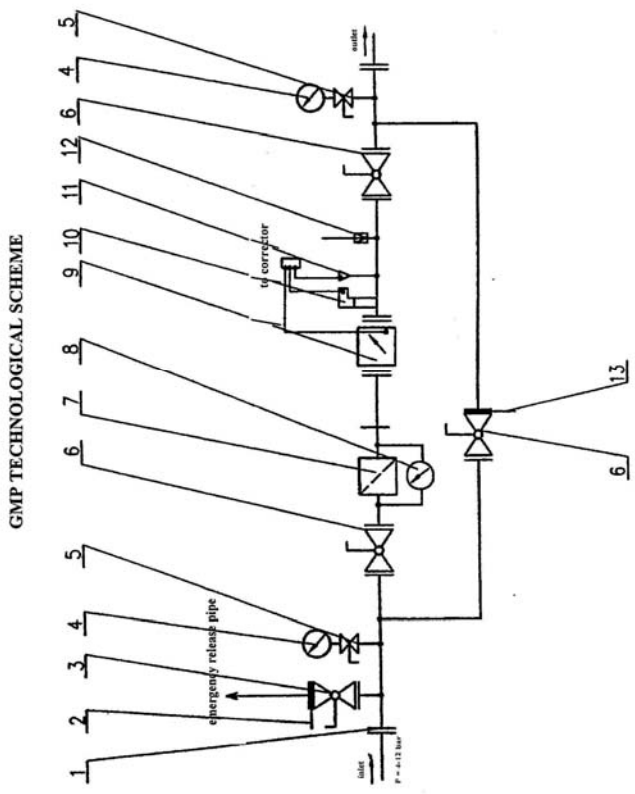

Fig. 3

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8.1 <u>Sub-project: distribution gas pipeline (12 bar) from AGRS to GRP-1 Town Section, GRP2-Town Section, GRP3-Town Section and gas pipeline connection to users in the Industrial Zone</u>

The main designation of the 12 bar distribution gas pipeline is to supply natural gas to GRP1-TS, GRP2-TS, GRP3-TS and users in the Industrial Zone in Lyaskovets. The DGP starts from SCU1 in the area of AGRS, continues eastwards, parallel to the main pipeline connection, reaching the G. Oryahovitsa-Lyaskovets road. It continues on southwestern direction, east of the D. Oryahovitsa-Lyaskovets asphalt road at 4 m away from the road surfacing. Around the petrol station the track passes to the right of the surfacing of M. Raikovich Street at 1.0 m from the western kerb of the Ring-Road. The DGP continues along the Ring-Road to H. Botev Str., and the street surfacing at 1.0 m from the western kerb. From H. Botev St. to the end of the regulation border of the town of Lyaskovets, the DGP passes in the separation greenery of the Ring-Road. After regulation, the track follows on the left of the asphalt road to the town of Elena at 4.0 m away from the surfacing and in the western end of the asphalted pedestrian lane. The gas pipeline connection to the Industrial Zone starts from SCU2, and runs in south-eastern direction along the street, at 1.0 m away from the kerb, after which it continues in the pavement at 0.5 m from the surfacing on the northern side. Before the existing parking site of the FMA EAD Company the track divides into a branching. The GC (gas connection) to "Vinprom" EAD crosses the street and runs along the pavement at 0.5 m from the kerb , after which it runs in a greenery area at 2.0 m away from the kerb. The GC for the FMA OOD and the Balance EAD runs at 0.5 m from the ends of the parking site in greenery areas, after which it enters the courtyard of FMA Company across a natural terrain and continues at 1.0 m from the northern fence of the FMA Company. From SCU2 to SCU7 it runs in south-western direction along the road to the town of Elena, crossing the railway line in a steel protection casing ∅426/7 mm, 12 m long, and ventilation plugs 57 mm. From SCU7 to SCU8, in the area of GRP1-TU, the track follows the street surfacing of the M. Raikovich St. at 0.5 m from the northern kerb. From SCU7 to SCU9, the DGP is following the road to the town of Elena. From SCU9 the track is diverted along the northern road facing of the H. Botev St. at 0.5 m from the centre line to GRP2-TS (SCU10). From SCU9 the track follows the road to the town of Elena to SCU12 in the area of the end user of the ARCUS AD System. The gas pipeline conection/GC/ to GRP3-TS is in the area of SCU11. The total length of DGP (12 bar) is 7712 m, of which: ∅159/4.5 mm - 3629 m; ∅108/4 mm - 2422 m; ∅76/4 mm - 1061 m, and ∅57/3.5 mm - 600 m. The SCU track avoids the places having the largest number of underground communications, determined on the basis of the underground cadastre and streets with congested traffic.

Gas pipeline connections to users, 12 bar

- Industrial zone - 1880 nm^3/h; L = 407 m; ∅76/4 mm; P = 12 bar
- FMA EAD Co. - 500 nm^3/h; L = 269 m; ∅57/3.5 mm; P = 12 bar;
- Vinprom EAD - 880 nm^3/h; L = 89+15 m; ∅57/3.5 mm; P = 12 bar;
- Balance EAD - 500 nm^3/h; L = 206 m; ∅57/3.5 mm; P = 12 bar;
- GRP1-TS - 2000 nm^3/h; L = 347 m; ∅76/4 mm; P = 12 bar;
- GRP2-TS - 2000 nm^3/h; L = 307 m; ∅76/4 m; P = 12 bar;
- GRP3-TS - 1000 nm^3/h; L = 21 m; ∅57/3.5 mm; P = 12 bar;
- Arkus AD - 3000 nm^3/h; L = 2422 m (from SCU11 to SCU12); ∅108/4 mm; P = 12 bar;

To the GCs of the industrial users, Stop cocks and GRMP are fitted with output pressure of 12 bar for the gas pressure regulation and metering the gas consumption for commercial purposes, fitted in the territory of the user.

The DGP and the 12 bar gas pipeline connections are made of seamless steel pipes, BSS 6007-80 of St.20 material based on BSS 5785-83 and of spiral-seam pipes, BSS 10208-72 of material Bst3 based on BSS 2592-71. The protection casings for the gas pipeline are made of spiral-seam steel pipes based on BSS 14479-78 of material Bst3cn based on BSS 2592-71.

Hot drawn elbows of KGI 90 type, based on Section Standard (SS) 1062645-86, smooth elbows 30-90 degrees based on SS 1962929 made of St20 and cold-bent elbows of seamless and spiral-seam tubes based on BSS 102-2. DGP and GC are laid underground, ensuring minimum cover depending on the terrain across which they run (in accordance with Ordinance No. 21/1990). The network has been tested for seismic stability.
In accordance with the requirement of Art. 4, para. 1 of Ordinance No. 4/20.02.1995 For Control and Acceptance of Gas Supply Systems in Urban Areas and Gas Installations in Building Operating on Natural Gas, in the supply of pipes and fittings, they should mandatory be accompanied by a certificate of the manufacturing factory, with guaranteed chemical composition and mechanical properties.

Welding and Control of Welding Connections

The assembly of the steel pipes and fittings shall be made in a trench by means of electric arc welding, in accordance with the provisions of Ordinance No. 21/1990 and Standard Technological Instruction (TTI-01-83) of the Montagi State Economic Corporation. The welding connection control using non-destructive methods shall be made in accordance with the provisions of Ordinance No. 0-31 for operation with radiation defectoscopes, and Ordinance No. 0-35 for operation with radioactive substances and other sources of ionization radiation.

Corrosion Protection

The steel pipelines in case of underground assembly shall be protected from soil corrosion and stray currents, according to BSS 15704-83 and BSS 15705-83.

Passive protection - insulation complex of adhesive primer 1019. insulation band Poliken 980-25 - black; and protection band Poliken 955-20 - white - 9 tons.

Active protection - electrochemical protection with cathode station, No. 1, anode earthing connections, No. 8, and control metering columns - No. 20.

The gas pipelines on the ground, before the Boiler Rooms, and the open ground parts of the equipment shall be covered with a primer and painted with two coats of yellow autoenamel lacquer.

8.2. Town Section gas distribution network (100 mbar)

The Town Section Low Pressure (LP 100 mbar) Distribution Network is connected, starting from the relevant GRP-TS and supplies the necessary quantity of gas to every user. In it are included buildings of PAS and RS. The track of the distribution network is determined on the basis of the specified consumption and the location of the three GRP-TS. Its objective is the connection of the users in a closed ring, using the shortest path, having the shortest possible connections to them. It is made of polyethylene high density tubes - PE-HD according to DIN 8075. In building the millibar network, the total length is 26142 m including - ∅63/58 mm - 19028 m; ∅110/10 mm - 4875 m; ∅160/14.6 mm - 1472 m; ∅200/18.2 mm - 453 m; and ∅219/ - 14 m. The gas pipelines and the connections are laid underground, ensuring their minimum covering, depending on the type of the terrain across which they run (in accordance with ordinance No. 21/1990 - min 0.8 m in greenery areas and min 1.0 m under road surfacing). When the gas pipelines cross other engineering equipment, the regulated clear distances between them (both horizontal and vertical) shall be observed.

The network has been tested for seismic stability.

In the MP network, in all distribution points stopcocks are fitted to all users connected in the network. All fittings: 3-way pieces, elbows, reducing fittings, unions, etc. are PE-HD made. The connection between the individual parts is made by butt welding with a hot element or by means of pipe unions and fittings with a built-in resistance conductor, mounted on their internal side and connected to the contact plug. According to the provisions of Art. 4, para. 1 of Ordinance No. 4/20.02.1995 "For the Control and Acceptance of Gas Supply Systems in Urban Areas and Gas Installations Operating on Natural Gas", in the supply of pipes and fittings, they should mandatory be accompanied by a certificate by the manufacturer, with guaranteed chemical composition and mechanical properties.

The pipelines and fittings of PE-HD are corrosion-resistive and need no electrochemical protection.

Gas pipeline connections to residential users

In the residential and public buildings, the natural gas runs from the town distribution network of 100 mbar pressure. The connections are made in several variants, depending on the positioning and the type of the user. They are made of PE-HD pipes, connected to the distribution network by a welding union. The connection reaches 0.5 m from the building, and thence commences the internal installation, made of steel or copper pipes with PE coating. In the LP network no stopcocks are envisaged, and if a need arises, stopping is made by stopping bags. A stopcock shall be mandatory when the connection diameter is D>63 mm. For the neutralization of stresses in the piping outside the building due to soil subsidence, temperature fluctuations and earth layer movements, elastic compensators are provided, connecting the PE and the metal pipes. All the connections end by a gas metering board for measuring the gas consumption. The gas metering instruments are in accordance with BS 10809-73.

Internal gas pipeline installations and equipment

The internal gas line installations transport the natural gas inside the premises to the combustion equipment of the user, wherein the technological process of combustion occurs, related to the separation of exhaust gases. They are executed in accordance with individual designs for the individual user equipment, depending on the gas instruments used, and the architectural and building structures. They commence from the gas metering board and include horizontal and vertical pipe connection of copper or steel pipes with PE coating. They include a stopcock before each gas-fired instrument. The premises are equipped with vents and airing chimneys and the discharge of the natural gas combustion products. The Design offers 5 model type schemes of internal gas line installations, depending on the structural design and the gas equipment used:

- one family buildings (Fig. 6): **1st scheme -**gas heating boiler in the basement, gas water heater on each floor; gas cooker; **2nd scheme:** gas heating boiler combined with water heater fitted in the basement, and gas cooker; **3rd scheme -**gas heating boiler, combined with water heater, fitted in the under-the-roofing space or on the story, and a cooking range;
- multi-floor buildings (Fig. 7) - **1st scheme -** gas heating boiler in the basement, on the roof, or in the under-the-roof space. It is beneficial in case of changing the torch in the existing local boiler room and having an already built heating transportation network in the building. It is connected to the 100 mbar distribution network in case of a flow rate under 400 nm^3/h. The remaining gas appliances are connected to a separate low pressure gas circuit; **2nd scheme -** gas heating boiler, combined with water heater, mounted in the individual apartment, and a gas cooker, connected to a low pressure circuit.

In the gasification of existing boiler rooms, equipped in the basement, triple exchange ventilation (mechanical, continually operating) and emergency ventilation with 8-fold air change are compulsory.

The implementation of ventilation vents and chimneys for the exhaust gases are compulsory.

10. Electrical equipment, Instrumentation and Automation

These are designed for the automatic control of the technological processes in the gas distribution system and the prevention of emergency situations. It comprises an electrical supply and gas metering broad (ESGMB); CF300T2 gas consumption corrector, metering lines, stabilitron units and sparkling protection to the corrector, configuration of the converter; lighting, thunderbolt protection and earthing installations.

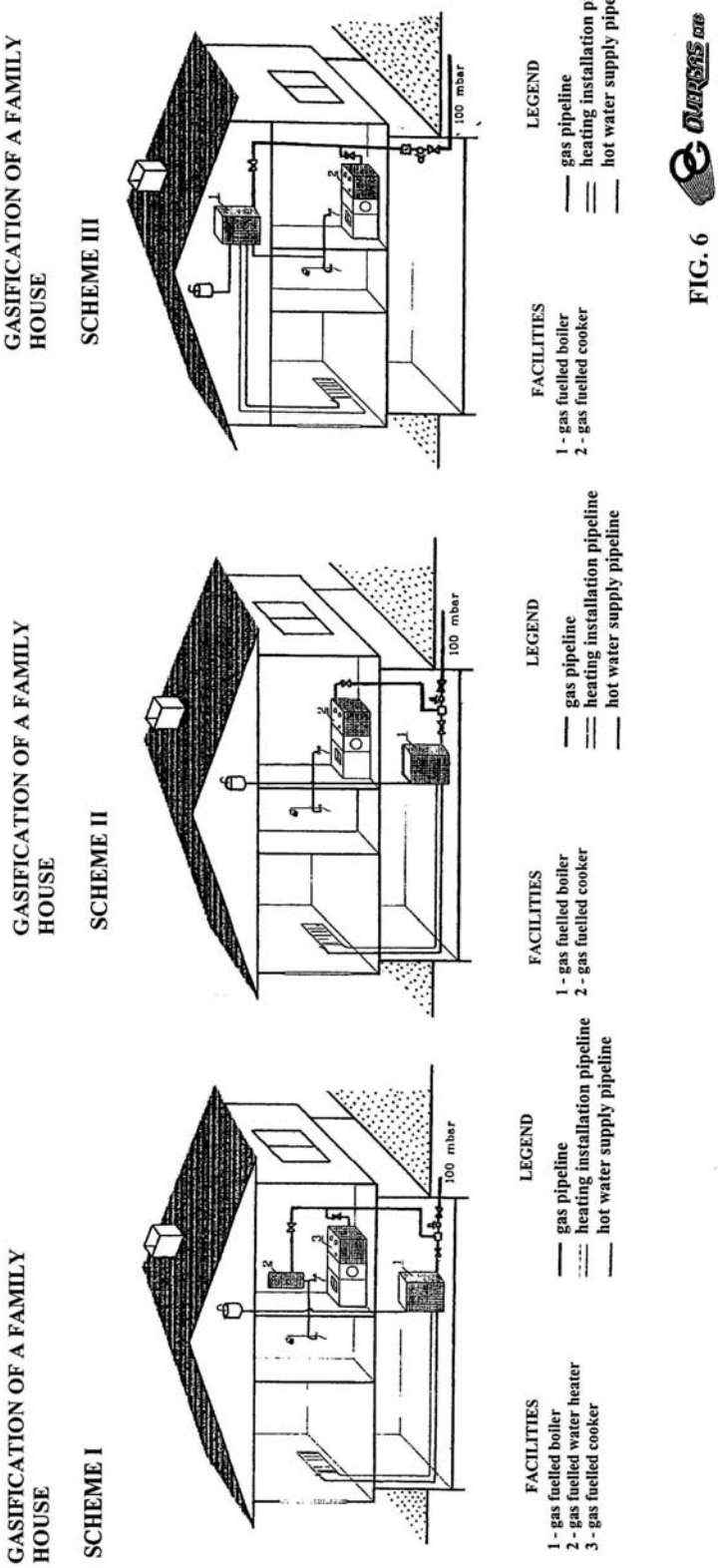

FIG. 6

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FIG. 7

11. Technological communication network

The information system about the control of the gas supply network in Lyaskovets has the following functions: pressure and temperature gas control, metering the gas consumption, transmitting operative information about any arising emergency modes. The system includes a dispatching point and sensors at specified points of the network, automatically connected by means of a local radio network. In the urban zone the ultrashort wave radio stations, equipment for data transmission and relaying equipment shall be fitted.

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

The gas supplying network of Lyaskovets shall be laid completely underground along the street network of the town. It requires no special area, will not limit the street network and the equipment and installation of the underground cadastre, as it shall be laid down in accordance with the requirements of Ordinance No. 3/1995, observing all the required vertical and horizontal distances. Ground surface equipment shall be the AGRS, GRP-Town, GRP-TS and SCU, which will require some terrain for fitting in the neighbourhood of the street network.

- AGRS, No. 1, site 18x30 m, 540 m^2 in size (Lyaskovets Municipality);
- External road to AGRS 190 m long - 1600 m^2 (Lyaskovets Municipality)
- GRP-TS - No. 3, sites of 4.2x3.3 m, of total size 41 m^3 (town of Lyaskovets);
- SCU before AGRS - G. Oryahovitsa 6.0x6.0 m - 30 m^2 (Lyaskovets Municipality)
- SCU (Industrial), No. 12 sites 1.2x1.3 m - total 18.72 m^2 (town of Lyaskovets);

The total area required for the above structures is 2230.32 m^2. It is municipal ownership, and its allocation shall not affect the interests of physical and legal persons. Out of it, the present design forms a connected area of 60.32 m^2. The remaining part is related to the following projects: "Main Gas Pipeline for the V. Tarnovo and Gabrovo Regions" and "Gasification of the town of Gorna Oryahovitsa", which are the subject of other EIS.

The project affects no farmland, forest land and protected natural territories.

The DGL track from SCU1 to SCU12 is determined by a Commission, appointed listed in Order No. 907/08.07.1998 of the Mayor of the Lyaskovets Municipality, based on Art. 185, para. 2, Chapter IV, Section III, pt. 7 of the PPZTSU, and in conjunction with Art. 180 of the PPZTSU (Annex: Minute of 01.10,1998).

