Лилев -

CO-GENERATION GAS POWER STATION BIOVET

JI PROJECT DESIGN DOCUMENT

BIOVET JSC, PESHTERA, BULGARIA

Volume 1

ERUPT 4
Version 2
Sofia, May 2004

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Remark:

All annexes are situated in PDD - Volume 2.

Abbreviations used

ABECng	annual baseline natural gas energy consumption	GJ/y
AECng	annual natural gas energy consumption by CHP	GJ/y
AEIR	Assessment Environmental Impact Report .	
AFCng	annual consumption of natural gas	m^3
AOH	annual operational hours	h/y
BEelec	baseline CO_2 emissions that are offset by electricity supplied by CHP	tCO_2/y
BEth	baseline CO_2 emissions that would be offset by CHP heat output	tCO_2/y
BEth fug	baseline methane emissions from natural gas production and pipeline leaks corresponding to heat supply that would be offset by CHP output	tCH_4/y
BEth eq fug	CO_2 equivalent of baseline methane emissions from ng production and internal and external pipeline supplying ng to provide heat that would be offset by CHP heat output	tCO_2eq/y
BEtotal	total baseline emissions (CO_2 equivalent)	t CO_2 eq/y
BEF elec	baseline CO_2 emissions factor for electricity from grid	$kgCO_2/MWh$
CAHO	CHP annual heat output	GJ/y
CGS	Co-Generation Gas Power Station	
CHOR	CHP heat output rate	GJ/y
CEO	annual CHP electricity output	MWh/y
CPO	CHP net power output capacity	MW_e
CV ng	lower calorific value of ng	$kcal/m^3$
e_b	industrial boiler efficiency (LHV basis)	%
Ecs	CO_2 emissions per year from ng combustion in CHP	t CO_2/y
Eeq fug	CO_2 equivalent of fugitive methane emissions from ng production and transport leakage (internal and external pipeline supplying ng to user)	t CO_2 eq/y
Eeq met comb	CO_2 equivalent of methane emissions from ng combustion	t CO_2 eq/y
Efug	fugitive methane emissions from ng production and transport losses (internal and external pipeline supplying ng to user)	tCH_4/y
EL	Energy Law	
Emet comb	methane emissions from ng combustion	tCH_4/y
Etotal	total project GHG emissions	t CO_2 eq/y
EFel gen	emission factor for electricity generation	$kgCO_2/kWh$
EF ng	CO_2 emission factor of natural gas	kg CO_2/GJ
EIRcog	energy input rate to CHP	GJ/h
ER	emission reduction from project activities	t CO_2 eq/y
EU	European Union	
GE	General Electric	
GWP (CH_4)	global warming potential of methane	21 – Kyoto protocol

GWP (N_2O)	global warming potential of nitrous oxide	310 – Kyoto protocol
MCEO	monthly electricity output of CHP	MWH/month
MCHO	monthly heat output of CHP	GJ/month
MECng	monthly ng energy consumption of CHP	GJ/month
MEF	methane emission factor for ng combustion	$kgCH_4/TJ$
MLR	methane leakage rate (from ng production, transport and distribution)	$kgCH_4/GJ$
NEF	nitrous oxide emission factor for ng combustion	kgN_2O/TJ
NES	National Environment Strategy and National Activity Plan 2000-2006	
NEC	National Electric Company	
NPS	Nuclear Power Station	
NSI	National Statistics Institute	
RES	Renewable Energy Sources	
SEC	specific energy consumption for power generation	kJ/kWh
TPS	Thermal Power Station	
WPS	Water Power Station	

REMARKS:

The following considerations are taken into account in evaluations of GHG equivalent emissions:

- GHG emissions from **CH_4 combustion; N_2O combustion; CH_4 leakage's** were not estimated due to their small contribution into the total amount of GHG emissions (estimated approx. less than 1 to 2 %) and both the lack of reliable data as corresponded emission factor and measurement problems during the monitoring period. Their contributions into the total GHG emissions are even less when emission reductions have to be evaluated;
- **CO_2 combustion** emission factor for natural gas is EFmg =56,1 kg/GJ – source: "Operational guidelines for Project Design Document of JIP" – Ministry of Economic Affairs of the Netherlands, June 2003;
- **CO_2 electricity** – these emissions associated with the electricity from the power grid depend on annually estimated CO_2 emission factor in Bulgaria. The predicted values - BEF_{el} are presented in Table E 1. (source: "Operational guidelines for Project Design Document of JIP" – Ministry of Economic Affairs of the Netherlands, June 2003;

1. PROJECT CHARATERISTICS

1.1 Project information

1.1.1 Project developer

Company name:	**Biovet JSC**
Position in the project:	Supplier
Visiting address:	39, Petar Rakov Str
Zip code + city:	4550, Peshtera
Country:	Bulgaria
Postal address:	4550, Petar Rakov 39, Peshtera
Contact person:	dipl.eng. Michev, Ivan
Job title:	Technical Director
Telephone number:	+ 359 350 85444, or + 359 889 302945
Fax number:	+ 359 350 5636
E-mail:	biovet@biovet-bg.com
	http:// www.biovet-bg.com
Date of registration:	11.11.1991
Company's core business:	Pharmaceutical industry, Food additives for animal's health

1.1.2 Project partners

Company name:	**GE Packaged Power, Inc.**
Position in the project:	Equipment Supplier
Visiting address:	2707 North Loop West, Houston
Zip code + city	77008, Houston, Texas
Country	U.S.A.
Postal address:	2707 North Loop West, Houston
Contact person:	Mrs. Tatyana Kossekova-Dimitrova
Job title:	Sales & Marketing, Central & Eastern Europe
Telephone number:	+359-2-944-0469
Fax number	+90-212-216-1652
E-mail:	Tatyana.Kossekova@ps.ge.com
Company's core business:	Gas turbines manufacturer

Company name:	**PMU JSC**
Position in the project:	Construction of the equipment.
Visiting address:	Lucoil-Nephtochim p.b.42
Zip code + city:	8104 Bourgas
Country:	Bulgaria
Postal address:	8104 Lucoil-Nephtochim p.b.42, Bourgas
Contact person:	dipl.eng Cholakov, Anton
Job title:	Executive Director
Telephone number:	+359 56 898012 or +359 888 724488
Fax number:	+359 56 898010
E-mail:	pmu_bs@bs.spnet.net
Date of registration:	08.09.1998
Company's core business:	Instalation, repairs and overhauls of industrial equipment

Company name:	**CoGen Engineering LTD**
Position in the project:	Designing and coordination of the project.
Visiting address:	54 A, Hristo Smirnenski Str.
Zip code + city:	1164 Sofia
Country:	Bulgaria
Postal address:	1164 Hristo Smirnenski 54 A
Contact person:	dipl.eng Manev, Stefan
Job title:	Executive Director
Telephone number:	+359 2 663293 or + 359 888 242728
Fax number:	+359 56 898010
E-mail:	cogen@bol.bg
Date of registration:	07.04.2004
Company's core business:	Engineering activities especially on the field of co-generations

1.2 Project Abstract

1.2.1 Project Title

Co-Generation Gas Power Station – Biovet, Peshtera

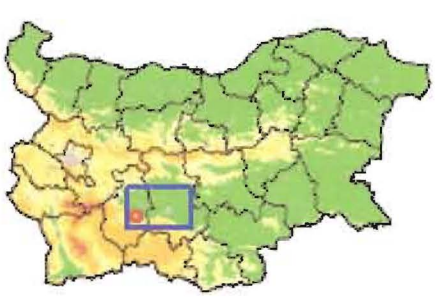
1.2.2 Abstract

The project is for the design, building and operation of a high efficiency Gas Power Plant of the co-generation type and power capacity of approximately 18 MW. The Power Plant will produce electric energy and industrial steam (for technological needs and heating) to cover the needs of Biovet JSC. The surplus produced electric energy will be sold to the National Electric Company at preference prices, in accordance with the new Energy Law. The conception is based on the above and consists of one co-generation installation in accordance with the minimum technological steam needs of Biovet.

1.2.3 Project location

The project is foreseen to be executed in the town of Peshtera within the facilities of the pharmaceutical company Biovet Joint Stock Company.
The town location can be seen on the map below.
Peshtera is a historical town, established during the second half of the 4th century AD. Its population amount to approximately 21 000 inhabitants, of which 56.3% is in the active employment age. It is situated at 450m altitude, at the foot of the West Phodope Mountains. Peshtera is located 20 km from the town of Pazardjik, 40 km from Plovdiv City and 125 km from Sofia City
The location of the site for the co-generation station can be seen on the map in **Annex No. 1** – General Layout. . The location is indicated by a rectangle close to the main site of Biovet. In the past, greenhouses were located on this site. Now it is free and Biovet is its owner. The design purpose of the plot is for industrial needs.
The dimensions of the site (200 m x 120 m) are fully sufficient for the construction of the co-generation station, as well as for its future expansion. Its location has been selected in the vicinity of the Gas Distribution Station, the Electric Substation of the Plant and the steam pipelines. Easy access is provided to the site, which will facilitate the execution of the civil and installation works.

Location of Peshtera



1.2.4 Date go decision of the project

The date for the decision to commence the Project is the end of April 2004.

1.2.5 Construction starting date

The execution of the project will really start as of June 2004 with the start of the equipment production and the elaboration of the working design. The necessary permits will be issued by the end of 2004.
The construction works for the co-generation installation are expected to commence on 20.07.2004.

1.2.6 Construction works completion date

The expected term for the completion of the construction works is 15.04.2005, and the commissioning to be completed by July 2005;
The operation of the co-generation station is expected to commence as of 01.07.2005.

1.3 Background and justification

1.3.1 Background

The motives for the realization of this CHP project are based on the analysis of the situation in the country and the expected reforms in the energy sector with reference to the accession of our country into the EU.

Biovet is very sensitive to the fluctuations of the electric energy prices due to the high relative share of its energy costs in the final product price. The unavoidable reforms in the energy sector are related to a future growth of the electric energy prices and their equalization with the average prices for the EU. The provision of relatively stable electric energy prices in the future will be of significant importance for the maintenance of the company's products compatibility.

Biovet is supplied with electric power from two independent sources and, notwithstanding the above, incidents have occurred, in which the company has been left without electric power supply for over an hour. This has caused serious production losses due to the eradication of the fermentation bacteria and the discontinuation of the fermentation processes. The improvement of the electric power supply reliability is an important factor for the functioning of Biovet.

The forecast development of Biovet, as shown in **Annex No. 3**, depends on the provision of a reliable alternative power supply source.

The company has a developed in the past infrastructure for gas supply. Biovet has constructed its own pipeline with a length of approximately 30 km and a capacity of approximately 30 000 Nm^3/h, which capacity is being utilized currently at less than 10 000 Nm^3/h annually.

The above considerations and the quoted available gas supply capacity were the main reason for Biovet to plan the construction of the Gas Station of the Co-Generation type.

The deficiencies of the Bulgarian legislation during the past years were the main obstacle before the realization of this idea.

It is a fact, that the decommissioned 3^{rd} and 4^{th} blocks of the Kozloduy NPS are expected to be substituted mainly by the new or overhauled facilities of the coal-fueled stations of Maritsa Iztok 1 TPS, Maritsa Iztok 2 TPS . Since the coal powered stations are one of the main sources of the greenhouse gases, this will not lead to a reduction of the greenhouse gases emissions (GHG) in the country and, respectively, of the obligations of Bulgaria with reference to the Kyoto Protocol.

With reference to the above, in 2003 the Government of Bulgaria elaborated a "Strategy and Policy to the Energy Sector for the Reduction of the Greenhouse Gases Emissions /2003/".