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

The implementation of the "Gasification of the town of Lyaskovets" project is not related to the use of natural raw materials and resources. The basic materials which are used for building the gas supply network are pipes of different diameters, fittings, etc., and standard equipment (AGRS, GRP, GRMP). The pipes are of two types:

- Steel - steel seamless, BSS 6007-80 of St.20 material based on BSS 5785-83, and of spiral seam pipes, based on BSS 10208 of Sst3 material, based on BSS 2592-71;
- PE-HD - polyethylene pipes, high density, based on DIN 8075.

The sole energy source, serving the technological processes in the gas supply system of Lyaskovets is electric power. It is used by the electrical equipment. instrumentation and automation, as well as in the electrochemical protection, related to the safety and reliability of the system, described in pts. 9. and 10.

The basic designation of the "Gasification of the town of Lyaskovets" project is the transportation of natural gas from its source to the users. The natural gas is a natural resource, which is not produced in the territory of the Republic of Bulgaria.

The production of natural gas in Bulgaria, based on OVERGAS data amounts to only 1% of the quantity of its consumption. For this reason, after building of the Main Gas Pipeline Russia-Rumania-Bulgaria in 1974, the commencement of the gasification was laid in this country entirely by the importation of natural gas from Russia. A Main Gas Transportation Pipeline was built with maximum pressure of 5.5 Pa, and a ring-type form, getting across

Northern and Southern Bulgaria, with connections for Turkey, Greece, Macedonia and Serbia. From the Main Gas Pipelines, by means of gas line connections and AGRS, the natural gas enters the gas distribution network to the users. By this moment, priority gasification has been made to industrial enterprises and energy propjets, while the gasification of the urban areas is in its initial phase.

Physicochemical properties and toxicity of the natural gas

The example composition of the natural gas, used in Bulgaria, is as follows: 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 + mercaptans - 21 mg/nm^3; density - 0.677 kg/nm^3; calorific value - 7943 Kcal/nm; due point - (-) 9 degrees.

Quantity, reserves and resources of the natural gas

As the natural gas at this moment is entirely imported from Russia, its quantity, deposits and resources, used by the Republic of Bulgaria are directly related to the interstate agreements.

Natural gas source for the Gasification of Lyaskovets

The town of Lyaskovets is located near the track of the main pipeline of the Northern Semi-Ring of the Republican Gas Pipeline Network. Out of it, for the gas supply of G. Oryahovitsa and Lyaskovets, by a gas conducting connection (GC) 55 bar, it is envisaged to supply a common AGRS 55/12 bar with a capacity of 50 000 nm^3/h, fitted on a site, Municipal property, in the territory of the town of Lyaskovets.

Natural gas consumption in the Lyaskovets gas supply system

In accordance with the submitted designs, the natural gas consumption was determined at the Preliminary Design Plan (PDP) for the three types of users, different by nature: industrial, public-administrative and households. The maximum hourly consumption (Qmax, nm^3/h) and the annual consumption (W, nm^3) have been determined, depending of the validity of each of the following cases:

- users having built their own heating boiler room fired by solid or liquid fuel;
- users having no heating boiler room of their own, but having built-in inner heating transportation system, supplied by an external source;
- users having no heating boiler and internal heating transportation system built.

Considering the trends of development of the town of Lyaskovets (100% gasification), the natural gas consumption has been determined as maximum hourly consumption (Qmaxh, nm^3/h), and annual consumption (W, nm^3), shown in Table 1.

Table 1. Forecast natural gas consumption in Lyaskovets

No	User	Qmax nm^3/h	W nm^3.10^6
1.	Industrial sector	4480	12.59
2.	Public and administrative sector (PAS)	830	0.864
3.	Residential sector (RS)	3965.4	6.75
4.	Total	9275.4	20.2

It is obvious that the largest user is the Industrial Sector - 63%, RS 33% and PAS - 4%.

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

Building of the project as a whole is not bound to the technical infrastructure of the area. Due to the requirements of Ordinance No. 21/1990, all civil engineering works shall be made by a licensed building organization and specialists. All raw and other materials shall be supplied by an external storage, which would not require any accompanying works and production. The civil works shall temporarily affect the street network, but it is due to restoration. In the restoration works of the road facing and the affected greenery area, local civil engineering companies shall be employed.

During the operation of the project, the carrying out of the technological processes shall be directly related to the electrical and communication networks in the town of Lyaskovets. As the Gas Supply Network of Lyaskovets shall supply energy resource to industry users, PAS and RS, it would become part of the energy infrastructure of the area and thus resulting in relations with the remaining 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 construction of the gas supply system in Lyaskovets is being made by a specialized group, in accordance with the provisions of Ordinance No. 21. In agreement with the social policy of the Employer the restoration work of the road surfacing shall be entrusted to local building companies.

The safe and normal functioning of the system in putting the project in operation shall be ensured by the Gas Company. A team of about 10 specialists shall be formed for carrying out its activities.

Public need for the project

The aim of this project is, by means of building a comprehensive system of gas supply of the town of Lyaskovets, to offer an alternative energy carrier to the so-far used ones in the industrial enterprises, the public and administrative buildings and in the residential sector. The possibilities and the advantages of natural gas, expressed in the opportunities for the introduction of new ecologically clean technologies, direct combustion in the user equipment, personal regulation and metering of consumption, its low costs as an energy carrier, determine it as a competitive energy carrier, meeting with the desire for sustainable environmental development and reproduction.

The need for the realization of this project has been dictated by the absence of a heating and gas supply network in Lyaskovets. The use of energy carriers, such as crude and light oils and coal, both in industry and in the public and communal service sector conceals a potential risk for the deterioration of the health and sanitation conditions and the pollution of the atmospheric air, the waters and soils with anthropogenous products.

There are opportunities for the implementation of the project - in the industrial zone and the residential area of Lyaskovets, subject of this study, as well as the necessary energy, ecological, technical and town-building prerequisites for the effective gas supply to potential users.

Social benefits

The town of Lyaskovets is an urban area of the 4th functional type, having 13,118 inhabitants in 3123 households. An industrial zone has been formed, located in the north-eastern part of the town. The total number of industrial enterprises is 4 of different industrial sectors. Three of them are in the Industrial Zone, and ARCUS AD (the largest user) is at about 1.5 km away from the town. They are great air polluters with hazardous emissions. The public administrative and communal services buildings are 18 in number, 10 of them being administrative and public buildings, and 8 schools and nurseries and kindergartens. Local boiler rooms have been built in all of them. The residential sector includes 1389 one-family one to three stories high buildings, 237 3-5-storied apartment blocks, and 19 apartment

blocks, higher than 6 stories. The housing is in good conditions. The town has central water supply and refuse collection. No central heating system has been built in Lyaskovets. The street network is over 90% asphalted or covered with other suitable surfacing. In town planning, the town shall develop on the basis of the now occupied area by increasing the number of stories of the existing buildings. The basic funds, related to the town social infrastructure are in the sphere of housing supply, education, health protection, culture, state and municipal administration, commercial network, public catering and communal services.

The town of Lyaskovets is a centre of a municipality. As such, it has all the necessary sections required for the normal functioning of the town and the municipality.

The availability of a competitive energy carrier such as natural gas is a prerequisite for improving the living standards of the population - independence in planning and consumption of energy resources, reducing the costs for heating and residential utilities, making lighter the labour for the maintenance of the households and having longer free time for the social life of the family.

Better conditions shall be formed for the development of the economic activities in the area of the town of Lyaskovets. The conditions of labour of the staff, servicing the boiler room equipment in the industrial enterprises, the public and administrative sector and the residential sectors shall be improved.

Risky workplaces

The construction and the operation of the project is not related to any risky workplaces.

Provision of healthy and safe labour conditions

The control of the technological processes in the gas distribution system is automatic and is performed from the dispatching point.

2.6. Stages for the implementation of the project

It is envisaged that the implementation of the project shall be in one stage, in accordance with a Working Design for the organization of the building works of the Contractor Company, in agreement with the Employer.

2.7. Project costs

The value of the çroject costs shall be submitted to the competent authority by the Employer separately from the Environment Impact Statement (EIS).

3. ANALYSIS OF THE PRESENT STATE, PROGNOSTICATION AND ANALYSIS OF THE EXPECTED EFFECT 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 effect and quality of the atmospheric air

The state of the atmospheric air in urban areas depends on the morphological features and the meteorological factors in the area, the location, the character and the capacities of the sources of pollution, and the degree of urbanization. The "Gasification of the town of Lyaskovets" project is located over the entire area of the town of Lyaskovets and its northern suburban parts. Lyaskovets is situated in the valley of the Yantra river, in the central part of the Danuben Plain. The relief is hilly-and-plain type, with an average height of 50-60 m above sea level. To the south-west the town is bounded by the Tarnovo Height (Arbanasi). To the north and east, the area is open, only low hilly formations occur.

Climatically, the area of Lyaskovets is related to the Medium Climatic District of the Danubean Plain, included in the Moderate Continental Sub-region of the European Continental Climatic Region.

Features of the atmospheric circulation

The cyclonic circulation (low-pressure region) over Bulgaria is determined by the passage of Atlantic cyclones during the whole year (up to 10 in number), and of Mediterranean cyclones - mainly during the winter months (up to 18 in number). The atmospheric circulation of anticyclonic type, related to active air transport and manifest clearing effect - refreshing the climate in Bulgaria, including that in Lyaskovets.

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

Of the meteorological factor, the greatest effect on the air quality is exercised by the thermal inversions and fogs, the wind, and the precipitation. As the basic sources of emission under urban conditions are low, direct relation has been established between the ingredient content in the air and the low ground inversions. In inversion days, the concentrations of SO_2, NOx and Pb increase up to two times. In case of fogs, the NO_2, NO, SO_2, H_2S concentration redouble in comparison with the clear days. Less is the increase of oxidant concentration, formaldehyde, phenol and dust.

The wind effect has the strongest impact on the dust content.

Precipitations have emphatic cleaning effect. Considerable air cleaning has been established in days with precipitation, and this effect is most strongly expressed during winter and less during summer months. The snowfalls have greater purification capacity than rains.

As the conditions of the atmosperic air are direct function to the meteorological conditions for the area, a long-year regime of the basic meteorological elements (Fig. 8) has been examined. As there is no Hydrometeorological Servce in Lyaskovets, data have been borrowed from the Hydrometeorological Service in Gorna Oryahovits (54 m above sea level), at 4 km north-west of the town of Lyaskovet

1. Solar radiation

The quantity of direct radiation depends on the height of the Sun, which also determines the type of its daily and annual movement. The maximum is duly in the hours around noon and in the months of June and July. The direct solar radiation intensity of the horizontal surface for Bulgaria around noon ranges from 0.24 kW/m in winter, to 0.70 kW/m in summer.

2. Air temperatures

The mean daily annual temperature of the air in the area is 11.5 ^{0}C. During the coldest winter month of January, the mean monthly temperature is about (-2.3 ^{0}C). The extreme monthly air temperatures are illustrated in Fig. 8. The mean monthly maximum temperature is 17.5 ^{0}C, and the minimum is -2.5 ^{0}C. The mean monthly maximum temperature is 29.8 ^{0}C (August), and the mean monthly one is -18.7 ^{0}C (January). The absolute maximum temperature is 41.8 ^{0}C, and the minimum one is (-33.7 ^{0}C). The mean monthly amplitude of the air temperatures is 12.2 ^{0}C (8.2 - 15.3).

The mean date of the last spring frost was 12 April (27.03 - 05.05), and of the first autumn frost 21 October (28.09-29.11), which determines the average time of the vegetation period of the plants of 191 days.

The duration of the heating period is 180 days. Calculation temperature are for heating minus 20 ^{0}C, for the ventilation minus 7 ^{0}C, period with tav<0 ^{0}C - 54 days, day/degrees - 2700.

3. Air humidity

The average air humidity deficit is 5.2 mb, with maximum values during the summer months (July - 10.4 mb), and minimum during the winter months (January - 0.9 mb). The mean monthly relative air humidity is 74% (63-86%), with the maximum during the winter months (December-January - 85-86%) and minimum during August - 63%. The high air humidity during the winter months assists the retention of the pollutants in the ground layer.

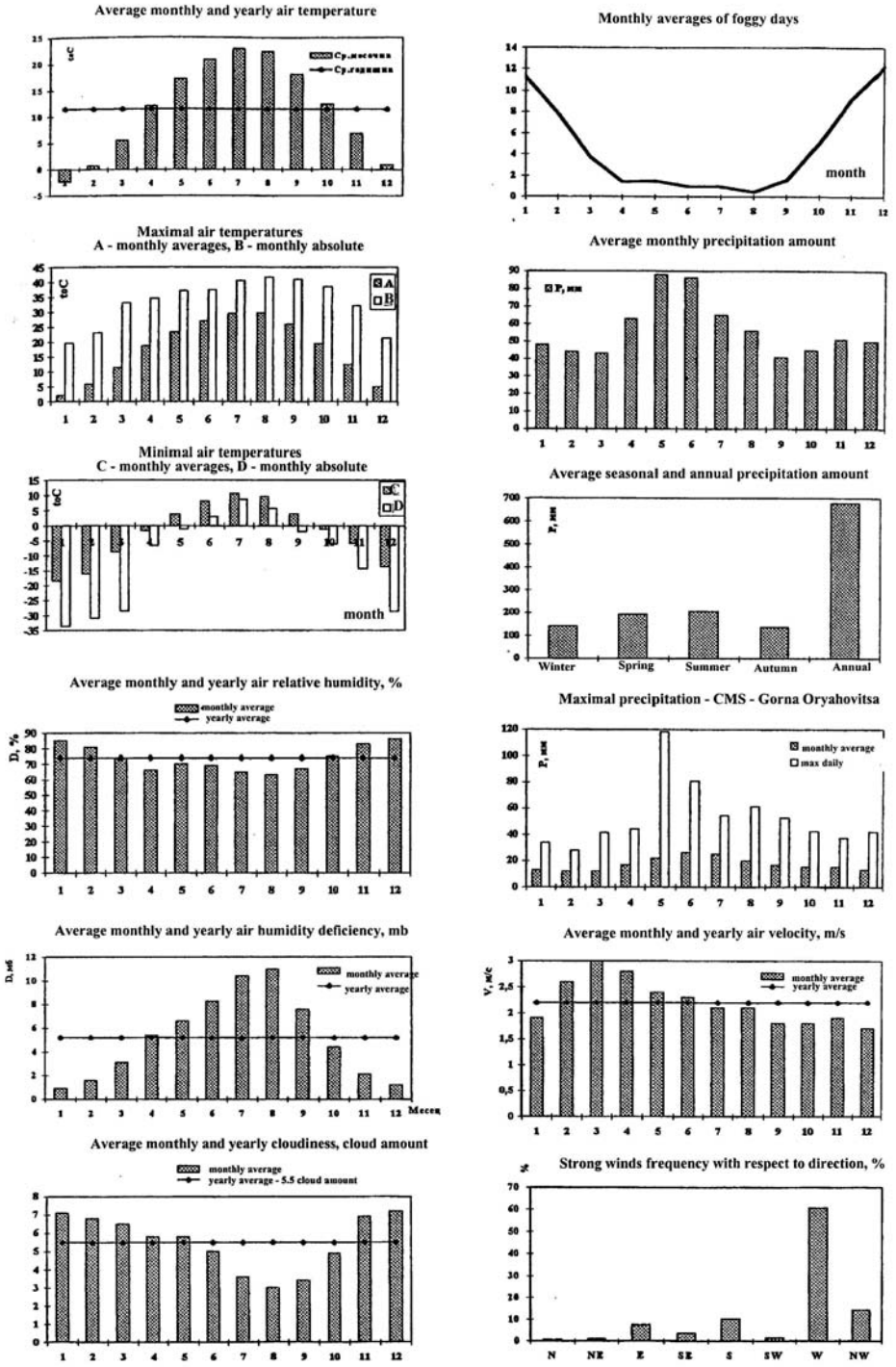

Fig. 8. Meteorological factors - the town of Lyaskovets

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4. Precipitation

Precipitation is one of the basic meteorological elements affecting the degree of comfort of the climate and the self-purification mechanisms in the atmosphere. The annual rain- and snowfall in the area under examination has emphatically continental character. The mean annual sum of precipitation is 680 mm. The mean monthly precipitation sums are illustrated in Fig. 8. The annual maximum of the daily amounts of precipitation is 118.1 mm (May). The distribution of the seasonal sum of precipitation is uneven. The maximum precipitation is during spring and summer period - 197-207, and the minimum during autumn and winter months is 137-142 mm. There are two precipitation maximums: in May - 88 mm and November - 51 mm, and two minimums: in September - 41 mm and March - 43 mm, which is typical for the Danubean plain. The total number of precipitation days is 137, of them 103 with rainfalls (maximum in May - 15 and minimum in September 7 days), snowfalls 25 (January 8 days), rain and snow falls 7 (1-2 days each in the summer months). The time of no precipitation period comes maximum to 114 days/year (9.5 days/month on an average). The maximum dry period is in October - up to 13 days, and minimum in June - 6 days.

The average depth of the snow blanket is about 10 cm deep, and the average annual number of days with a snow blanket is about 50.

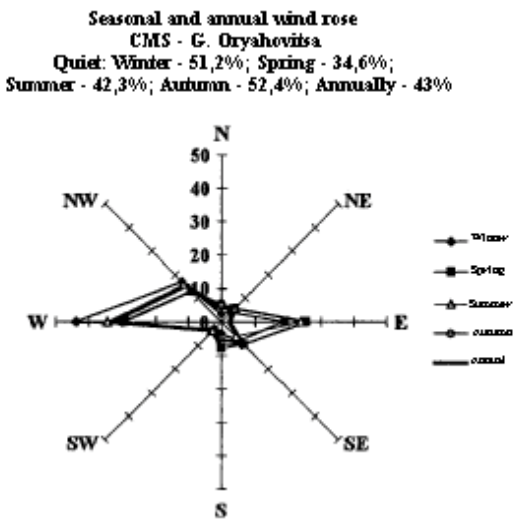
The mean annual number of foggy days is 56.4. Out of them 49.5 are in the October-March period, and 6.9 are in the April-September period.

The average monthly and annual general cloudiness is 5.5 bale.