According to this Strategy, the basic way to achieve this reduction of GHG emissions in the sector is the following:

- Increasing the share of restorable energy sources – 100 % reduction of GHG emissions;
- Gasification of housing facilities – up to 90 % reduction of GHG emissions;
- **Priority construction of combined energy production plants – up to 60 % reduction of the GHG emissions;**
- Increasing the share of TPP's fueled by natural gas within the national energy balance – up to 20 % reduction of the GHG emissions;
- Overhaul of the production facilities at the large TPP's – up to 10 % reduction of the GHG emissions;

- Reducing the losses in the supply network – up to 5 % reduction of the GHG emissions.

In accordance with the above, three basic aims have been defined by the Strategy:

- Stimulation for energy production on the basis of restorable energy sources by compulsory purchasing of the produced electric energy at preferential prices and with priority financing;
- **Encouragement of combined energy production by compulsory purchasing of the produced electric energy at preferential prices and participation with equal rights on the green certificates market;**
- Regulation of the new green certificates market.

A continuation of this Strategy comprises the elaboration of a new legislative framework and the approval of the most important laws with reference to the energy sector by the end of 2003 and the beginning of 2004.

The main law in this case was the new Energy Act (published in State Gazette No. 107 dated December 2003). Chapter XI of the same concerns primarily the encouragement of energy production based on restorable energy sources and combined energy production. According to the provisions of Art. 162, clause 1 and clause 2, item 1, the public supplier of electric power, the National Electric Company (NEC) is obliged to purchase at preferential prices the whole surplus quantity of electric power produced by highly efficient combined power production plants with power capacities of up to 50 MW.

Art. 33, clause 2 of the same Act provides that these preferential prices shall not be less than 80 % of the average sales price of electric power to domestic consumers for the preceding year. See **Annex No. 2**, Excerpts from the Act.

Significant documents with reference to the reduction of the hazardous air emissions are also the approved in February 2004 Energy Efficiency Act, as well as the Regulation on the Issue of Certificates of Origin for Electric Power, Produced from Restorable Energy Sources and by Combined Production, on the issue of green certificates and trade in the same as of October 2003.

In the end of 2003, the final decision was made for building the Plant on the basis of gas-turbine engines with electric and steam cycles, without direct production of hot water, as technically the most efficient alternative.

1.3.2 History and issues to be resolved by the execution of the project

The issue with reference to the construction of an own co-generation plant within the facilities of Biovet AD has been under discussion for a number of years. Various alternatives were studied for its construction on the basis mainly of gas engines on a steam-water cycle. The deficiencies of the Bulgarian legislation in the field of energy, the low credit rating of our country, and the lack of sufficient experience in the field can be quoted as the main reasons for the non-execution of the project till date.

The construction of this highly efficient plant for the production of electric and thermal power will resolve the following issues of Biovet AD:

- High reliability of the electric power supply of the facilities will be guaranteed. In this case, the fact that even a ten-minute power supply disruption leads to high production losses, has to be taken into consideration,

since without the provided by the turbo-compressors oxygen, the bacteria required for the performance of the fermentation processes die very quickly.

- As a result of the low production costs of the electric power and of the steam from the new installation, the production costs of the main product will drop significantly and this will improve the compatibility of the company on the international markets.
- The required electric power and technological steam supply for the planned future expansion of the production facilities.

1.3.3 Core business of the project partners and their relations

Biovet JSC" and its owner are the providers of the reduced emissions, the investor for the project and the owner of the Gas Power Plant.
Biovet is a leading European manufacturer and marketer of medicated and nutritional feed additives, enzymes, bulk active substances and pharmaceuticals for farm animal productivity and animal health. The company offers intermediates, active ingredients and medicines for the human pharmaceuticals industry. Biovet provides enzymes, enzyme complexes, and other ingredients for the baking, brewing, juice production, alcohol production, wine making, oil extraction, pharmaceuticals, paper, detergents, leather and textiles industries.
Biovet was established in 1961, more than 40 years ago. The first manufacturing plant was designed for the production of just one major animal health antibiotic. Throughout the decades, Biovet has been manufacturing a range of veterinary and human products in response to the changing market demands. Today, the product portfolio includes over 80 products for animal health, human health and enzymes.
Since its founding, the company has grown significantly. The Company increased its workforce and expanded its production facilities several times, established a Research and Development department and built a wastewater treatment plant. Over the recent years, Biovet has made significant investments in plant upgrades, equipment automation, and construction of new production facilities, laboratories and warehouses. At present, the administrative and production complex extends over an area of approximately 150 000 m^2.

Staying a step ahead of the requirements of the fast-changing environmental laws, Biovet completed in advance the required preparation for implementing the new Regulations of the National Plan for the Management of the Environment and Auditing, approved by Decree of the Council of Ministers No. 61 dated 12.03.2003.

Biovet is the main supplier of reduced emissions and is the main organizer and executor of the project. Biovet will provide the financing of the project by means of a credit obtained from Bulbank, Bulgaria. The negotiations will finish to the end of Jun 2004.
Biovet will execute contracts with the individual suppliers of the equipment and will control the execution of the deliveries.
Biovet, with the aid of CoGen Engineering, will provide for the overall management of the co-generation station construction.
Biovet will execute itself the larger share of the civil works and a part of the equipment construction works.
A photograph of the plant is shown here below.

Biovet executed a contract on the 24.04.2004 for the delivery of the gas turbine, complete with the generator and all auxiliary equipment in a container execution for outdoor installation with the main supplier for the project General Electric.

Biovet will complete by 15.06.2004 the negotiations and will execute contracts with the remaining equipment suppliers /Emerson, the supplier of the boiler/, as well as with the contractor for the design and coordination of the project CoGen Engineering. A contract will also be executed by the end of September with PMU for the partial construction of the equipment.