5. Wind

Based on data from the Gorna Oryahovitsa Hydrometeorological Station, in the area the quiet weather is predominant - 43% (during autumn 52.4% and 51.2% during winter). The prevailing wind direction is westerly (33.5%). During the heating period westerly winds prevail: in autumn - 30,3%, and 43.7% in winter.

Outside the heating season in spring the greatest frequency also belongs to the westerly winds: in spring 29.4%, and 34.4% in summer. The mean annual velocity of the wind is 2.2 m/s. The greatest frequency in the area are winds with velocities 0-1 m/s (53.3%) and 2-5 m/s (33.0%). The number of days with strong winds (V>14 m/s) is 1.3, which is under 5%.



Of the strong winds, prevailing are the westerly (60.7%), followed by the north-westerly (14.4%).

The climatic characteristics of the town of Lyaskovets are typical for the middle part of the Danubean Plain and are characterised by continuous absence of wind, high air humidity during the autumn-winter period, which are determined by low self-purification ability, setting prerequisites for lasting retention of the air pollution, caused by its anthropogenous loading.

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

The state of the atmospheric air in given, limited areas, is a result to a great extent to sources of local character. The level of the polluting substance concentration in the atmosphere is determined by several factors, affecting the conditions for their retention or dissipation:

- the change of local climatic conditions due to the morphological characteristics of the area;
- the disposition in the area and the power of the sources of emissions;

- the character of the urbanization.

The town of Lyaskovets is not included in the National Air Monitoring Control Network. In connection with the development of the present EIS, in the inquiries made at the District Inspectorate of Environment and Waters in Veliko Tarnovo, and in the National Centre of the Environment and Resources, no existing data have been established for immission and emission measurements in the territory of the town.

In this connection, the quality of the atmospheric air cannot be assessed in the EIS on the "Gasification of the town of Lyaskovets" project due to the unavailability of any data. Taking into consideration the infrastructure of the town of Lyaskovets, the type and the quantity of the fuels used in the different sectors, one can expect the presence in the atmospheric air of such ingredients as SO_2, NOx, H_2S, dust, hydrocarbons, carbon oxides, especially during the heating season. Considering the size of the town, it is presumed that the basic source of air pollution is the used conventional fuels, employed by the organized sources, and to lower degree the road transport (NO_2).

Also when considering that the basic technological processes in the "Gasification of the town of Lyaskovets" project are not a source of environmental emissions, the state of the atmospheric air shall not be an obstacle for the implementation of this project.

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

The technological processes in the gas supply system, such as delivery, shipment, distribution, regulation and maintenance of pressure, gas metering, scrubbing and odouring of the natural gas are not the source of hazardous environmental emissions. They are carried out by means of a closed tubular gas distribution network, laid underground and on ground equipment, which operates fully automatically in guaranteed safety and reliability. If required, during servicing and repair works, individual sectors of the gas supply networks are blown. This is made by means of the devices of the SCU and the venting plugs, which are ground equipment. The natural gas, released under control in the atmosphere (with specified intensity), due to the fact that it is lighter than air, dissipates and is no hazard for humans and the environment.

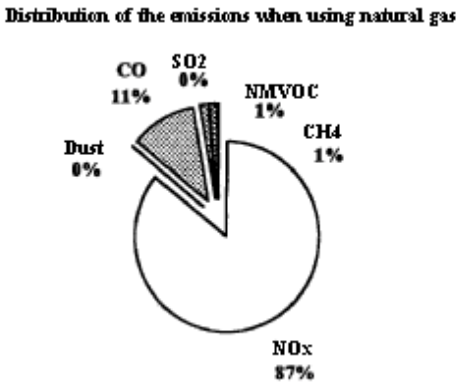
The implementation of the "Gasification of the town of Lyaskovets" project shall contribute to changing the type of fuel used in industry, in the administrative and communal services and for residential needs in the town of Lyaskovets. The solid and liquid fuels shall be replaced by natural gas, the generating capability of which concerning pollution substances (emission) during combustion is considerably lower. In particular the heating process means of the users are the source of hazardous environmental emissions. The introduction of natural gas as an energy source shall change the type of composition of the emissions - wherein practically no dust, ashes and SO_2 are separated; there is separation of NOx, CO (depending on the quality of the fuel processes), NMVOC, CH_4. Of them, the determining characters belong to NOx.

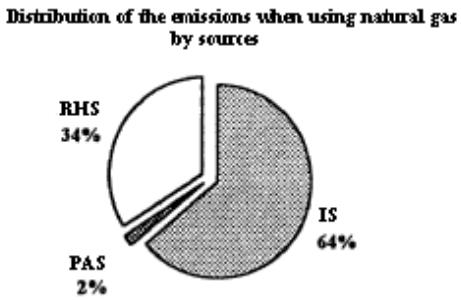
After considering the trends of development of the town of Lyaskovets and the specified natural gas consumption (at 100% gasification), listed in Table 1, the composition and the quantity of the hazardous substances from the heating means of the users is forecast (Table 2).

Table 2

No	User	W $nm^3.10^6$	Nox t/yr	CO t/yr	NMVOC t/yr	CH_4 t/yr
1.	Industrial zone	12.59	53.51	6.96	0.86	0.86
2.	Public and administrative sector (PAS)	0.864	1.47	0.19	0.07	0.07
3.	Residential sector	6.75	28.69	3.73	0.46	0.46
	Total	20.2	83.66	10.88	1.39	1.39

The total quantity of the emissions is 97.72 t/year. The quantity of NOx is 87%, followed by CO - 11%. The total quantity of the hydrocarbons is 2%. As it has already been noted, no dust and SO_2 are emitted. According to the natural gas consumption distribution in industry, PAS and RS, total for the town of Lyaskovets, 13% of the emissions are separated during summer months, and the remaining 87% - during the heating period (in winter). One is impressed by the fact that the basic source of emissions in Lyaskovets is the Industrial Zone - 64%, followed by the Residential Housing Sector (RS) - 34%, and the Public and Administrative Sector (PAS) - 2%.





3.1.4. Scrubbing equipment (type, scrubbing effect)

Of the basic technological processes in the gas supply network, solely the scrubbing of the natural gas from mechanical impurities is made by using filters (net-type or centrifugal), which are the equipment part of the technological scheme of AGRS, GRP-TS and GRMP. Their designation is to guarantee the hydraulic conductivity of the network. Their gas scrubbing effect is over 90%. Scrubbing is automatic.

The instrumentation equipment of the users is of heating type, and of low heat capacity (group I, according to Ordinance No. 1/1977 for the Operation of Dust Arresting and Gas Scrubbing Installations). No purification equipment to them is built, as they are not required by any technological or sanitation needs.

3.1.5. Prognostication and assessment of the expected changes in the quality of 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 realization.

The effect of the "Gasification of the town of Lyaskovets" project should be examined in two periods: Period of Construction and Period of Operation.

Period of Construction

During the civil works there will be noise effect and dust pollution of the atmospheric air as a result of the execution of the civil and assembly works and the operation of the construction machinery. The construction of the distribution gas pipeline from AGRS to the regulation line of Lyaskovets is outside urban areas, along the existing road network, affecting no farmland and forests. Within the town regulation the gas distribution network is laid fully underground along the street network. The basic share of the dust pollution belongs to the excavation works for laying the gas transportation network in the urban area.

During the operation of the civil works mechanization, emissions characteristics for the exhaust gases of the internal combustion engines shall be separated. In accordance with Art. 12 of the Law for the Preservation of the Purity of Atmospheric Air, the laying of the standards of hazardous substances in the exhaust gases from the internal combustion engines

is made from the indices of fume-content and carbon oxide content. The control authorities measure the emissions from the motor transport vehicles at least once a year.

According to WPORC, developed for an identical project by a building company, contractor for the project, the required constructional machinery includes, as standard working unit: single-bucket excavator with reversible shovel 1.5 m^3 - 1 psc.; bulldozer with 3.20 m wide spreader - 1 psc.; pipe transportation vehicle - 1 psc.; autocrane with 3-ton lifting capacity - 2 psc.; autocrane with 5-ton lifting capacity - 2 psc.; asphalt laying machine - 1 psc.; petrol or pneumatically driven circular saw metal cutter - 1 psc.; compressor - 1 psc.; mechanical rammer - 4 psc.. No fuel filling of motor vehicles, resulting in their evaporation, including saturated hydrocarbons, benzene, toluene and xylene shall not be taken into consideration, and are not envisaged in the area of the site. The dissipation of the exhaust pipe gases within the project (up to 2.4 m) in the direction of the wind, determined by simulation, indicated that the emissions separated at this wind direction are within the standards of the maximum allowed quantities (MAQmax,single).

Cm ‘(MCO) = 0.01 mg/m^3	MAQmax.single - 60 mg/m^3
C ‘(Mhydrocarbons)= 0.00105 mg/m^3	- not subject to standardization
C ‘(MNo. 2 = 0.0016 mg/^{3}	- 0.2 mg/m^3
C ‘(MSO2 = 0.00105 mg/m^3	- 0.5 mg/m^3
C ‘(Mashes) = 0.00009 mg/m^3	- 0.15 mg/m^3
C ‘(MPb) = 0.0000068 mg/m^3	-

When the wind blows perpendicularly to the source and values of MAQmax, single are again not exceeded:

Cm’’(MCO) = 0.13 mg/m^3	MAQmax.single - 60 mg/m^3
Cm’’ (Mhydrocarb.) = 0.0137 mg/m^3	- not standardized
Cm’’(MNo.2) = 0.0206 mg/m^3	- 0.2 mg/m^3
Cm’’(MSO2) = 0.0137 mg/m^3	- 0.5 mg/m^3
Cm’’(Mashes)=0.00118 mg/m^3	- 0.15 mg/m^3
Cm’’(MPb) = 00009 mg/m^3	-

From the results above it can be seen that the effect of the constructional machinery, considering the character of CMP and the composition of this unit can be neglected.

The range of the territory of the dust and noise effect are only within the range of the project (considerably under the lowest degree of the 5 km criterion) - is small:

- degree of the effect - insignificant;
- duration - short time;
- frequency - single, during the period of engineering works;
- chances of restoration - yes;
- cumulative effect - none.

In case of a suitable selection of excavation works, the effect of the project on the air, which is limited by time and place, can practically be neglected. The effect of the phase of the construction of the project on characteristics such as temperature, humidity deficit, precipitation, wind, is non-existent.

Period of Operation

As it has already been noted, the basic technological processes to be carried out in the "Gasification of the town of Lyaskovets" project, such as deliveries, supplies, distribution, pressure regulation and maintenance, gas metering, scrubbing and odouring of the natural gas are not a source of emissions, and they shall not result in any change in the quality of the atmospheric air. In case of necesity, in servicing and repair works, individual sections of the gas transportation network shall be blown. The natural gas the release of which is controlled

(of specific intensity), due to the fact that it is lighter than air and is dissipated, is of no hazard for humans and the environment.

At the same time the basic objective of the design is, by means of the alternative energy source offered, to undertake the replacement of the conventional fuels by natural gas in industry, in PAS and in RS in the town of Lyaskovets. In the period of operation, the sources of emission having an effect on the atmospheric air characteristics are the heating and energy-consuming installations fired by natural gas (emissions from immobile sources) which belong to the users.

In this connection, regardless to the fact that the heating system user installation are not the subject of the EIS, comparison was made between two alternative hypotheses in order to fully assess the effect of the gasification of the town of Lyaskovets:

- 1st Hypothesis (zero hypothesis) - existing situation - using conventional fuels for energy source and assessment of their effect on the atmospheric air;
- 2nd Hypothesis - implementation of the project - the use of natural gas as energy carrier and assessing its effect on the atmospheric air.

In both cases analysis was made in the contribution to the air pollution by all sources of emission, related to this project. The motorcar traffic has not been taken into consideration.

Existing situation (zero hypothesis) - conventional fuels

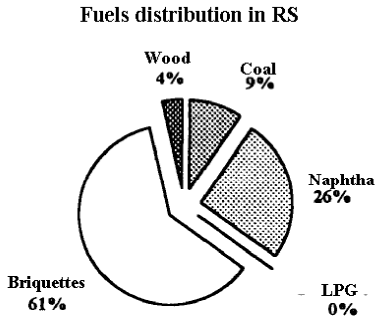
The basic sources of emissions in the area of the town of Lyaskovets, subject to analysis and evaluation are the following:

- industrial enterprises;
- public and administrative, and communal services sector;
- residential housing sector.

The hazardous substances emitted by them are exclusively due to the combustion of different types of fuels, depending on their needs.

Industrial zone - four are the large industrial enterprises in Lyaskovets. Three of them are concentrated in the Industrial Zone of the town, located in its north-eastern part. They belong to different industrial sectors: Vinprom EAD, Balans EAD and FMA EAD. The fourth - Arkus AD is located 1.5 km south of the town. They are heating-supplied by their own boiler rooms, which are coal- and oil-fired, or using electric power. The total fuel consumption in the Industrial Zone (in the enterprises, included in the design) in Lyaskovets is: crude oil 12474 t conventional fuel; diesel oil - 598 t conventional fuel and propane-butane - t conventional fuel. Residual fuel oil firing is predominant - 93%, and naphtha 7%. At the moment the industrial capacities are not fully used because of the general fall of production. In the town planning respect, the location of the Lyaskovets Industrial Zone is favourable: it is in the north-eastern part of the town. In considering the regime of the climatic factors, especially of the wind (prevailing westerly direction, followed by easterly - see the Rose of Winds), it can be presumed that the effect of the Industrial Zone on the quality of atmospheric air in the urban part of Lyaskovets is rather limited.

Residential part - The town of Lyaskovets belongs to the 4th functional type urban area, having 13 118 inhabitants in 3123 households. The public administrative and communal service buildings are 18 in number, 10 of them being administrative and public buildings and 8 are schools, and kindergartens and crèches. All of them have their own boiler rooms. The housing sector includes 1389 one-family 2-3-storeyed buildings; 237 apartment 3-5-storyed buildings and 19 over 6-storeyed apartment blocks. The conditions of the housing are



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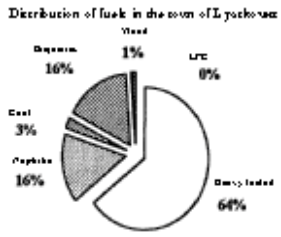
good. In Lyaskovets no central heating system has been built. In town planning respect, the town shall develop on the area it now occupies, by increasing the numbers of the building storeys.

The total fuel consumption for the PAS is: oil 814.3 tons (100%).

In the RS the fuel consumption is as follows: coal 490.2 tons conventional fuel, oil 1340.18 tons, briquettes 3192 tons and wood 194.4 tons. In the RS the use of briquettes is prevailing - 61%, oil 26%, coal 9% and wood 4%.

Totally for Lyaskovets the use is prevailing of fuels which are emitters of hazardous emissions in the atmospheric air - crude oil 64%, coal and briquettes 19%, light oil 16% (a total of 99%). The energy sources which do not pollute the air such as wood and propane-butane are a total of 1%.



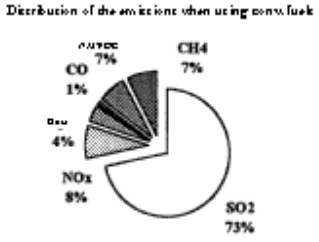
The next figure illustrates the capability of the different types of fuels to generate hazardous emissions. The fuel distribution shows that the fuels employed have an exceptionally high emission potential. This is unfavourable for all environmental components and for the living environment.

Based on the quantities of the fuels used, the "CORINE AIR" method was used for the determination of the emissions in the combustion processes in the power industry, in industry, and in heating in the residential sector (approved by the Ministry of Environment and Waters), the quantities of the hazardous emissions have been determined - Table 3.

Table 3. Composition of Emissions Depending on Fuels Used

Fuel	Emissions, t/year						
	SO_2	NOx	Dust	CO	NMVOC	CH_4	Total
Crude oil	426.27	66.61	20.76	8.64	1.11	1.11	524.50
Naphtha	39.46	6.24	4.69	0.81	9.94	9.94	71.08
Coal	27.52	0.43	1.72	0.056	0.056	0.86	31.45
Wood	0	0.65	0.029	0.086	2.43	1.62	4.81
LPG	0	0.011	0	0.002	0.00045	0.00045	0.014
Briquettes	179.2	5.6	11.2	0.73	56	56	308.73
Total	672.46	79.53	38.41	10.32	69.54	69.53	940.58

The total quantity of the separated emissions, as a statistical parameter, is 940.58 t/yr. The largest is the quantity of SO_2 - 73%, followed by hydrocarbons - 14%, NOx - 8%, dust - 4 % and CO - 1%. In this distribution of the fuels used, in type and quantities, the largest contribution to the atmospheric air pollution belongs to heavy oil - 55.8%, briquettes - 32.8%, light oil - 7.6. The lowest content of the separated mechanical compositions (ashes, dust) indicates that the reason for the dust content in Lyaskovets should be sought amongst the unorganized sources and the motorcar transport (secondary dust pollution).

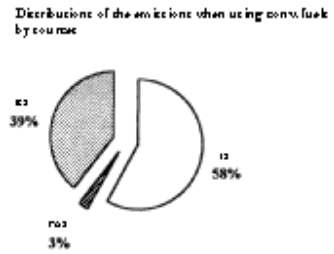


The effect of the individual sources on the composition of the emissions is illustrated in Table 4.

Table 4. Composition of emissions by sources, t/year

Source	SO_2	NOx	Dust	CO	NMVOC	CH_4	Total
IS	473.64	68.77	22.11	8.92	6.2	6.2	549.83
PAS	10.621	2.012	1.26	0.26	4.75	4.76	23.66
RS	224.2	8.75	15.03	1.14	59.39	58.58	367.09
Total	672.46	79.53	38.41	10.32	70.34	69.53	940.58

It can be seen that the contribution of the industry is the basic one - 58%, of PAS is 3%, and of RS is 39%. In this distribution of the fuels used, in type and quantities, therefore, the Industrial Zone appears to be the largest emitter of hazardous emission in the atmospheric air in Lyaskovets. Regardless of the fact that the PAS and RS contribution amounts to only 42%, their effect is intensified, due to the fact that the prevailing height of the buildings in the town is not big. The low height of the waste gas emission is a prerequisite for their superposition together with those of the unorganized sources (motor-car transport) and for their retention in the air close to the ground in the urban area.