GE Packaged Power, Inc. is a leading supplier of aeroderivative gas turbines for industrial and marine applications and is also the world's largest and most experienced aeroderivative gas turbine service provider.The technology, products, and services to the energy industry led to 2003 revenues in excess of $ 18 billion. GE Packaged Power, Inc. offers aeroderivative gas turbines ranging from 5.5 up to 100 MWe and 8 300 to 60 000 shp. They also provide comprehensive maintenance coverage, from on-site field services to depot repairs and genuine GE OEM parts.

GE Energy has been serving the power industry for more than a century. Since the installing of the first steam turbine in 1901, their installed base of steam and gas turbines for power generation has grown to more than 10 000 units in more than 120 countries. GE offers a full range of heavy-duty gas turbines, steam turbines, generators, and combined cycle systems, optimized for a wide variety of customer applications and duty cycles, co-generation and integrated gasification combined cycle while continuously striving to lower the costs of electricity and enhance environmental performance by increasing fuel efficiency and flexibility of the products.

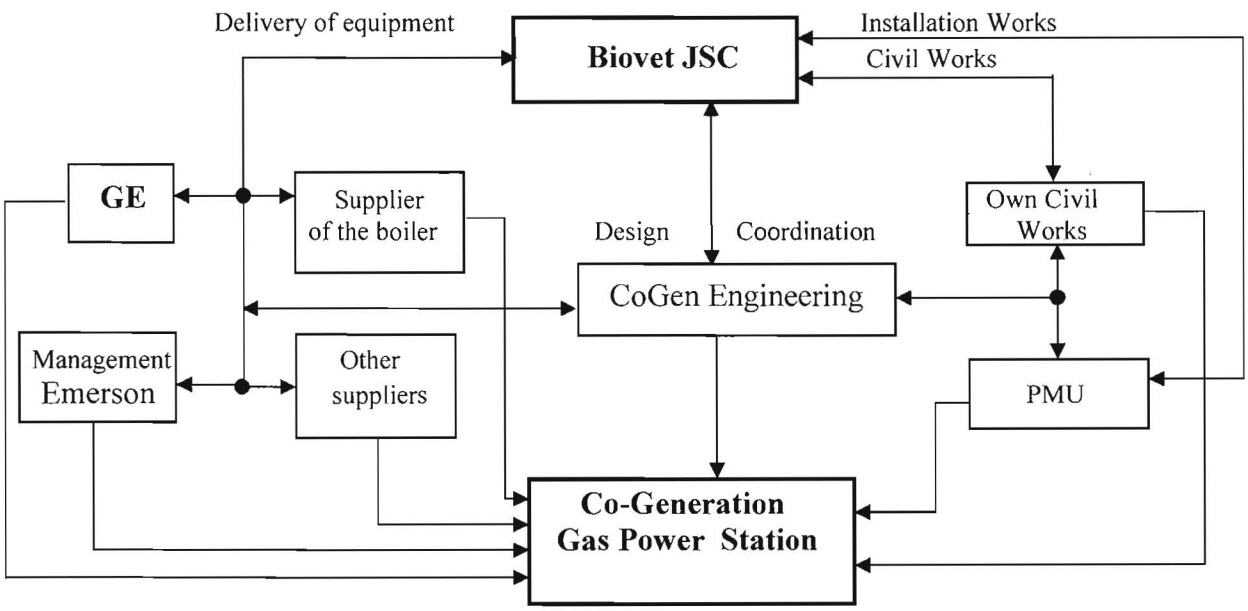
The role of GE Packaged Power, Inc. in the project is to supply the equipment, to provide supervision on the site and the commissioning of the installation.

GE Packaged Power, Inc has also executed with Biovet a contact for the maintenance of the delivered equipment.

PMU JSC - Industrial Construction Company –Bourgas was established in 1998. As a successor of MONTAZHI EAD-Sofia, Bourgas branch, the company inherited 40 years of experience and highly qualified human resources of specialists and managing engineering-technical staff in the machine, electrical and instrumentation fields. PMU–Bourgas performs all kinds of machine, electrical and instrumentation installations for newly constructed projects and plants, as well as repair, revamp, reconstruction and modernization of existing plants in the fields of the Chemical and Power Industry, Oil and Gas Industry, Cement Industry, Wood Processing Industry and Foodstuffs Industry, Machine Building Industry, Metallurgy, etc.
The company employs highly qualified personnel in the fields of mechanical and electrical construction works, welders with passports for the execution of welds, which have to pass x-ray control and dye penetration tests, and management technical staff with vast practical experience, acquired and proven in our joint work with suppliers and supervisors from the USA, Japan, France, Italy, Germany and Russia, who have worked within the territory of the Republic Bulgaria.
The role of the Company in this project is to execute the installation of part of the equipment.

CoGen Engineering – LTD is a completely new company incorporated on the basis of Aecon V.S. especially to operate in the field of co-generation. Highly experienced specialists in the field of energy have been employed by CoGen Engineering, as well as a design team with many years of experience in gas-turbine engine installations. The role of CoGen Engineering in this project is related to the preparation of the partnership papers in ERUPT 4, the elaboration of the working design, with the adaptation of the individual installation components for the complete realization of the project in accordance with the provisions of the Bulgarian Laws and the compliance with the necessary organization during the individual project execution phases, the performance of independent supervision, participation in the plant installation and commissioning.

The individual partners in the realization of the project are related according to the following organization scheme.



1.4 Intervention

1.4.1 Description the GOALS of the project

The most important goals to be achieved by the realization of this project refer both to the specific circumstances in the field of energy and to the government's strategy for the future development of the energy sector.

Reduced production costs and, therefore, improved compatibility of Biovet AD on the international and domestic markets as a result of:

- Low production costs for the electric power and steam due to the high efficiency coefficients of the installation and the comparatively low price of the fuel;
- Realistic expectations for a growth of the electric power prices with reference to the reduction of the electric power production facilities in the country and the expected overhaul of the large coal fired TPS's, including the construction of sulfur-trapping installations;
- Preferential prices for the sales of the surplus produced electric power.