Simulation of the emission distribution in space

In the evaluation of the atmospheric air quality, of particular importance is the distribution in space of the hazardous emissions, in order to outline the zones of unfavourable characteristics and their range. For the town of Lyaskovets this is of particular importance, due to the unavailability of information of immission measurements. Furthermore, by simulation, all sources are placed under equivalent energy conditions in respect of the usage of conventional fuels and natural gas. In this way alone can one prognosticate correctly any changes in the state of the atmospheric air when the liquid and solid fuels shall be replaced by natural gas.

For this purpose a stationary digital model was used for the calculation of environmental loading, caused by the basic point and area sources. In the model, data were introduced for their basic parameters: chimney height, diameter, t. degree C of gases, gas velocities, flow rate of gases, intensity of emissions. In order to identify the effect of the type of fuel used on the degree of pollution of the air near the ground, results have been presented from calculations of the summation field of air pollution caused by the basic organized sources in the territory of Lyaskovets.

An area, including the territory of the town of Lyaskovets, was selected of 2.0 by 3.0 km, in which a Cartesian co-ordination system was established commencing from the south-west corner. A network with step (x=500)/(y=500) m, in the points of which the pollution concentrations were calculated. In representing the fields, the isolines (contour lines) are drawn after interpolation between the points of the network. The fields close to the ground are given in mg/m3.

The mean monthly values of the air temperature, the quantity and duration of precipitation and the frequency of the wind in direction and velocity were used as meteorological information, also recording the percentage of quiet weather, determined on the basis of data from the previous year. The months of January and July were selected to represent the heating and the off-heating seasons.

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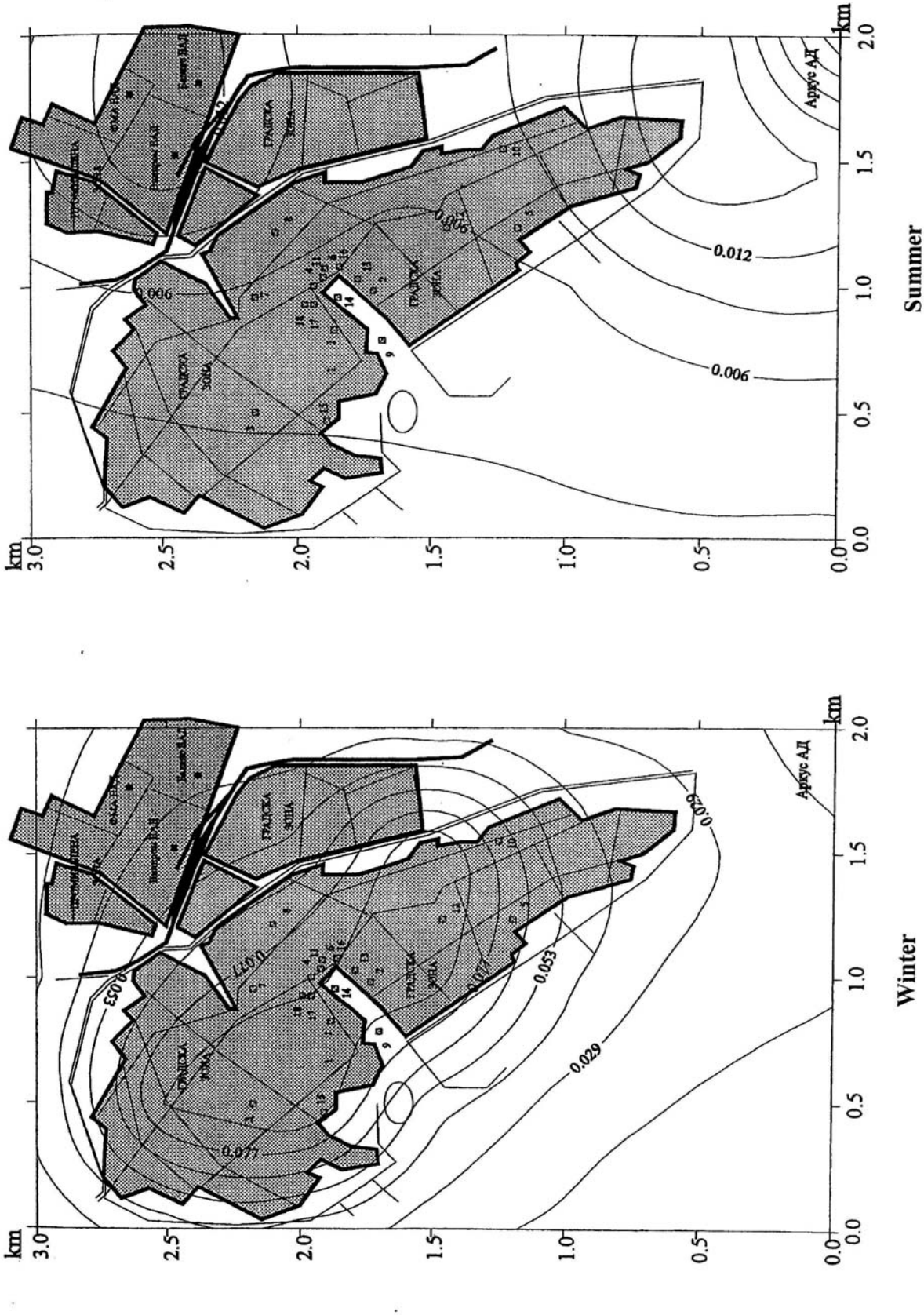

Fig. 10. The avarage monthly fiel concentration of SO2 in the air when using conv. fuels

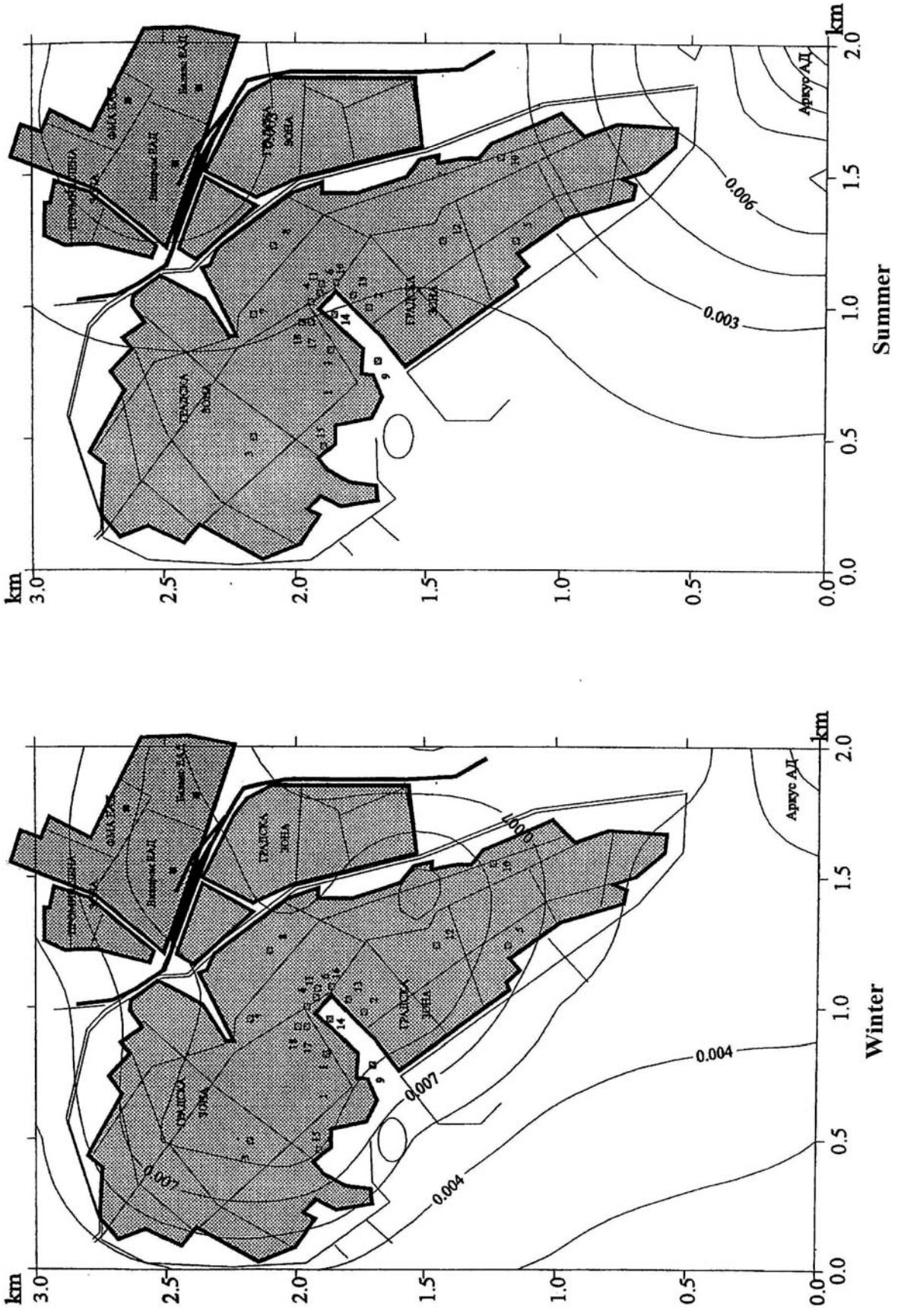

Fig. 11. The avarage monthly fiel concentration of NO2 in the air wnen using conv. fuels

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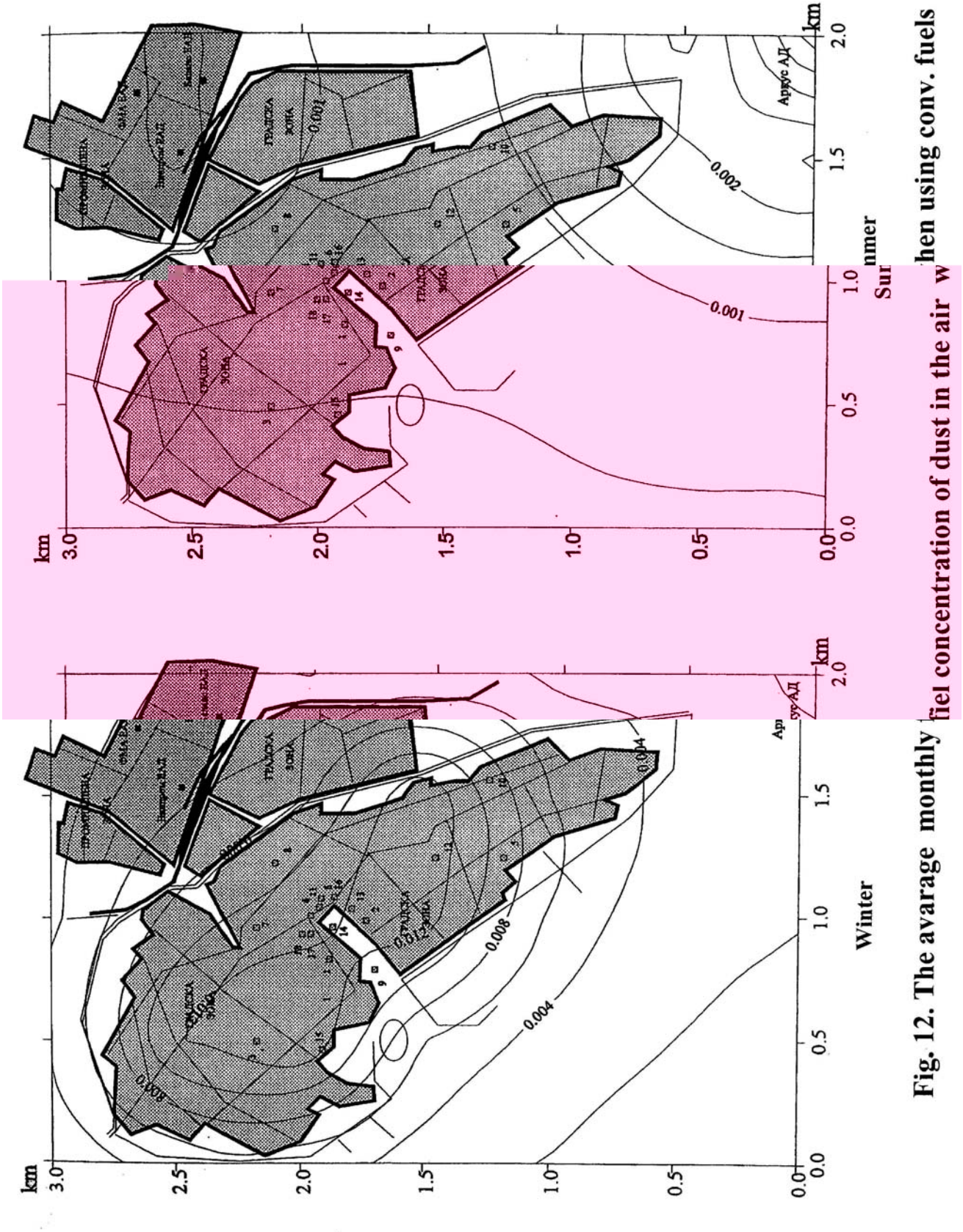

Fig. 12. The avarage monthly fiel concentration of dust in the air when using conv. fuels

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When liquid fuels (heavy and light oil) and solid fuels (coal, briquettes, wood) are used, sulphur dioxide, nitrogen oxides and dust are discharged in the atmosphere as basic pollutants, which are controlled with the provisions of Ordinance No. 14/1997. For each of these ingredients the average field of pollution for January and July was calculated (Fig. 10-13). The figures illustrate the zones of polluted air, their territorial range and the degree of pollution.

The 24-hour maximum quantities (MAQ) allowable, typical for the given month was used for commentary of the field of the mean monthly pollutant concentration produced. The EIS does not examine cases of extreme situation (salvo emission discharges).

Sulphur dioxide

During the heating season, the calculated concentration changes were within 0.007 to 0.1 mg/m^3 range. The maximum model concentration was 1.5 times under the MAQav.day (0.15 mg/m^3). The entire territory of Lyaskovets was bordered by an isoline 0.029 mg/m^3 (Fig. 10). The most heavily affected was the area of the urban part situated west of the road to the town of Elena, bordered by isoline 0,077 mg/m^3. The maximum model concentration includes a very small area in two points: in the centre of the northern urban area and the centre of the southern urban area. This shows the considerable effect of PAS and RS on the state of the air in winter. In the summer the model concentration was within 0.002-0.0017 mg/m^3, which is up to 8.8 times under the MAQ av.day. The affected zone is shifted in the Industrial Zone and in the area of ARKUS AD. This is due to the fact that in summer, PABS and RHS are not using conventional fuels, and ARKUS AD and Vinprom EAD are using fuels for technological needs. In winter the unfavourable zone of effect is larger, and in the summer it shrinks close to the sources. The seasonal SO_2 distribution indicates the high generation ability of the solid and liquid fuels used during the heating season.

Nitrogen dioxide

During the two seasons under examination, the model fields indicate NO_2 concentrations lower than the MAQav.day (0.1 mg/m^3) in an area, analogic to that for SO_2 (Fig. 11). In the month of January the maximum model concentration is 0.01 mg/m^3 (10 times under the MAQ), and in July is 0.05 mg/m^3 (20 times under MAQ). The zone of NO_2 air pollution in the winter is wider and more moved to western direction. In the summer it shrinks more around the industrial zone. In the winter the area of the central urban area is outlined as a centre of the zone, and in the summer two centres are observed: in the industrial zone and around ARKUS AD enterprise.

Dust (ashes)

As can be seen from the attached schemes (Fig. 12), the loading of air with inert pollutants, resulting from the simulated sources is not essential. The maximum concentration calculated during the winter is 0,014 mg/m^3 (18 times as low as the MAQ av.day - 0.25 mg/m^3), and in the summer - 0.0024 mg/m^3 (considerably under MAQ). The dust pollution distribution is over the entire territory of the town of Lyaskovets, but the highest values are the areas listed above. In winter this is the urban part, and in summer - the area in the vicinity of the ARKUS AD enterprise.

Based on the results of the state of the atmospheric air simulation in the area of Lyaskovets, under the effect of the present-state simulation, it was established that:

- the range of the effect was over the entire territory of the town;
- during the two seasons, the zones with unfavourable characteristics differ. In winter, the area, including the central town part, west of the road to the town of Elena is outlined as a centre of the zone of unfavourable characteristics for the atmospheric air. In summer months, the centres are the Industrial Zone and the area round the ARKUS AD enterprise;
- of the monitored indicators SO_2, NO_2 and dust, no concentrations above the standard are prognosticated. For SO_2 they are the closest to the MAQ av.day (up to

0.67 times the MAQ in winter) in the above mentioned hazards area. For NO_2 and dust, the prognosticated concentration are considerably under the MAQ av.day standard;

- the duration of the effect is long, within the framework of the heating season for the urban zone, and permanent in the IZ and the area of the ARKUS AD enterprise;
- the frequency of the effect is continuous, especially during the heating season;
- as the concentration of the model in using conventional fuels does not exceed the MAQ av.day, no cumulative effect can be expected.

2nd Hypothesis: Realization of the project (alternative hypothesis - natural gas)

With the implementation of the "Gasification of the town of Lyaskovets" project, the number of users, listed in the "zero hypothesis" is preserved, but only the type of fuel used in industry, in the administrative and communal services and the residential sector in Lyaskovets shall change. The solid and liquid fuels are replaced by natural gas, the generation capacity for the pollutants (emissions) is considerably lower.

By the introduction of natural gas as the energy source of Lyaskovets, the composition of the types of emissions, separated from the heating installations of the users shall change - practically no dust, ashes and SO_2 shall be separated; there shall be separation of NOx, CO (depending on the combustion processes), NMVOC, CH_4. Of them the determining character belongs solely to NOx.

After accounting for the trends of development of the town of Lyaskovets and the determined natural gas consumption (at 100% gasification), illustrated in Table 1, prognostication was made about the composition and the quantity of the hazardous substances emitted from the gasification user equipment (Table 2), pt. 3.1.3. The total amount of the emissions is 97.32 t/year, and in this respect, when conventional fuel is used amounting to 940.58 ton/year, this amount is reduced 9.7 times. The quantity of nitrogen oxides, which are a determining factor, is increased 1.05 times, NMVOC and CH_4 decrease considerably. CO is increased 1.06 times and the sulphur oxides, dust and ashes will be completely abolished.