- Guaranteed high reliability of the electric power supply of the production facilities of the company;

Guaranteed required electric power supply for the planned future expansion of the production facilities;

Reduced emissions into the atmospheric air of the country resulting from the replacement of the fuel and reduced losses from the transfer of electric power.

1.4.2 Description the PURPOSE of the project

The main purposes for the realization of the project are:

- The reduced costs per unit consumed energy and the stabilization of these costs over a long period of time, which will be guaranteed upon the realization of this project, will indubitably improve the compatibility of Biovet AD.
- To guarantee the reliability of the electric power supply and to reduce the costs of the used electric and thermal power.
  As quoted in item 1.3.2, a disruption of the electric power supply for the duration of more than 10 minutes leads to high production losses due to the extermination of the fermentation bacteria as a result of shortage of oxygen. Biovet AD is a consumer of the first category (i.e. supplied with electric power from two independent sources) according to the Bulgarian norms, but power disruptions have been known to happen, leading to the realization of the quoted losses.

1.4.3 Description the RESULTS of the project

The specific results from the realization of the high efficiency Co-Generation Station refer directly to the produced and replaced quantities of electric and thermal energy and to the quantities of electric energy sold to the NEC, as well as to the realized during the 2006 – 2012 period reduction of the emissions into the atmospheric air.
The data on the future needs of Biovet AD in energy reflect the planned expansion of the production facilities and are quoted in **Annex No. 3**, but the data with reference to the increased production of specific types of products comprise confidential information and, therefore, are not quoted specifically.

It can clearly seen that after 2005 the Plant will be consuming all of the annually produced:

- 139 810 MWh/year at 17.05 MW mean annual electric power capacity of the Station and 8200 operational hours;
- 172 200 t /year of steam at parameters of 8,5 barg and 175°C at 21 t/h mean annual thermal power capacity and 8200 operational hours;

These quantities of electric and thermal power produced by the Co-Gen Station shall be insufficient and the required additional energy will be provided from:

- The electric energy – from the supply network of NEC;
- The steam – from the existing stand-by boilers. Biovet will dismantle 4 of the existing boiler and will retain 5 of the boilers (60 t/h of steam capacity) as stand-by equipment.
  The boilers and the thermal outlet of the Station shall be connected in a common steam manifold. The scheme of this thermal connection is shown in item 1.5.1.

The quantity of the reduced emissions of CO_2 as a result of the operation of the Co-Gen Station amounts to 200 ktons AAUs for the years 2005 to 2008 and to 339 ktons ERUs for the years 2008 to 2012.

1.4.4 Description the ACTIVITIES of the project

The activities to be performed for the realization of the project include the following:

Design of the Co-Generation Gas Power Plant;
Production and delivery of the equipment, as follows:

- Gas-turbine engine 18 MW type LM 2000, complete with electric generator 20 MW, 6 kV, 50 Hz , electric power system, automatic control system, in a container for outdoor installation, complete set produced by General Electric;
- Steam boiler of 45 t/h power capacity at steam parameters of 9 bar, 175°C with an additional burner, expected producer Standard Fasel – Netherlands;
- Supply of High Level Control System, produced by Emerson, Process Management, USA
- Supply of accessories and other auxiliary equipment.

Construction works on the site;
Installation of the equipment;
Commissioning of the Co-Generation Power Plant;
Operation and maintenance of the plant.

1.5 Detailed project description

1.5.1 Description of the technology and the technical capacity

Biovet's cogeneration plant has been designed to meet their own business, technical and commercial requirements, i.e. :

1. Captive power generation for their own facility
2. Thermal load, as process steam, for their manufacturing process
3. The ability to export excess power to the local grid
4. Meet local and/or national emission norms - both NOx and noise, as stipulated by Bulgarian law

Design point modeling

For Biovet's cogeneration plant, the cycle has been designed at the following design conditions :-

- AIT = 15degC
- RH = 80%
- Altitude = 450m ASL
- Make-up water at 12degC
- Gas suction pressure of 10barg. A gas compressor will need to be included in the plant's scope of supply, and will need to discharge gas at a pressure of 27.26Barg
- Gas fuel specification of: C1=84.5%vol., C2=5.58%vol., C3=2.05%vol., C4=0.78%vol., C5=0.18%vol., C6=0.17%vol., CO_2=0.67%vol., N_2=5.93%vol., and O_2=0.14%vol.
- LM2000 gas turbine genset inlet and exhaust losses of 101.6mmH_2O and 203.20mmH_2O
- HRSG is a single pressure system with a dearator system. The HRSG is designed to generate medium pressure steam for process, and high pressure steam for steam injection into the combustor
- HRSG is designed to generate the following steam conditions :-
  - Medium pressure process steam at a flow rate of 21T/hr, 11Bar and 195degC
  - High pressure steam for SI, at a flow rate of 4.5T/hr, 47Bar and 343degC
- HRSG pinch temperature difference is set at 8deg.
- Note, the actual design and configuration of the HRSG will and should be verified by the appropriate HRSG OEM, which Biovet will select
- Process steam, excluding the steam injection flow for NOx control, returns back to the cycle at 90degC
- The PowerPoint slide – attached in **Annex No. 4**, is the heat balance diagram at the design point.
- The thermodynamic model of the CoGen plant at the design point – as shown above, has then been used to analyse the performance of the plant at the different off-design cases. In Biovet's case the off-design cases are for the different operating months (i.e. different AITs, process heat loads, SI, etc…).
  The off-design cases / models have been generated / created by using a commercially available software tool called GT-Pro and GT-Master, which is designed and developed by Thermoflow Inc.
  GT-Pro is used to generate / create a thermodynamic model of the plant at the chosen design point. For off-design operation, such as different AITs, different thermal loads, GT-Master is used.