According to the distribution of natural gas consumption in industry, in PAS and RS, total for the town of Lyaskovets, 13% of the emissions are separated during the summer months, and the remaining 87% during the heating period (in winter). It is noticeable that in the use also of conventional fuels and in their replacement by natural gas, the basic source of emissions is the Industrial Zone - 58-63%, and the share of PAS and RS is reduced to 37-42%.

Depending on the quality of the combustion process (complete or incomplete fuel combustion), CO and CO_2 is emitted in the atmosphere. The world practice has shown that in case of complete natural gas combustion only CO_2 is separated, which is not subject to standardization in our ecological legislation.

According to Ordinance No. 2/19.02.1998 of standards for admissible emissions (concentration in waste gases) of hazardous substances released in the atmosphere by immobile sources (State Gazette, No. 51/1988), Art. 22, para. 1 and Annexes Nos. 4-1 and 4-2, the standards of the emission, depending on the heating capacity of the heating equipment in burning gas fuel are given in Table 5, at 3 vol. % oxygen content in the flue gases.

Table 5

Thermal capacity	Dust mg/m^3	Sulphur oxides mg/m^3	Nitrogen oxides mg/m^3	CO mg/m^3
over 500 MV	10	35	350	100
100 - 500 MV	10	-	350	100
50 – 100 MV	10	-	350	100
0.5 - 50 MV	-	-	250	100

In the utilization of natural gas amounting to 20,204.10 6 nm^3/year and observing the above norms, up to 2.02 t/year CO shall be separated in the atmosphere, which is 2.1 times

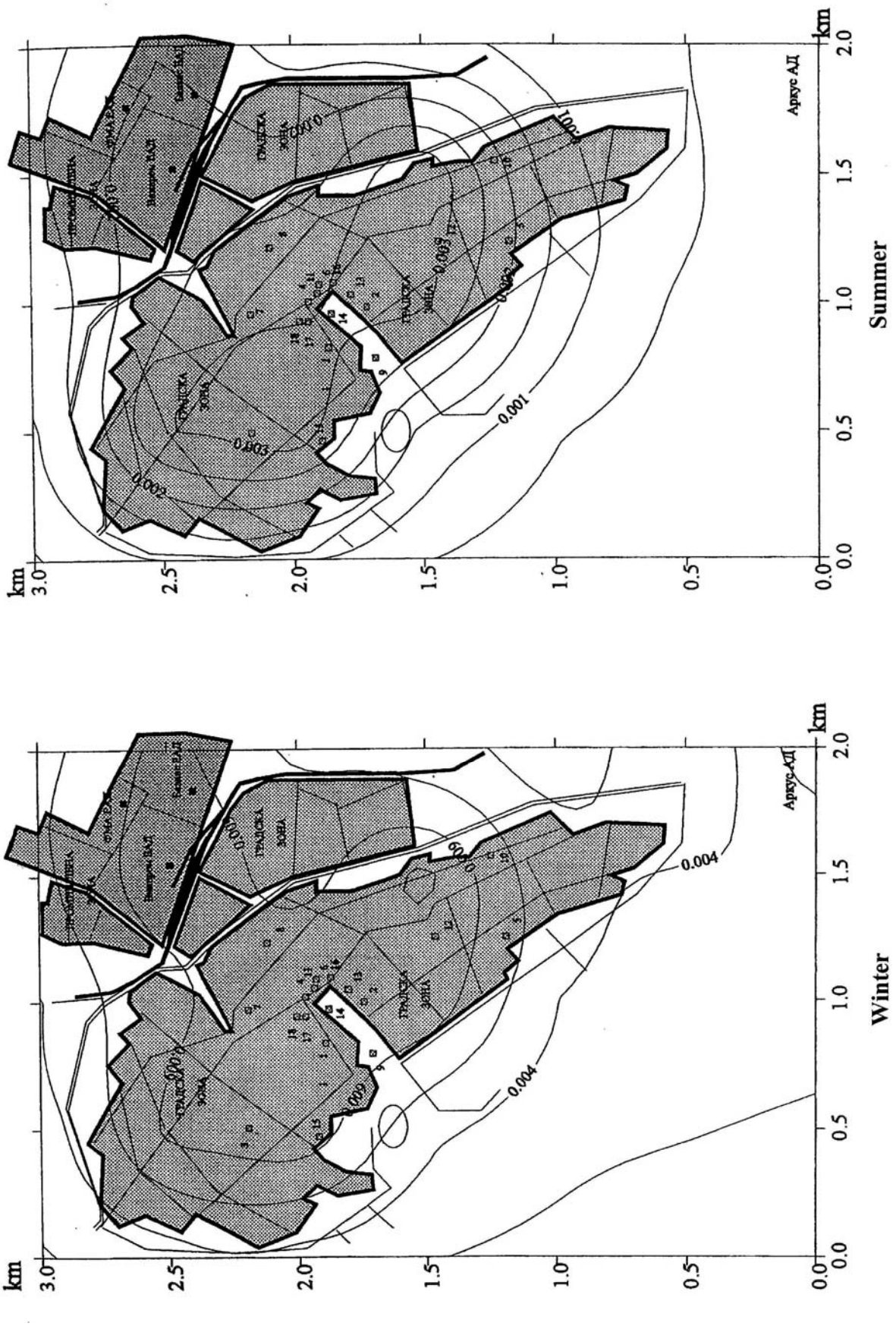

Fig. 13. The avarage monthly fiel concentration of NO2 in the air when using natural gas

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smaller than the CO in burning conventional fuels by users with the same thermal capacity. This shows the exceptional importance of the right regulation of the combustion processes. For consumers under 50 MW, as those in Lyaskovets, the quantities of nitrogen oxides would be only 50.5 t/year, which is 6.5 times lower than that when using conventional fuels by consumers having the same thermal capacity.

In using natural gas, all technical means of reducing the quantities of nitrogen oxides, known also in the conventional fuels, are applicable. At the same time technological solutions can also be used, such as:

- right operational regime - 15-20% reduction of nitrogen oxides;
- air feeding in stages - 15-30% reduction;
- torches with minimum generation of nitrogen oxides - 40-50% reduction;
- combined torches with feeding the fuel and air in stages - 75% reduction;
- catalytic reduction of nitrogen oxides (denitrification) - 50-80% reduction.

Based on simulation, the environmental loading is determined, caused by the basic point (organized) and area sources (town sections) in the town of Lyaskovets operating on natural gas (Alternative 2). When natural gas is used, nitrogen oxides are also emitted in the atmosphere as basic pollutants. Fig. 13 illustrates the zone with polluted air, their territorial range and the degree of pollution.

Nitrogen dioxide

When natural gas is used as fuel, certain increase of the level of pollution is noticed, which is also expressed in the fact that in January the maximum model concentration is 0.011 mg/m^3, which is 9 times under the MAQ av.day, and 1.1 times higher than that in the conventional fuels (Fig. 13). In the summer the extreme values of the model in this case are 0.0029 mg/m^3 - 34 times under MAQ av/day (1.9 times lower than those in the conventional fuels). It is also noted, that regardless of the insignificantly higher NO_2 values in using natural gas, in both seasons the MAQ av.day is not exceeded. In winter the affected zone is identical to that in the conventional fuels. In the summer months it is shifted in western direction and shrinks closer to the central town part. This is due to the fact, that in summer, in the RS, natural gas is used, and its effect is comparable to that of the IZ and ARKUS AD.

Sulphur dioxide

No sulphur dioxide is emitted when natural gas is used.

Dust (ashes)

No dust and ashes are emitted when natural gas is used.

Based on the results of the simulation of the state of the atmospheric air in the area of the town of Lyaskovets under the effect of the implementation of this project, it was established that:

- the range of the effect includes the entire town territory;
- in winter the degree of its effect is most strongly expressed in the area, described in the Zero Hypothesis. In summer the zone of its effect includes mainly the central town part, unlike when conventional fuels are fired, the effect of which is concentrated in the Industrial Zone;
- of the controlled indicators, SO_2 and dust are not separated, and for NO_2 no concentration above the standards is forecast;
- the continuation of the effect is long-lasting throughout the whole year, and its intensity is considerably higher during the heating season (87% of the effect);
- the frequency of the effect is permanent;
- as the model concentrations are considerably lower than MAQ av/day, no cumulative effect can be expected.

From the comparison between the two hypotheses it is seen, that with the implementation of the design the state of the atmospheric air shall be considerably improved. This will have an indirect bearing on all environmental components, but most sensitively it

shall be felt on the soils, the vegetation, the animal species and the human environment in the area of the town of Lyaskovets.

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

According to Art. 4 (1) of the Law for the Purity of the Atmospheric Air (State Gazette No. 45/1996), the basic indicators, characterizing the atmospheric air quality in the layer next to the ground are the concentrations of: particles (aerosols, fog, fumes, dust); sulphur dioxide; nitrogen dioxide; carbon monoxide; ozone; lead (aerosol).

According to Ordinance No. 14/23.09.1997 for MAQ standards for hazardous substances in the atmospheric air in urban areas (State Gazette, No. 88/1997), the standardized MAQs of the basic polluting substances are mean annual, mean 24-hour, and maximum single ones (Annex No. 1 to Art. 2, para. 1).

From the analysis made of the replacement of the solid and liquid fuels in industry, the administrative and communal services and residential sector in the town of Lyaskovets by natural gas, it is clearly seen that the total quantity of the emission separated is reduced by 9.7 times. The quantity if CO and the nitrogen oxides is increased 1.05 times, but the sulphur oxides, dust and ashes are completely removed. The separated hydrocarbons are also sensitively reduced. In case the DE standards are observed, the quantity of CO is insignificant as a result of the complete combustion in the natural gas-fired heating and energy installations.

During the heating system the average 24 hour concentration of the determining pollutant NO2 is 9 times under the MAQ av.day, and in summer 34 times under the MAQ av.day. In both cases these concentrations are prognosticated for a limited area. This is in compliance with the provisions of Ordinance N. 14/1997 and demonstrates the advantages of natural gas before the remaining types of fuels and the actual needs for the Design of Improving the Ecological Environment in the town of Lyaskovets,

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 having an effect on the formation and the state of the surface and ground waters in the area of the town of Lyaskovets are as follows:

Surface waters

The town of Lyaskovets is in the main valley of the Yantra River, which runs north of the town. The hydrographic and hydrological conditions are characterized by the following indicators:

Density of the river network 0.4-0.5 km/km^2.

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

The coefficient of variation of the surface run-off is 0.7-0.8, and the run-off coefficient 0.1.

The average duration of high waters is 7 months, the mean date for its occurrence being in December, and ending in June. The area is characterized by a rather unstable period of high waters. The volume of the run-off during the period of high waters is 60-70% of the annual runoff.

The average duration of the lower water period is 3-4 months (July-November). The run-off volume during the low waters period is up to 10% of the annual run-off. The time when the surface waters in the area of Yantra river run dry is 45-75 days annually.

The modulus of the absolute dry run-off is 0.3 l/s/km^2 and is characterized by variation coefficient 1.0-1.25. It appears around 1-10 September or 10 November, with fluctuations in July and October.

The average annual temperature of the river waters is 8-10 ^{0}C (April 10 ^{0}C; July 21 ^{0}C, October 12 ^{0}C).

The turbidity of the waters in the river run-off is 1000-2500 g/m^3, and the floating sediments are 100-500 t/km/annually.

The total amount of the dissolved salts is 300-400 mg/m^3 in the spring high waters, and 300-400 mg/m^3 in summer low waters. Their hardness is 8.4-12.6 degrees H in the high waters period, and 8.4-12.6 degrees H in the low water period.

The waters are not aggressive to concrete. In the area there are no natural lakes. According the hydrological mapping the surface waters are rain- and snow-fall supplied and having unstable phase run-off distribution under the effect of the European continental climatic conditions.

Ground waters

In the area between the town of Veliko Tarnovo and the Samovodene village the valley of the Yantra River has intruded into sandstones and limestones. The wide part of the valley between the Samovodene village and Draganovo village, where the town of Lyaskovets is situated, includes marls, covered by alluvial materials 5-7 m thick. The alluvial is formed of lower gravel layer 0.8 to 3 m thick, and upper sandy-clay layer over 4 m thick. Considering the deep striking of the ground waters in the territory of Lyaskovets it is 2.0-5.0 m.

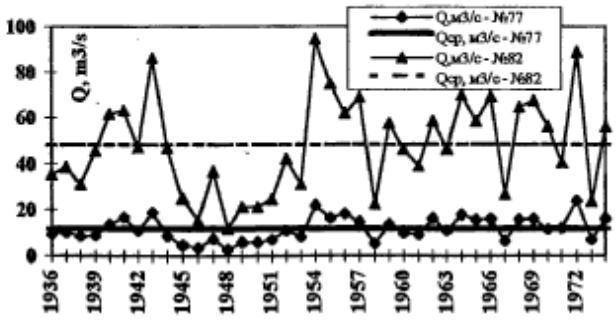
In the *alluvial deposits* gravitational ground waters are formed having direct hydraulic connection with the surface river waters - The Dryanovo gully. The regime of the levels of the ground waters, which is of "hydrologic" type, depends on the spring high waters, caused by the spring snow melting and of the autumn low-water period (September-October). By "general mineralization" the ground waters are classified as "fresh", by "general hardness" - as "soft", and by "predominant ionic composition" as "hydro-carbonate-sulphate-calcium-magnesium" type. The Pliocene clays serve as an impermeable layer of the alluvial ground waters. The aquifer layers are subjected to anthropologic effects. Close composition to that of the surface waters can be prognosticated due to their direct connection. The ground waters in the area of Gorna Oryavovitsa and Lyaskovets are used for potable water supply. Water intake equipment has been constructed with a total flow rate of over 80 l/s.

There are karst areas in close proximity to Lyaskovets, but there are no karst ground waters with deep circulation and thermal waters have not been established. Such are found north-west of the town in the area of Veliko Tarnovo and west in the area between Veliko 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 the town of Lyaskovets" project includes the entire territory of the town of Lyaskovets. The water resources in the area include the Yantra River and the ground waters in its terrace. It runs north of the town of Lyaskovets, in immediate proximity to the town of G. Oryahovitsa. In the town of Lyaskovets the collector of the surface waters is the Lyaskovets gully. The Yantra River is included in the hydrometeorological network of the National Institute of Meteorology and Hydrometeorology and the monitoring network of the National Centre of Environment and Resources - the Ministry of Environment

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



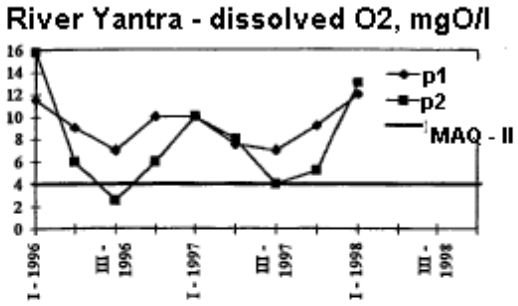
and Waters (NACEM), but in the area of G. Oryahovitsa and Lyaskovets there is the Hydrometeorological Service (HMS) and NACEM points. In this connection data are indicated for the quantitative characteristics of the Yantra River (basic water source and water intake in the area) in HMS No. 77 - Cholakovtsi, and HMS - No. 82 - Karantsi. The first one is upstream, and the second downstream, after Gorna Oryahovitsa and Lyaskovets. 55.7% of water intake area is afforested. Based on data from HMS No. 77, in the 1289 km^2 area of the water intake site, in a 40-year period, the mean many-year run-off is 11.9 m^3/s, the run-off modulus is 9.23 $l/s/km^2$; the run-off volumes amount to 375.3 mln m^3, the variation coefficient is 0.434. Based on data from HMS No. 82, for an area of water intake site of 6860 km, in a 40-year period, the annual many-year run-off is 48.2 m^3/s, the run-off module is 7.03 $l/s/km^2$, the run-off volumes amount to 1520 mln m^3, the variation coefficient is 0.434. The figure indicates the reflection curve of the natural run-off in the two points, compared with the mean many-year run-off. According to ECO for the HMS No. 77 - Q 50% = 11.5 m^3/s; Q 75% = 8.01 m^3/s; Q95% = 3.93 m^3/s. For HMS No. 82 - Q 50% = 46.5 m^3/s; Q 75% = 32.5 m^3/s; Q 95% = 16.0 m^3/s.

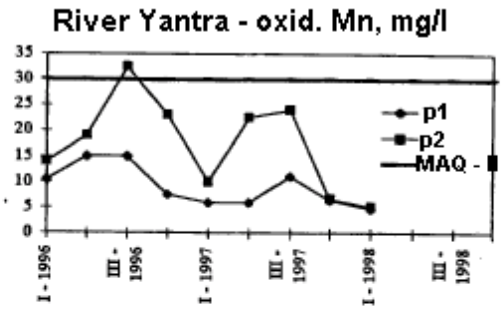
The Yantra river and its tributaries are the basic water source for the water supply of the urban areas in its upper course and for irrigation of the farmland near them. Its natural run-off to the said sites is disturbed due to many water catchments and pumping stations meant for irrigation. In that part of the river course, in the same period, also over 15 small dam reservoirs have been built with a total volume over 3.7 mln m^3. Near the town of Gabrovo the H. Smirnenski Dam was built, designed for water supply.

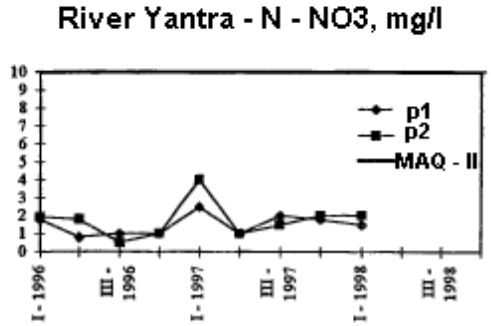
The qualitative characteristics of the course of the Yantra River, by basic indicators, upstream and downstream before and after Gorna Oryahovitsa and Lyaskovets - P1 - Samovodene village, P2 - Vurbitsa village are illustrated in the following figures. The quality of the waters in that sector is basically formed under the effect of the town of Gorna Oryahovitsa, but the outfall of the waters from the Lyaskovets gully is also in the same sector.