  In GT-Master, the GT-Pro model is taken as the basis of the plant design, and the flow areas, heat transfer areas, HRSG tubing design, etc., are all then fixed mathematically. By inputting the new operating points (i.e. AIT, gas turbine exhaust conditions, gas turbine performance, thermal load requirements, etc.), the relevant off-design cases are generated / created.

LM2000 Gas Turbine Genset

At the heart of Biovet's cogeneration plant is GE AERO ENERGY's LM2000 aeroderivative gas turbine genset. The LM2000 gas turbine, which is actually a re-rated LM2500 gas turbine, has a rating of 18MW at 36.4% thermal efficiency. This gas turbine is a single shaft gas turbine with a free power turbine.
The axial compressor is made up of sixteen (16) stages, at a pressure ratio of 16.4:1. A two stage axial turbine drives the sixteen stage axial compressor. Both the compressor and turbine are on one shaft.
The free power turbine is a two-stage design, which is directly coupled to the generator, and is generating electricity at 3,000 RPM (or 50Hz).
The combustion system, chosen for this project, is GE AERO ENERGY's ***S***ingle ***A***nnular ***C***ombustor (**SAC**). This combustor design shares a lot of similarity / commonality with the aircraft engine combustor, except that this combustor is also designed to burn natural gas, as well as liquid fuel (eg: Diesel, Kerosene, etc...).
NOx requirement for Biovet's project is 25vppm at 15% O_2 (or 51mg/Nm^3 at 15% O_2).
To meet the NOx requirement, the SAC combustor requires either ***W***ater ***I***njection (**WI**) or ***S***team ***I***njection (**SI**), to reduce the unabated emissions to the required level. For Biovet's project, SI is going to be used. The SI flow is directly injected into the combustor, and will reduce the unabated NOx emissions to the required 25vppm at 15% O_2.
The steam for NOx control shall be provided by the ***H***eat ***R***ecovery ***S***team ***G***enerator (**HRSG**). The HRSG is designed to provide the required amount of steam, at the required pressure and temperature, and quality levels, as stated by GE AERO ENERGY.
Performance figures like this for one "typical" month tabulated in **Annex No. 5** are used in the design of the cycle and the heat balance analyses for each month of the year. The basic data for each month are shown in p.5.3.

Heat Recovery Steam Generator Design

The exhaust gases from the LM2000 gas turbine genset are exhausted into a HRSG, which is designed to generate :

- Steam for process – at the required pressure, temperature and flow.
- Steam for injecting into the LM2000 combustor - at the required pressure, temperature and flow, for NOx control.

Currently the HRSG design, which has been configured in the thermodynamic model of the CoGen plant, is a conventional drum type design. GE AERO ENERGY has recommend to Biovet to consider the ***O***nce ***T***hrough ***S***team ***G***enerator (**OTSG**) technology. The reason for the recommendation is that Biovet could gain flexibility and attain some level of commercial benefit in their plant operation.
Shown in the attached **Annex No. 5** - is the annual heat balance diagram for one ***"typical"*** month. Diagrams like this are prepared for each ***"typical"*** month. The actual process steam loads, required for each month, where kindly provided and tabulated by Biovet – see attached **Annex No. 6.**

When viewing / studying the above heat balance diagrams for each month, the reader needs to take note of the following :-

- HRSG is only generating steam for Biovet's process requirements and SI for NOx control

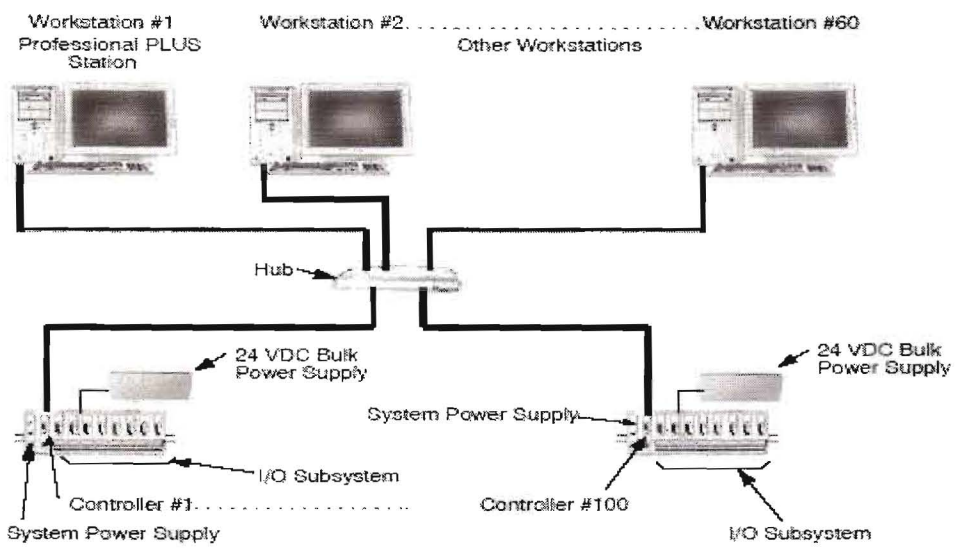
- In certain months, there may be excess steam being generated than is required for SI and/or process. This excess steam could be either exhausted into the atmosphere, collected / sent back to either the dearator or mixed with the return process flows. This level of detail will be designed during the detailed engineering of the project.

High level Automation System of the CoGen Plant

A DeltaV system includes, at least:

- A control network that provides communication between workstations and controllers.
- The Professional PLUS workstation that provides a graphical user interface to the process and system configuration functions.
- A controller that performs control and manages communications between the I/O subsystem and the control network.
- An I/O subsystem that processes information to and from field devices.
- A system power supply for the DeltaV system
- A bulk power supply (or 24 Vdc plant power) for field devices connected to the DeltaV system.
- DIN-rail mounted carriers that provide power and communication connections for the controller and I/O subsystem.

DeltaV system can be scaled to include many workstations, controllers and their associated power supplies, and I/O subsystems, including Classic I/O, HART I/O, and I/O bus systems. Systems can be simplex or redundant.



Typical DeltaV system architecture

Gas Measurement

Micro Motion ELITE CMF flowmeters
Micro Motion® ELITE® CMF meters are the leading flowmeter for precision flow measurement. ELITE meters offer direct mass flow, volume flow, density, and temperature measurement of liquids, gases, and slurries - without the need for additional equipment, manual calculations or estimations.
Micro Motion ELITE meters are designed for unsurpassed performance in even the most harsh operating environments. They have no moving parts, and no special mounting or flow conditioning requirements.

Stream Measurement

Rosemount 3095MFA Mass ProBar® Flowmeter
The Rosemount 3095MFA Mass ProBar Flowmeter accurately measures static pressure, temperature, DP, and calculates dynamically compensated mass flow, through a single pipe penetration. The Rosemount 3095MFA Mass ProBar® provides higher accuracy over a wider flow turndown than traditional DP technology and provides the most advanced method of measuring flow.
Single Device Measures Three Variables: Continuously measures DP, pressure, and process temperature through a single pipe penetration
Mass Flow Output: Dynamically calculates compensated mass flow

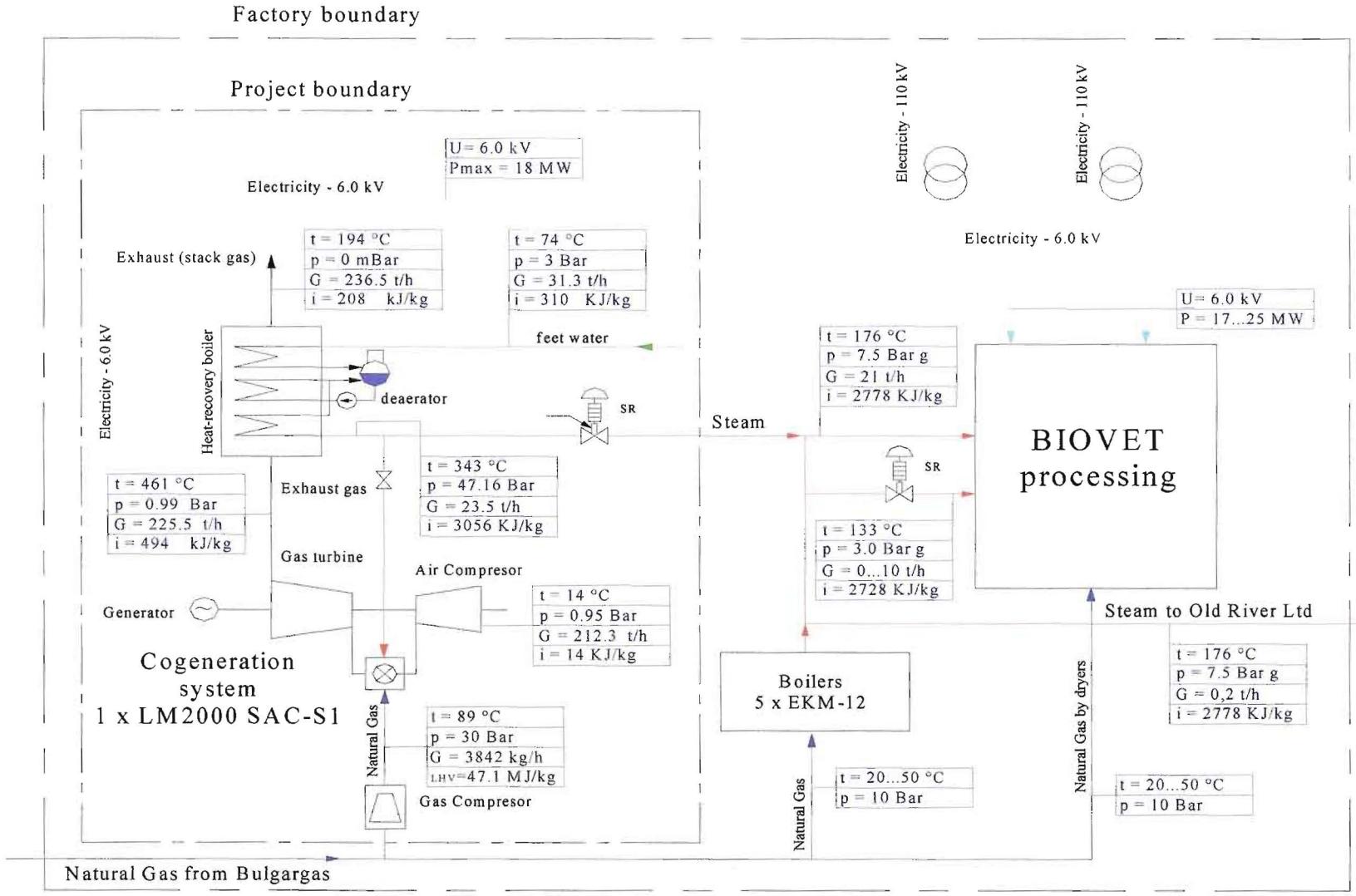
Block scheme for control of the whole CoGen Plant is given on **Annex No. 7.**

Conclusion

The current proposal for the construction of the Co-Generation Station is very favorable for Biovet due to the following reasons:

1. Long-term stable and low prices for the electric and thermal power consumed by the Plant.
2. Preferential prices, at which the surplus produced electric energy will be sold.
3. The M2000 gas turbine comprises a modification of the well-proven turbine technology, such as the LM2500. The LM2500 turbine is widely used and has proven operational and commercial advantages, which can be confirmed by the customers of GE AERO ENERGY.
4. Biovet will acquire higher reliability in the production and consumption of electric and thermal power.
5. By the realization of this project, Biovet will comply with all the recommendations and engagements in accordance with the provisions of the Bulgarian legislation with reference to environmental protection. The expected emission rates for NOx and CO in the exhaust gases (**HRSG**) shall be lower than the Bulgarian and European norms.