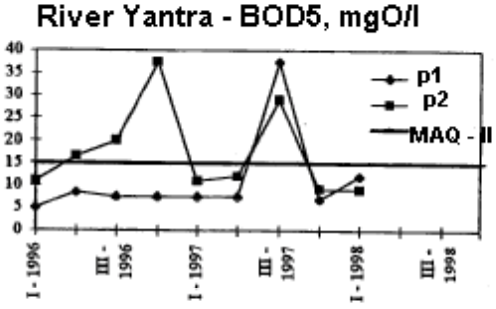
The waters of the Yantra River in the area of Gorna Oryahovitsa and Lyaskovets are both used for water supply, but only for irrigation of farmland and for drinking of cattle. The ground waters of its terrace are used for industrial water supply of Gorna Oryahovitsa, Lyaskovets and for potable water supply of the villages of Pisarevo, Vurbitsa, Dolna Oryahovitsa, Dobri Dyal and Kozarevets, with a population of about 10500 people. The town of Lyaskovets is supplied with potable water mainly from the "Yovkovtsi" Water Supply System, put in operation after 1982, having the Yovkovtsi reservoir as it basic water source. The waters are treated in a two-stage Water Treatment Station with a capacity of 2.5 m3/s.

The waste water intake from the residential area and industry in Lyaskovets is the Yantra River. The town of Lyaskovets has no waste water treatment station built. All waste









waters - industrial, residential waste waters and pluvial waters are discharged in the Lyaskovets gully, and thence- to the Yantra River, via a sewing system, which is of mixed type.

A Preliminary Design Study and CHRP (mechanical stage) for the Town Waste Water Treatment Station (TWWTS) with a capacity of 500920 m3/day was developed in 1988, to serve G. Oryahovitsa and Lyaskovets, situated in the area of the Kozarevets village. Civil works have not yet started. Over 60% of the sewing system has been built, with a degree of usability of 68%. The incoming collector for the TWWTS, 2000 m long, has not been started. The water intake in area is of 3rd category at the Samovodene village (upstream of G. Oryahovitsa and Lyaskovets) and 2nd category at the Vurbitsa village (downstream G. Oryahovitsa and Lyaskovets). Of the industrial enterprises in the town, the basic polluters are Vinprom EAD and Arkus AD.

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

The technological processes carried out in the "Gasification of the town of Lyaskovets" project consisting of: transportation, distribution, reduction and automatic maintenance of pressure in the gas transportation network, scrubbing and quantitative metering of the natural gas, are not related to any water consumption of water for industrial and potable needs, and are no source of waste waters.

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

In accordance with the technological scheme of the project and the technological processes carried out, listed in pt. 2.1 and the provisions of pt. 3.2.3 in the design no sources of pollution of the surface and the ground waters are envisaged and no waste waters, requiring treatment are released.

3.2.5. Technological flow chart of the water treatment and equipment (type, water treatment effect)

The "Gasification of the town of Lyaskovets" project is not aimed at establishing the effect on the water resources, and, in conjunction with pt. 3.2.4 it requires no water treatment equipment.

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 the town of Lyaskovets" project is not hydrotechnological and uses no water for technological needs, and does not, therefore, separate any waste waters and products polluting the surface and ground waters. In this aspect the implementation of the design shall have no bearing on the regime of the water flows and ground waters and no direct effect on the quality of the water resources and on the general state of the ecological water systems

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

Of the civil works related to the construction of the project the largest share belongs to earth works (excavation, filling) for laying the gas transportation network. Along the AGRS track to the regulation of the town of Lyaskovets they shall not have any negative effect on the surface waters, as along the track of the distribution pipeline there are no such waters. In the earth works on laying the town gas transportation network, temporary pollution

of the surface waters can be expected with soil depositions carried by the pluvial waters sewing system.

In the period of civil works the technology of the execution of the project shall provide for a minimum wet processes, related to the concrete laying of the GRP-Town, GRP-TS, SCU, Control Metering Column (CMC),and Electrochemical protection (ECP). The different types of building mortars are supplied from centres outside the project area. Pollution is possible due to the flowing pluvial waters, but the size of the sites is such, that it cannot have any effect on the quality of the surface waters.

Based on the prospecting drilling works it was established that the ground waters in the area of the gas pipeline tracks are found at a depth of more than 2.0 m. No ground waters flow in the civil engineering excavations is expected in the earth works along the street network.

The prognostication for the project effect on the surface and ground waters during carrying out the civil engineering works is local, in situ, with a lower degree of effect, in individual cases, during the period of civil engineering works, with a good chances for their restoration, and the lack of any cumulative effect.

Period of operation

The technological processes in the operation of "The Gasification of the town of Lyaskovets" project are not related to water consumption, no technological products are formed related to potential hazards of changing the regime and the quality of the surface and ground waters.

The implementation of the design, in agreement with its destination, shall have no effect on the regime of the surface and ground waters.

The effect of the project on the general state of the water ecological systems is exceptionally beneficial. The replacement of the now used solid and liquid fuels by the industrial enterprises and the population with natural gas shall eliminate any needs of the maintenance of large storage room, mechanical handling sites and no motor-car and railway transport servicing, the operation of which shall not involve any real conditions for the pollution of surface and ground waters with oil products, coal dust and other 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 any considerable effect

The implementation of "The gasification of the town of Lyaskovets" project shall not change the hydrological and hydrogeological conditions in the area of the town of Lyaskovets. An indirect positive effect can be expected on the state of the water intake by removing the need of storage room for conventional fuels, which are a potential source for the pollution of the surface and ground waters.

3.3. WASTES

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

The basic technological processes designed in "The gasification of the town of Lyaskovets" project, such as transportation and distribution of natural gas. regulation and maintenance of the pressure in the gas line network, scrubbing of the gas from mechanical impurities, odouring, measuring the parameters of the gas flow shall not generate any wastes. When natural gas is fired in the user heating system plants, no wastes shall be separated. In this respect the implementation of the design shall help the abolition of all wastes related to the use of solid and liquid fuels in the different sectors in the town of Lyaskovets.

In the construction of the project, the basic share belongs to laying of the gas distribution network underground along the town streets. According to the applied technology of the execution in the asphalt or asphalt-and-concrete street surfacing, the excavation has to take the form of the trenching works. In excavation works the street surfacing on the side of the trenches shall not be broken. The excavated material from the broken surfacing shall be shipped away and stored in a place indicated by the Employer and the local authorities in

advance. The excavated earth, fit for the refilling, depending on its location to the excavation works along the entire track, shall be piled up on a spoil heap on the side of the trenching. In the technical parameters of the project, therefore, building wastes can be expected (code 211414) to have a volume amounting to 3386 m^3.

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

The building wastes (unusable street surfacing material) shall be collected at the time of their excavation and shall be transported away to the place of their deposition.

3.3.3. Waste treatment before shipping it for final decontamination

The unfit for refilling street surfacing materials shall not be treated before their deposition in spoil heaps.

3.3.4. Waste storage

The town of Lyaskovets has two spoil heap storages which are in operation. The first one is the landfill in the area of the Cheremetya village (used together with the town of Veliko Tarnovo). It can take up annually about 4126 t. on an average of residential wastes. The second one is for building works wastes and is found at the Tanova Mogila locality (a former quarry of the town of Mizia) of an area of 0.182 decares. The waste depositing places are outside the boundaries of the territory treated in this design.

As it was mentioned above, the excavated material from the broken surfacing shall be deposited to a place indicated in advance by the Employer and the local authorities. It is possible to use the storage heap for building wastes of the town of Lyaskovets, or the building wastes may also be used for filling works in other civil engineering projects, old excavations or other planning works.

3.3.5. Other forms of decontamination

Other forms of rendering harmless the building wastes, apart their deposition in spoil heaps, are not envisaged.

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

"The gasification of the town of Lyaskovets" design does not envisage any wastes which may be handed over or exported for re-treatment, as well as such which shall be received or imported from other sources for treatment. At the same time, by the limitation of the use of coal and briquettes, the formation of cinders (code 11504), resulting from their firing, shall be avoided.

3.4. HAZARDOUS SUBSTANCES (based on UN classification)

3.4.1. Toxic substances - sources, toxical substances sources, toxical characteristics

In the civil works and the operation of "The gasification of the town of Lyaskovets" no use of toxic substances, according to the UN classification is envisaged, which may be environmental hazards and hazards for the living environment.

3.4.2. Other hazardous substances - sources, types, characteristics

The basic designation of the gas supply system of the town of Lyaskovets is to supply natural gas to the users. Natural gas possesses specific properties, such as fire risk, explosion risk and toxicity, which make it dangerous in case of wrong operation and in emergency situations. Its composition is described in pt. 2.3, and the characteristics of the potential hazards are examined in para. 4.2. In case of observance of the requirements of Ordinance No. 1/1991, Ordinance No. 3/1995, Ordinance No. 4/1995 and Ordinance No. 2 for the PSST disadvantageous properties of natural gas are reduced to a minimum.

When natural gas is fired in the user heating system equipment, certain hazardous emissions are released in the atmosphere, such as NOx and CO, the emissions and immisions of which are standardized by Ordinance No. 2/1998 for the emission allowance standards

(concentration in waste gases) of hazardous substances released in the atmosphere by stationary sources (State Gazette, No. 51/1998|, Art. 22, para. 1 and Annexes No. 4-1 and No. 4-2 and Ordinance No. 14/1997. In compliance with the assessment made and the prognostication in pt. 3.1, these pollutants can be classified as potentially dangerous.

3.5. HAZARDOUS PHYSICAL FACTORS

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

For the town of Lyaskovets the basic sources of noise loading and vibrations are the motor-car transport and the industrial enterprises. There is no data about any noise maps prepared for the town. The central part is restricted in space, with intensive traffic, and public and administrative buildings and residential buildings fitted in proximity to the street and road surfacing. This results in constant noise and vibrations loading of the buildings from the motor-car traffic. The terrain conditions do not allow the construction of special noise and vibrations protection equipment, and the only factor limiting the noxious effect is vegetation. In this part of the town it is insufficient, which makes it ineffective. The inner space between the building in the town section and their appurtenant pedestrian zones are less affected.

No sources of hazardous radiation have been established in Lyaskovets. No permanent or temporary centres have been opened in the said area by the National Automated System for Ecological Monitoring (NASEM) for measuring the radiation gamma background and non-ionization radiation. The intensity of the equivalent radiation background dose in the Central North Bulgaria (based on data from the Centre in Pleven) in 1997-1998 was 0.10-0.15 microSv/h, which meets with the average values established in the permanent centres establish in this country. No high pressure sources have been established in the town environment.

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

No sources of hazardous factors are expected in "The gasification of the town of Lyaskovets" design. The gas distribution network is laid underground. On the surface are fitted only the gas regulation points, equipped with instrumentation and automation for the monitoring and control of the technological processes. These are fitted in steel cabinets and are no source of noise and noxious radiation. The monitoring of the welding connections in the steel piping using the non-destructive method, is made in accordance with the requirements of Ordinance No. 0-31 for operation with radiation defectoscopes and Ordinance No. 0-35 for operation with radio active substances and other sources of ionization radiation.

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

During the construction works of the project, the basic source of hazardous physical factors, such as noise, vibrations and dust pollution is the constructional equipment machines working on earth works (excavation, filling, raw and other materials transportation) within the regulation plan of the town. In pt. 3.1.5, it is established that the emissions separated from the constructional machinery after their dissipation, meet the requirements of Ordinance No. 14/1997. The building works are to be made in succession in rather limited urban areas (street), and only after their complete completion they shall be moved to the next sector. In this connection, the territorial range of the dust and noise effects is localized: only within the territory of the project (considerably under the lowest degree of the criterion, which is 5 km) - quite small; the degree of its effect - insignificant; its duration - short-time; frequency - a single time during the period of its execution; reclaiming and restoration potential - yes; cumulative effect - no.

During the operation of the project no sources of hazardous physical factors are envisaged, and no effect whatsoever of such a type are 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

The soils have been formed under the effect of forest deciduous trees and grass. The sundry relief, the climate, the soil-formation rock, the vegetation and the remaining conditions for the soil formation determine the presence in the area of the town of Lyaskovets of the following natural soils of economic importance: Rendzinas (humus-carbonate) and Gray Wooded Soils. They are divided in areas by their identical origination, conditions of soil formation, similar physical and chemical properties, mechanical composition and similar agrotechnical and land improvement measures.

Rendzina (humus-carbonate) - The profile structure and the morphological characteristics of these soils to a great extend depend on the profile characteristics. In the low, accumulative relief forms, where weathering runs more intensively, the Rendzina soils have heavier mechanical composition, they are richer in re-deposited clay minerals and are saturated by a larger quantity of chemical elements. On the Quaternary river terraces, by their mechanical composition, the soils are light and medium sandy-clay, stony. The are formed on solid carbonate rocks under the effect of grassy vegetation. The profile of these soils is represented by horizon A of 12-20 cm thickness, limited by the solid rock. In places the surrounding rock emerges to the surface and breaks through the soil cover. The Rendzina soils are dark brown, skeletal, with well-expressed granular-crumb-like structure. The organic content is high - 5.5 - 7.0%. The carbonates are established in quite large quantities at the surface. The soil reaction is alkaline. They are not quite well deposited with general nitrogen (0.40%), and general phosphorus (0.23%), and are poorly productive.

Gray wooded soils - they cover the suburban hills to the west and the terrains east of Lyaskovets to the terrace of the Djulyunitsa river. This type of soil is characterised of a differentiated type. The pseudopodzol horizon is 20-40 cm thick. These soils are distinguished by very low natural fertility. The humus content is 1.0-1.5 to 2.5%. The quantity of the general nitrogen is 0.10-0.12%.

The design gas pipeline tracks cross a plain terrain, formed of Quaternary alluvial clays, sands and gravel. There are no physicgeological phenomena of the type of landslides, rockslides, erosion and others endangering the safety of the designed pipeline. The foundations of the gas lines and its appurtenant equipment can be executed in all the lithological varieties, with the exception of the soil layer. The area under study seismically belongs to magnitude I = VIII intensity, and seismic coefficient Kc = 0.15.

Disturbed land in the territory of the project and land adjacent to it

The entire gas distribution network, including the Gas Distribution Pipeline from AGRS to the town regulation boundaries is mounted under the street network in the town of Lyaskovets and outside it. Under the effect of urbanization and the intensive industrial activities in the area of the project, the soils have been transformed into *anthropogenous.* The normal interaction between the different ecosystems (soil - plant - water) is destroyed when hazardous substances or solid impurities enter the soil. Under such conditions the soils slowly, but progressively are exhausted, polluted and change in a negative way in comparison with their original states. The soils in the area of the project belong to the non-disturbed ones, i.e. they have normal morphological structure, but have deteriorated solid-formation process, due to the road surfacing. They are, above all, exhausted, and by the degree of expression of this trend they are medium-changed.

According to the "Annual Book for the Environmental Conditions in the Republic of Bulgaria", there are no soils polluted by heavy metals in the area of the town of Lyaskovets. In Decree of the Council of Ministers No. 50/State Gazette No. 24 of 26.03.1993 for accepting Ordinance for the Application of Art. 10, para. 10 of the Law for the Ownership and Utilization of Farmland, and Annex No. 1 to it.

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 listed in pt.1.2 and t. 2.1, the track of the Distribution Gas pipeline from AGRS to the town regulation boundaries of the town of Lyaskovets, about 2100 m long, is laid along the existing street and road network within the boundaries of the town of Lyaskovets. It does not affect any farmland or forests. The track has been determined by a Commission, appointed by Order No. 907/08.07.1998 of the Mayor of the Lyaskovets Municipality, by virtue of Art. 185, para. 2. Chapter IV, Section III, pt. 7 of the PPZTSU, and in conjunction with Art. 180, para. 11 and Art. 183 of PPZTSU (Annex - Minute of 01.10.1998).

In accordance with Ordinance No. 1 for the determination, co-ordination and approval of tracks and terrains for linear projects, and the law for the protection of arable land and pastures, Art. 56 (1) & (2), the track of the gas pipeline, 2100 m long, is not expropriated, as the pipeline is laid at a depth of min. 0,8 m > 0.7 m. Excavation works shall be executed in agreement with the provisions for the building and technical standards and ordinance No. 26 for the reclaiming of disturbed terrains, improving the poor productivity land and utilization of the humus layer. According to Section II, Art. 7 (1) for building works on land of categories I - VI, can be preformed only after removal of the humus layer. According to Art. 8 (3) for laying underground pipelines, the removed humus is used for land reclamation after their refill. A 10-m wide zone on both sides of the pipeline is envisaged, taken from the central line (a total of 20 m) for temporary storage of the removed humus soil and the soils excavated during the civil work. The depth of the humus layer after the reclamation shall be no less than 30-35 cm after compaction. As it was mentioned above, regardless of the selected option, the soil fertility shall not change, and only restricted regime of land usage shall be introduced.

Excavation works within the boundaries of regulation of the town of Lyaskovets shall be made basically along the street network. Wherein there are asphalt and asphalt-and-concrete surfacing, the excavation shall have the width of the trench. In excavation works the surfacing on the sides shall not be broken. The excavated material for the broken surfaces shall be transported away and deposited at a place specified in advance by the Employer and the Local Authorities. The soil fit for refilling, depending on the location of the excavation along the entire track, shall be piled up on the sides of the trenches. All excavation works shall be made under control for the observance of the design parameters, levels, distances from other engineering equipment and the safety technical requirements. After laying the piping, they shall be filled in 10-15 cm thick layers above the keying, and 20-50 cm above it, depending on the potentials of the construction machinery. When building and assembly works (BAW) are made in streets and pavements all defects that would appeal on the surfacing shall be mended at the expense of the organization carrying out the works in the project.

In the project, zones intersecting greenery area and vegetation, the grass and vegetation shall be removed and the soil is cut in at a depth of 0.2 m only in the witdh of the trenching. The uppermost humus layer shall be piled up separately and when the trenching is filled, it shall be used as a topmost, finishing layer. After the reclamation works, the humus layer should be no less than 30-35 cm thick after the compaction of the soil, in order to allow the replanting of the greenery vegetation.

The effect of building works on the soils is only local of low degree of effect, in a single occasion during the period of civil work, with the possibility for restoration and the lack of any cumulative effect.

Period of operation

During the operation of the project no unfavourable effect can be expected on the soils and the soil fertility. After building the Distribution Gas Pipeline from AGRS to the regulation boundaries of the town of Lyaskovets, in accord with the provisions of Degree No. 38/1977, the following limitations are regulated within its zone:

- the 10-m wide strips of arable land on both sides of the gas pipeline, which can be cultivated, shall be sown with annual crops at cultivation depth of 30 cm;

- planting of orchards and similar plants, the trees of which have well developed root systems is banned of a distance at least 10 m from both sides of the pipeline;
- starting of fires and burning of the fields after the collection of the farm crops is not allowed at a distance 20 m away from the gas pipeline, and 30 m from the stop cock equipment and the plugs.

The replacement of the conventional fuels by natural gas shall completely abolish any sulphur oxides and dust, which is quite favourable for the state of the soils in the zone around the Project, the removal of dust depositing shall reduce any secondary dust formation and soiling of the surface layer with anthropogenous products. At the same time there shall be no longer any need of storage facilities and transport used for the supply of traditional fuels which are a source of soil pollution with oil 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 forming the Sub-Balkan morphostructural zone are presented by old vulcanogenous and sedimentation rocks known by the name of diabasephillitoid formation, Pleozoic granitoids, dyke rocks, conglomerates, sandstones, limestones and dolomites of different facies and age. In the middle region of the zone in the area of Lyaskovets, fused sedimentation rocks (Lower Cretaceous limestones, marls, sandy limestones, sandstones), unfused rocks (Quaternary materials: sands, clays, loess and alluvial deposits) - erosion-resistant. The Pliocene sediments are represented by sands and clays and occupy large areas of the river valleys. Loess occupies practically all plains in the zone. It is developed like loess-like depositions up to 1-5 m depth. The alluvial depositions are made of boulders, sands and clays of crossed deposition. Their thickness is the greatest in the river valleys - up to 8-12 m. They are not fused and are rich in ground waters.

Engineering-geological and hydrogeological characteristics of the town of Lyaskovets

Based on the geologo-lithological structure, the hydrogeological conditions and the physico-geological processes manifested in the town of Lyaskovets, the sediments of the Pliocene and Quaternary are prevailing:

Quaternary: it is represented by brown sandy clays, variegate, grayish-whitish and grayish-beige, silty-sandy clays with carbonate small size gravel, dark gray to red clay - eluvial , alternating with lighter delulvial intercalations. In the lower part of the town of Lyaskovets (around the Lyaskovets gully) the Quaternary is represented by alluvial depositions - gravel with sandy filler of average 3-4 m thickness. The total depth of the Quaternary Complex varies in wide ranges, but is from 5-7 m. The level of the ground waters in the area is established at a depth of 2 m from the ground level.

Pliocene: it is represented by the characteristic clay marls, which in their upper part are greatly weathered and in places transit into great-bluish marl clays. The Pliocene sediments serve as lower impermeable layer for the accumulated ground waters.

The construction and the operation of the project is not related to any changes of the geological base and the relief in the area of the town of Lyaskovets.

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

As with the implementation of the project in laying the gas transportation network at a depth of 0.8 - 1.0 m from ground level, the geological base does not change, and no effect can be expected on the existing buildings and projects in the area of the town of Lyaskovets, as well as to the environmental components, directly related to it.

3.7.2.Ground natural resources

The implementation of the "Gasification of the town of Lyaskovets" project is not related to any mining of underground natural resources. The natural gas, as an underground natural resource, is produced outside the boundaries of the Republic of Bulgaria.

3.8. FLORA AND FAUNA, PROTECTED TERRITORIES OF NATURE

3.8.1. Characteristics of the present state and forecasts and assessment 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 relief of soils in the vicinities of the town of Lyaskovets form specific conditions for the growth of different type of plants in the locus.

Natural vegetation

The town of Lyaskovets is situated in the Central part of the Danubian Plain. The territories around the town are occupied by farmland formed in lieu of mixed forests of oak (Quercus cerris) and Q. frainetto Ten. In the territories west of the town, mesoxerothermal grass-type vegetation occurs, with predominant Op grass, pasture ryegrass (Lolium perenne| and couch-grass (Synodon dactykon), in places with bellflower.

Crops

The vegetation in the town zone is of park-type - grass area sown with ryegrass and street greenery, represented mainly by the tree species: horse chestnut, birch, lime-tree, poplar, silver and common spruce, etc. According to the General Town Plan, the public greenery areas in the town territory come to 7.64 ha and form 3.89% of the total town area. Lyaskovets is an agricultural region with developed vegetable and vineyard production In the farmland areas in the suburban area there are vineyards, annual grain and fodder crops and different vegetables, grown, depending on the situation in the markets.

The track of the Distribution Gas Pipeline from AGRS to the regulation boundaries of the town of Lyaskovets does not affect and perennial crops, farmland and forestland.

The construction of the project shall have temporary adverse effect on the existing vegetation in the town greenery areas. The tracks of the gas pipelines shall not affect the perennial crops. According to Ordinance No. 1/10.03.1993 of the Ministry of Territorial Construction for the protection of greenery areas and decorative plantation, Art. 9, para, 10, the Employer shall restore any damages incurred at his own expense. When decorative plantation in the greener areas is restored, sowing of trees having deep root systems is not allowed in the zone of the gas pipeline.

The operation of the project is not related to any unfavourable effect on the natural and cultivated vegetable species in the area of the town of Lyaskovets. The basic technological processes shall have no direct and indirect effect on vegetation. Solely the plantation of perennial vegetation species having deep root system is not allowed in the zone of the gas pipelines, in conjunction with the provisions of Decree No. 38 for the safety of the gas supply system.

Out of the emissions separated from the user natural gas-fired heating system equipment only the nitrogen oxides are determining. The maximum NO_2 concentration emitted from the user heating system equipment is within 0.11 times the MAQ av.day (Ordinance No. 14/1997), during the heating season and 0.03 times MAQ av.day. The range of this effect is over a limited area of the Town Zone. In the remaining part of Lyaskovets its effect is considerably under the MAQ av. day. This determines its effect on the town vegetation as insignificant.

In this connection the project impact on the flora can be assessed as local by territorial range; insignificant in degree of effect; short-time during the time of construction; single occurring; having the potentials of restoration; having no cumulative effect.

The designation of the project, related to the replacement of solid and liquid fuels by natural gas shall improve the quality of the atmospheric air, expressed in the elimination of sulphur oxides and inert particles (dust, ashes). This shall have an exceptionally favourable effect on the greenery areas in the town part and the vegetation in the suburban zones.

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

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Birds are represented by several basic groups: Corvidae, Mothacillidae, Emberizide, and others. In the near locus representative are also met of the Colubidae, Hirundinidae, kite (Faslco tinunculus), house sparrow, and others.

Mammalian: in the locus near the town, mainly small mammalian and muridae rodent, hare, foxes and other animals typical for the climatic conditions and the altitudes above the sea level, are found.

The construction and operation of the project is not related to any unfavorable effect on the natural and cultivated animal species in the area of the town of Lyaskovets,

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

In the territory of the project there are no natural projects registered and protected territories.

3.9 LANDSCAPE

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

All the environmental components are also elements of the landscape and form an interconnected and determined unity. The hierarchic ladder of the components of the landscape is: geological structure - lithology - relief - climate - waters - soils - vegetation - animal life. The landscapes are either transformed or cultural, subjected, to some or other degree, to the anthropologic effect.

By their quantitative and qualitative indicators and criteria the landscape system is divided into landscape subsystems and landscape areas. Some of the determined conventional boundaries overlap the boundaries of the physico-geographical regions, subregions and areas. Lyaskovets is located in the Balkan Mountain landscape subsystem (II), covering, in the said conventional boundaries, a territory of 23660 km^2 (forming 21.4% of the country's territory), a medium-sized Forebalkan Landscape area (II2) with a territorial size of 5869 km^2. According to the typological landscape zoning the area of the town of Lyaskovets includes the following types of landscapes: agro-landscapes - 68% of its territory; forest landscape - 6% of its territory; anthropogenous landscapes - 26% of its territory.

The relief of the area of the town of Lyaskovets is plain-type and hilly. It falls within the transition between the Danubian morphostructural zone - middle region and the Fore-Balkan morphostructural zone - middle region, but formally it belongs to the second one. Low mountainous relief is prevailing, the mountain hills are developed parallel to the Balkan Mountain Range. In the relief the anticlinal and the monoclinal elevations and synclinal valleys are predominant. A great part of the gorges are tectonically determined. The Fore-Balkan is formed basically of limestone rocks with prevailing normal folds. The low-mountainous relief is related to normal plicated structures. The average height above sea level of the zone is 364 m. The hilly belt occupies 89.6% (114390 km^2), the mountain crests of 600-12500 m height occupy the remaining 10.4%. The valley network is developed in grated form. The valley asymmetry has local distribution. Along the river valleys there is strong soil erosion, due to the relief characteristics, the height above sea level, the rock substrate, the exposition and the inclination of the slopes.

The project is situated in an anthropogenous landscape - the urban medium of the town of Lyaskovets, which is suitable for the materialization of the objectives of the design without changing the structure and the functioning of the landscape.

The construction and the operation of the project shall have no effect on the landscape and shall not change its classification.

3.9.2. Analysis and assessment of the landscape pollution migration

The specificity of the technological processes of the "Gasification of the town of Lyaskovets" project is not related to any release of environmental hazardous emissions. Pt. 3.1.5 explains in greater detail the contribution of the natural gas consumers to the atmospheric air pollution. Nitrogen oxides being the priority pollutants. The migration range is within the anthropogenous landscape (Fig. 13). The effect intensity is low - considerably under the MAQ av. day, according to Ordinance N. 14/1997. Under the worst conditions in quiet weather, the centre of the effect is within the area of the Central Urban Part. At over 2.0 mm/s velocity of the wind and westerly prevailing strong winds, the pollutants are shifted to an easterly direction wherein the Industrial Zone of Lyaskovets is located, followed by agro-landscapes. The pollutant migrations is airborne, of low intensity and has no effect in the landscape structure and functions.

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

The implementation of the project shall completely eliminate the sulphur oxides and dust resulting from the combustion of the conventional fuels and the wastes related to this. The total amount of emissions is reduced by 9.7 times. This is exceptionally favourable for the self-purification and self-restoration of landscapes, the more so that by the introduction of natural gas as energy source, the anthropogenous loading shall considerably reduce, and shall be within the standards.

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

The construction and the operation of the project shall not change the classification of the landscape, its structure and functional characteristics.

3.10. CULTURAL HERITAGE

3.10.1 Availability of historical, archaeological and architectural monuments

The town of Lyaskovets has been known since the 15th century. The town is an agricultural centre, specialized in vegetable production and viticulture.

By decision of the National institute of the Monuments of Culture, 120 architectural and historical monuments of culture have been declared on the territory of the town of Lyaskovets. More well known amongst them are: The Market-gardening Museum, a Picture Gallery, houses and churches during the Bulgarian Renaissance, The Lyaskovets St Peter and Paul Monastery of the 12th century, and others.

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

The construction and operation of the project shall not affect the cultural and historical heritage of the town of Lyaskovets. The abolition of the sulphur oxides and dust shall form better conditions for the preservation of the 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 Lyaskovets" project includes the entire territory of the town. In this aspect, the whole population of Lyaskovets is subjected to the effect of emissions released in the combustion of natural gas in the user heating system equipment. This effect is specified in pt. 3.1 as insignificant and within the requirements of Ordinance No. 14/1997. The location of the project and the activities performed in it are not in contradiction with the provisions of Ordinance No. 21/1990, Art. 7, pt. 5 for the protection

zone around the AGRS 9100 m from the boundary of the project, and annex 6 to Art. 26 for the minimum distance between the AGRS and urban areas, industrial enterprises and other structures (max 100 m). In the protected zone no activities are allowed as listed in Art. 4 of Decree No. 38/1977 and are allowed activities, provided for in Art. 3 and Art. 5 of the same Decree. GRP, which are built in the distribution gas pipelines in urban areas and in the territory of physical and legal persons shall conform to the requirements of Chapter 4, section I, of Art. 67 to Art. 83 of Ordinance No. 21/1990. The project is not also in contradiction with the maximum allowable levels of sound pressure in the different territories and urban areas (State Gazette, No. 16/1975). The emission released in the air in the construction and operation of the project shall not exceed those entered in Ordinance No. 14/23/09.1997 for the MAQ of hazardous substances in the atmospheric air in urban areas (State Gazette, No. 88/1997). The temporary deposition heaps from the excavated soil and humus shall be reclaimed. The broken street surfacing and greenery shall be restored. The operation of the project is not related to the consumption of natural resources and do not release waste waters and wastes requiring treatment and deposition.

The health and hygienic conditions of the living environment shall be improved with the elimination of the noxious sulphur oxide and dust deposition.

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

Natural gas is alternating in composition (basically of its sulphur content). It is nearly twice lighter than air, which predetermines its retention in the upper parts of closed premises unlike the propane-butane gas. At outdoor sites and their microdepressions it is not retained. Natural gas has no smell. In industry no odouring is made, and its presence is established by means of a gas-analyzer. In the public buildings and residentially it is mandatory that natural gas should be subjected to odouring. It is felt in the air at up to 1% concentrations. Natural gas is fired in the form of gas-and-air mixture. The ignition temperature is 650 ^{0}C, and the time for its ignition at that temperature comes to 10 sec. At t = 1000 ^{0}C it is 1 sec, and at 2000 ^{0}C it is instant. The explosion concentration is 5-15 vol.% to air. Explosion occurs in case of availability of gas-and-air mixture in explosive concentration; the source of ignition is the required temperature; opportunity for forming pressure. The building structures are destroyed at explosion wave pressures exceeding 0.035 MPa. The toxicity of the natural gas is bound with the content of methane. In case of oxygen content of the gas-and-air mixture under 20% difficulties of respiration occur, and lethal is an oxygen content under 12 vol.%.

4.3. Characteristics 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 that occur at the "Gasification of the town of Lyaskovets" project, are not related to harmful effect on human health in case of TBT observance, as the tubular network is underground, and the gas regulation points are in the open air. According to the requirements of Ordinance No. 21/1991 all indoor premises in which gas equipment is found, shall be equipped with vents or forced ventilation, ensuring the necessary air exchange, as well as facilities for discharging the combustion products in the atmosphere. The instrumentation and automation envisaged shall reduce to a minimum any chance of emergency situations related to any adverse effect on human health.

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

In conjunction with pt. 4.3, no complex and cumulative effect of the potential factors can be expected.

4.5. Exposure characteristics

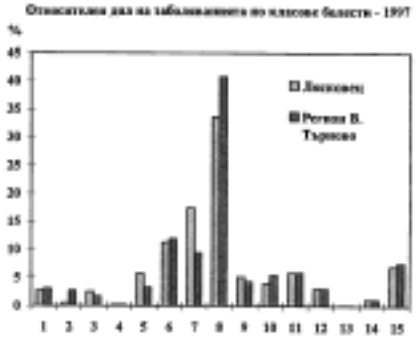
The technological processes taking place in the gas supply network of the town of Lyaskovets are not a source of hazardous emissions, requiring analysis of their exposure. In the replacement of conventional fuels with natural gas, the character of the exposure is

preserved, regarded as a range, duration and intensity in pt. 3.1, but with the removal of the noxious sulphur oxides and inert pollutants, the health and hygienic conditions of the living and working environment in Lyaskovets shall be improved.

4.6. Health condition of the affected population

The morbidity of the population in the town of Lyaskovets is formed under the effect of the labour, living, environmental and social media.

The distribution of the registered diseases in the town of Lyaskovets and the Veliko Tarnovo Region, by class of diseases and the relative share in classes for the year 1997 is submitted according to information supplied from the District Health Centre in Veliko Tarnovo.



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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 the town of Lyaskovets the largest is the share of diseases of the respiratory system (33.70%), followed by the blood circulation organ diseases (17.45%), diseases of the nervous system and the sensory organs (11.29%), skin and subcutaneous tissue diseases (5.80%) and others.

The relative share of the respiratory system diseases in the municipality is smaller than that in the Veliko Tarnovo region (40.75%). It is noticeable that the share of the blood circulation organs diseases (17.45%) and endocrine gland diseases, or digestion and immunity disturbances (2.45%) in the town of Lyaskovets considerably increases that in the Veliko Tarnovo region - blood circulation diseases (9.43%), endocrine gland diseases, of digestion and immunity disorders (1.6%).

The diseases of the respiratory system among the children and adult population have correlation connection to the air pollution with dust and sulphur gases, released basically when conventional fuels as energy sources are used. Children are the most affected people. In 1997, the registered respiratory system diseases among children of the 0-17-year age group is 1.81 times higher than that of the adults.

The same pollutants, due to their irritation effect, demonstrate a reliable relation to the inflammatory eye and skin diseases,

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

The elimination of pollutants such as dust and sulphur dioxide and the reduction of the quantity of the hazardous substances released in the atmosphere shall bring about an improvement of the health and hygienic conditions, of the living and working environment in the town of Lyaskovets.

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

1. Methods for the determination of the emissions in the combustion processes in the power industry, the industry, heating in the residential sector and from the technological processes, approved by the Minister of the Environment, 1992, extended and supplemented in 1994, included in the List of Existing Methods for the Assessment and Prognostication of the Effect on the Environment.
2. PLUME models - for the calculation and gases and aerosol dispersal - included in the List of the Existing Methods for the Assessment and Prognostication of the Effect of Environment - MoEW publication, p. 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 No. RD-00-11/1994 of the Ministry of Agriculture for the determination of the type and degree of pollution of agricultural land within the boundaries of urban areas and their usage - Bulletin of Ministry of Agriculture, 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 Lyaskovets" project as location, technical potentials and capacity has no alternative. So far as the technical implementation of the gas supply network, three basic ways are possible: interconnected, branching and mixed network, executed of steel or PE-HD piping. The equipment involved in carrying out the technological processes in the gas supply network, such as AGRS, GRP, GRMP, SCU, gas metering boards, etc. are standard and can be supplied by well-known companies, and accompanied with certificates for their fitness.

The feasibility study phase examines and compares three basic alternatives for the implementation of the design:

- 1st Alternative: two-stage pressure regulation - 12/0.1 bar. By means of Distribution Gas Lines (DGL) (steel, 12 bar, 7712 m long), commencing at AGRS supplying all users in the industrial sector, and No. 3 GRP (TS) where the pressure is reduced to 100 mbar. The town and the town section networks are merged in a common low-pressure network (100 mbar), commencing at GRP Town Sector) and covering all users. It is 26142 m long of PE-HD (polyethylene). The Distribution Gas Line (DGL) network shall be laid underground, in its greater part along the street and road network of Lyaskovets. The distribution network is of ring-type, which improves its safety and reliability.
- 2nd Alternative: two-stage pressure regulation - 12/4 bar. By means of DLG (steel type, 12 bar, 7028 m long, commencing from AGRS, shall supply the industry users, and No. 1 GRP (Town) where pressure is reduced to 4 bar. From GRP (T) commences the town distribution network of medium pressure (4 bar) which shall supply the users in the Public and Administrative Buildings Sector (PAS) and the

Residential Housing Sector (RS). It shall be made of PE-HD, 25131 m long. The Town Section distribution network is of antenna type, formed of 34 antennae.

Due to its advantages the first alternative was chosen enabling: the ensuring of the consumption, extension of the network without changing the diameter of the gas lines, multiplication in the constructional works, and smaller initial investments. The inner technical council of OVERGAS Inc. AD approved it as authentic for working designing. On the basis of this Authentic Design, the documentation for the approval of the tracks of the gas pipeline network was prepared by the Architectural and Town Planning Commission (ATPC) of the Lyaskovets Municipality. The DLG track from AGRS to the town regulation border of the town of Lyaskovets and inside it was approved by the ATPC of the Lyaskovets Municipality. (Annex).

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

The three alternatives for the implementation of the design have different technical characteristics, but they are not alternatives concerning the effect on the environmental components. As it was mentioned before, the basic objective of the design is the replacement of the conventional energy sources with natural gas. In this connection, in the three alternatives, the number of the users, the quantity of the replaced fuels, as well as the consumption of the natural gas are the same. In pt. 3.1.5, comparison is made on the environment effect of the "zero alternative" (existing situation), and the authentic alternative for the implementation of the project. The assessment and the prognostication made are made at full loading and capacity of the combustion installations and equipment, both fired by liquid and solid fuels, and also by natural gas. During the civil works certain changes in some of the elements of the design are possible, but that should not be regarded as an alternative of its main scheme and shall not change the statements and conclusions already made in the EIS about the positive effect on the environmental components.

From the analysis made of the replacement of solid and liquid fuels in industry, in the administrative and communal service buildings and the residential sector of the town of Lyaskovets one can see that the total amount of the released emissions is reduced by 9.7 times. The emission of sulphur oxides, dust and ashes from the organized sources is terminated at nearly 100%. The amount of nitrogen oxides grows by 1.05 times, but the simulation made of their dissipation indicates that the maximum concentration allowances shall not be exceeded. When the standards for the allowable emission (AE) are observed, the quantities of CO is insignificant as a result of the complete combustion in the natural gas-fired heating and energy installations and equipment. This demonstrates the advantages of the natural gas before the remaining types of fuels and the reliability of the design for improving the ecological situation in the town of Lyaskovets.

The assessment made categorically proves the insignificant effect and the positive results in the environmental and human health components, due to the replacement of the conventional fuels used with natural gas, and determines the designation of the project as ecological and social. Based on the present-day prognostication methods, on the basis of mathematical statistics, the probability and digital modelling in accounting for the trends of the development of the town of Lyaskovets, the validity of the prognostication was reliably determined, regardless of the change of some specific technical solutions which would occur during the time of construction.

Having all said above in mind, one can positively allege that under the geographical situation, the climatic, natural, social and economical conditions, determining the present state of the environmental components, by its designation, the "Gasification of the town of Lyaskovets" project has no alternative.

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 two alternatives examined for the implementation of the project are not alternative to each other so far as their environmental effect is concerned, but they have different feasibility indicators, safety and reliability of the gas transportation and supply. The rejected alternatives have lower complex assessment.

7. MEASURES FOR THE REDUCTION OF ANY NEGATIVE CONSEQUENCES

The implementation of the project is not related to any unfavourable effect on the environmental components which may result in lasting and irrevocable damages.

In order to reduce the quantities of the nitrogen oxides and carbon monoxide, released during the combustion of natural gas, it is necessary to maintain high quality of the combustion processes and observe the limitations listed in pt. 4.1 [Standards for allowable emissions (concentration in waste gases) of hazardous emissions released in the atmosphere) (State Gazette, No. 81/1991), Art. 20, paras, 1,2,3,4)].

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

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

Any possible emergency situation in the Gas Supplying Systems are related to the risk of uncontrolled gas release, resulting in the formation of fire- or explosion-risky concentrations. Pt. 2.1 examines the basic physico-chemical properties of natural gas and analysis is made of the different types of potential dangers in case of emergency situations.

The experience in countries with developed urban gas supply has shown that the frequent reason for emergencies or salvo natural gas releases is the piercing or breaking of the gas pipelines. The reason being defects of the butt welding seams in assembly works, or factory-made seams, defects in the basic metal of the pipes due to laminations in the metal, non-metallic inclusions, deep injury or corrosion. A reason can also be the inadmissible increase in the pressure, or external involvement - a blow caused by an earth-moving machine or any other mechanism.

If there is an outdoor gas leakage there is no danger of explosion, as the gas is lighter than air and is dissipated in the atmosphere. When the gas leaks are small, there is danger of gas concentration in closed premises. An explosion risk can be formed only in closed premises when explosion-risk concentrations, listed in pt. 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 the normative documents, regulating the design, construction, acceptance and operation of the gas supply systems are observed, such as: Ordinance No. 3 for the design of systems of the gas supply of urban areas and gas installations and equipment in buildings operating on natural gas; Ordinance No. 21 for the design and safety operation of the gas equipment and installations; Ordinance No. 4 for monitoring and acceptance of gas supply systems in urban areas and gas installations in buildings; Ordinance No. 2/1987 for the PSTN, Regulations for the design of electrical equipment, 1981, BSS 15704 - Corrosion Protection. Equipment metal, underground. General Technical Requirements, BSS 15705-83 - Corrosion Protection, equipment, underground, metal. Methods of measuring and supervision.

All processes in the gas supply system of the town of Lyaskovets are automated, equipped with the necessary instrumentation, information and communication network. The necessary measures are envisaged for lightning protection and earthing of the equipment. As an example, one can indicate the automatic operation of the regulation lines in GRS, wherein any raising of the initial pressure (e.g. switching off of a large-size user), and inability of the basic regulator to react due to some reason in the supply of 1.1 Pout pressure, the monitor starts up. If for some reason the monitor also fails to reduce the pressure, at 1.25 Pout the

safety valve releases gas in the atmosphere through the plug. If pressure reaches 1.3 Pout a cut-off device is actuated and the pressure at the inlet drops. When reaching 0.9 Pout a spare line opens up. If pressure again is again raised, at 11.5 Pout the cut-off device of the spare line closes. The gas supply to the users is terminated. When pressure in the basic line goes up to 0.9 Pout, the regulator of the basic line opens. If pressure drops to 0.5 Pout, the supply of gas to the users is terminated.

For the prevention and limitation of natural gas emergency release, according to Art. 409 (1) of Ordinance No. 21/1990, works on the elimination of emergencies are carried out in accordance with specially developed instructions in the introduction and operation of the gas equipment and installations by the owner or the user. In this point, the basic principles of the measures in emergency situation are given in an Emergency Plan, developed by the Employer, which includes the following directions:

1.Announcement -this is made to the people in the area of the emergency (50-100 m radius); the duty officers of the endangered projects; the Civil Defence; the Ambulance Service; the Gas Supply Company; the duty dispatcher of BULGARGAZ; the local police office - tel. 160; the Rescue team; the Traffic Control Police - tel. 166; Overgaz Engineering OOD - tel. 046/3 52 0-3;

2.Work immediately commences for the discontinuation of the natural gas leakage by the Emergency Department of the Gas Supply Company and giving first aid to the casualties;

3.Restriction of the access of people and motor vehicles to the emergency area by the security officials.

4.Restoration works:

- Starting the restoration works on the gas pipeline and its equipment;
- Quick restoration of the gas supply with the observance of all safety requirements;
- Setting up of the necessary MTB for the due restoration of the faults occurring as a result of the emergency;

The carrying out of this complex of tasks demands the training of authorities for managing, the establishment of Civil Defence groups and the involvement of the local population to learn and realize the protection methods and the performance of rescue and emergency activities in an explosion-risky and fire-risky atmosphere. In training the population, the efforts should be concentrated to the formation of such a behaviour of action in the event of uncontrolled natural gas leakage.

The efforts and the means of the Gas Supply Company should be in a position to stop the leakage of natural gas within 30 minutes and to restore the supply of natural gas in the emergency sector within 24 hours.

9. PLAN FOR OWN MONITORING

The basic technological processes in the gas distribution system of the urban areas are the transportation of natural gas, gas distribution and gas metering, which processes are not a source of hazardous emissions. Emissions are released in the user firing installations which are not the property of the gas distribution network owner, and are, therefore, no object of this report. In this situation, there is no need of envisaging an own system of monitoring outside the means for technical monitoring and control, ensuring the normal operation and safety of the gas distribution network, regulated in the normative enactment provisions for designing, building, acceptance and operation of the gas supply network in urban areas.

According to the requirements of Ordinance No. 21/1990 for the design and safe operation of gas equipment and installations, prophylactic servicing is performed of the underground gas pipelines and the appurtenant equipment by going along the track inspection within times ensuring their safe operation (Art. 330).

When making the inspection along the track any gas presence in all shafts and control piping along the gas pipeline is checked, as well as wells and shafts (water supply, sewing, heating system etc.), as well as collectors, basement premises of buildings, shafts of bridge stays and others, which are located within a distance of 15 m of both sides of the gas pipeline (Art. 334).

The monitoring of the state of the air medium (gas presence) in the collectors, sewages, technical corridors, basements, covered trestles and other premises is made by automatically actuating gas analyzers which send a signal to dispatching or other points wherein the staff is on 24-hour-duty or by periodic inspections for the presence of gas within the terms of time ensuring safe operation (Art. 332, para. 2).

The design for the Gas Supply of Lyaskovets is a large-scale infrastructure design, the objective of which is the replacement of conventional fuels by natural gas. The gas supply network delivers natural gas to the three categories of users: industrial enterprises, PABS and RHS which are available on the entire territory of the urban area. In the combustion of natural gas in the energy and heating equipment and installations, belonging to the users, the basic pollutants, subject to control are NOx and CO. In the context of what was said above, the owners of the combustion installations bear all the responsibility for their state and environmental effect. The observation of the normative documents for preventing the purity of the atmospheric air shall be observed within the framework of the emission and immision control by the competent authorities. The designation of the project, its capacity and degree of effect on the environmental components does not motivate any need for the monitoring of the state of the remaining environmental components: waters, geological base, relief, soils, flora and fauna.

10.CONCLUSION

10.1. Inferences

The results of the research conducted for the report to assess the environmental impact on the project of "Gasification of the town of Lyaskovets" impose the following inferences:

1.The project has ecological importance. It provides for the substitution of the use of solid and liquid fuels in industry, in the administrative and communal service and in the residential sector in the town of Lyaskovets for natural gas, which has the lowest possible emission generation.

2.From the analysis made for the substitution of solid and liquid fuels in industry, the administrative, the communal services and the residential sectors in Lyaskovets, it can be seen that the total quantities of released emissions is reduced by 9.7 times. The release of sulphur oxides, dust and ashes from the organized sources is nearly 100%-terminated. The quantity of nitrogen oxides increases by 1.05 times, but the simulation made of their dissipation indicates that the maximum concentration allowance is not exceeded. When the standards of the allowable emissions are observed, the amount of CO is insignificant, as a result of the complete combustion in the gas-fired heating and the energy-consuming installations. This shows the advantages of natural gas before the remaining types of fuels and the reliability of the project for improving the ecological atmosphere in the town of Lyaskovets.

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 health and hygiene and building standards in the Republic of Bulgaria.

4.The civil works and the operation of the project shall have no negative effect on the environmental components: air, surface and ground waters, soil, flora, fauna and human health; on the contrary, it shall improve the state of the environment and the living environment in the town of Lyaskovets.

10.2. Conclusions

The conditions for the design and construction of gas supply systems in urban areas were regulated by the acceptance of Ordinance No. 3/20.02.1995 for the design of systems for gas supply in urban areas and gas installations in natural gas-fired buildings, and Ordinance No. 4/20.02.1995 for the control and acceptance of gas supply systems in urban areas and gas installations in natural-gas fired in buildings. By their character, these are large-scale infrastructure designs, the designing of which undergoes two phases: feasibility study and working design.

In the development of the EIS of the design for the "Gasification of the town of Lyaskovets", the individual subprojects have been examined in their general technological relation intended to make full assessment of the comprehensive environmental impact. The EIA Report was developed in accordance with the requirements of Art. 9 (1), pt. 1 of Ordinance No. 4 for Environmental Impact Assessment (7.07.1998). as a preliminary one. The assessment, the project effect prognostication and the conclusion were made in accord with the requirements for the norms and standards as per Art. 2 of the Law for Environmental Protection (LEP), and in a range provided for in Annex No. 2 to Art. 13, para. 1, pt. 2 of Ordinance No. 4 for the final report. The assessment made categorically 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 specifies the designation of the project as ecological and social. On the basis of present-day prognostication methods made, based on mathematical statistics, the probability and digital simulation in accounting for the development trends of the town of Lyaskovets, the prognostication validity was reliably determined, regardless of the changes of some specific technical decisions which had occurred during the time of construction.

In conclusion, the team of independent experts of CONTROL P EOOD proposes to the Expert Council of the Area Inspectorate of Environment and Waters to accept the present EIS Report as final, in accordance with the provisions of Art. 9 (2) of Ordinance No. 4/7.07.1998, and gives permission for the implementation of the Project, and also in accordance with Art. 20 (2), pt. 2 and Art. 20 (3), pt. 1.

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

LYASKOVETS MUINICIPALITY, LOVECH DISTRICT.

M I N U T E S

Today, 01 October 1998, the Commission appointed by Ordinance No. 907 of 08.07.1998 of the Mayor of the Lyaskovets Municipality, in conjunction with Art. 185, para. 2, Chapter IV, Section III, pt. 7 of the PPZTSU and in conjunction with Art. 180, para 1, and Art. 183 of PPZTSU, has a meeting with following agenda:

1.Co-ordination of gas pipeline track for:

- distribution gas pipeline from AGRS - Gorna Oryahovitsa to ARKUS AD and connection to GRP1-TS, GRP2- TS, GRP3-TS and to gas users: VINPROM EAD, BALANS EAD and FMA-EAD.

The meeting was attended by:

1. Ivanka Dimitrova - Lyaskovets Municipality
2. Vassil Chervenodonchev - TVD
3. Stoyan Stoyanov - LKS, Sofia, MKR - V. Turnovo
4. Dipl. Eng. Georgi Petrov - Electrical Supply, Lyaskovets Sector
5. Hristo Kolev - ViK (Water Supply and Sewerage), Lyaskovets Area
6. Dipl. Eng. Staiko Staikov - Road Administration, V. Turnovo
7. Dipl. Eng. Dimiter Dimitrov - RAHOVETS GAS 96 AD
8. Dipl. Eng. Anton Gorchilov, OVERGAS Eng. - Sofia
9. Dipl. Eng. Georgi Stefanov - OVERGAS Eng. - Sofia.

After making an inspection in situ and specifying the underground communications, the Commission

DECIDED :

1. Co-ordinates the tracks of the distribution gas pipeline and its connections, as follows:

- from AGRS - Gorna Oryahovitsa the gas pipeline track goes eastward from the D. Oryahovitsa-Lyaskovets asphalt road, at 4 m from the asphalt surfacing;
- around the Petrol Station the track goes to the right side of the road surfacing of M. Raikovich St., at 1.0 m from the western kerbstsone. The track follows the western kerbstone to the Ring Road;
- along the Ring Road to H. Botev Blvd. - track within the street surfacing at 1.0 m from the western kerbing;
- from H. Botev Blvd. to the end of the town regulation, track in a separation greenery area of the Ring Road;
- after regulation, the track runs to the left of asphalt road to the town of Elena, at minimum 4.0 m of the asphalt surface and in the western end of an asphalt pedestrian avenue;
- the connection to VINPROM, BALANS and FMA follows the street leading to them, on the street facing at 1.0 m from the kerbstone to the end of the kerbstone, after which in the banquette (side pedestrian road) at 0.5 m from the asphalt surfacing, northward;
- before the existing parking site of FMA the track branches out in two branches:
  - ◊ to VINPROM - the track crosses the street and runs along the pavement at 0.5 m from the kerbstone, after which it enters a greenery area at 2 m from the kerbstone;
  - ◊ to FMA and BALANS - the track gets at 0.5 m from the ends of the parking side in greenery area, after which it enters the FMA courtyard across a natural terrain, after which it goes at 1.0 m from the FMA northern fence.
- the connection to GRP1-TS is along the street facing of M. Raikovich St., from the north kerbstone;

- the connection to GRP2-TS is along the northern street facing of the H. Botev Blvd. from its centre line.

2. The equipment (GRP and SCU) shall be fitted on municipality land.

Remarks:

1.When streets with facing are excavated, the excavation should be filled in with sand or gravel, and the facing then should be restored.

2.Any crossing and closing of streets should be agreed with the Traffic Police in Lyaskovets.

3.Before the commencement of civil works, the working designs should be co-ordinated with the above instances.

COMMISSION:

1. (Sgd) Iv. Dimitrova
2. (Sgd) V. Chervendonchev
3. (Sgd) S. Stoyanov
4. (Sgd) Dipl. Eng. G. Petrov
5. (Sgd) H. Kolev
6. (Sgd) Dipl. Eng. S. Staikov
7. (Sgd) Dipl. Eng. D. Dimitrov
8. (Sgd) Dipl. Eng. A. Gorchilov
9. (Sgd) Dipl. Eng. G. Stefanov