The method for integrating the Co-Generation Station with the existing equipment and installations is shown on the block scheme here below.


Factory boundary
Project boundary
U = 6.0 kV
Pmax = 18 MW
Electricity - 6.0 kV
Electricity - 110 kV
Electricity - 110 kV
Electricity - 6.0 kV
t = 194 °C
p = 0 mBar
G = 236.5 t/h
i = 208 kJ/kg
Exhaust (stack gas)
t = 74 °C
p = 3 Bar
G = 31.3 t/h
i = 310 KJ/kg
feet water
Electricity - 6.0 kV
Heat-recovery boiler
deaerator
SR
Steam
t = 176 °C
p = 7.5 Bar g
G = 21 t/h
i = 2778 KJ/kg
U = 6.0 kV
P = 17...25 MW
BIOVET
processing
t = 461 °C
p = 0.99 Bar
G = 225.5 t/h
i = 494 kJ/kg
Exhaust gas
t = 343 °C
p = 47.16 Bar
G = 23.5 t/h
i = 3056 KJ/kg
SR
t = 133 °C
p = 3.0 Bar g
G = 0...10 t/h
i = 2728 KJ/kg
Gas turbine
Air Compresor
Generator
t = 14 °C
p = 0.95 Bar
G = 212.3 t/h
i = 14 KJ/kg
Steam to Old River Ltd
Cogeneration
system
1 x LM2000 SAC-S1
Boilers
5 x EKM-12
t = 176 °C
p = 7.5 Bar g
G = 0,2 t/h
i = 2778 KJ/kg
Natural Gas
t = 89 °C
p = 30 Bar
G = 3842 kg/h
LHV=47.1 MJ/kg
Natural Gas
t = 20...50 °C
p = 10 Bar
Natural Gas by dryers
t = 20...50 °C
p = 10 Bar
Gas Compresor
Natural Gas from Bulgargas

1.5.2 Expected availability

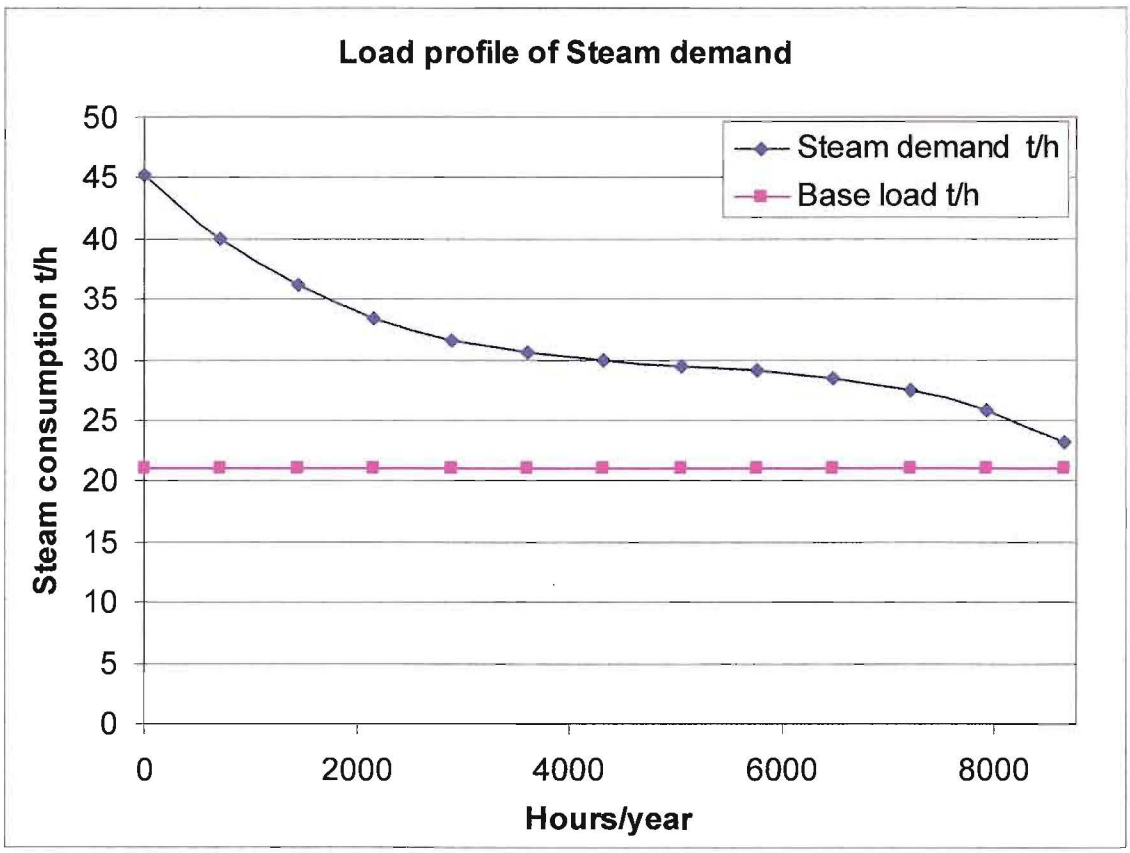
According to the preliminary agreements between Biovet AD and Bulbank AD, the final contract for the provision of the credit to the amount of 8 000 000 EURO shall be executed by the end of June 2004.
In accordance with the above and with the already executed contract for the delivery of the main equipment with General Electric, the date for the commissioning of the Station into operation has been set for the 01.07.2005. The table here blow provides a time schedule for the execution of the main works for the realization of the project.

No.	Description of the Works	Terms for execution	
		Start	End
1	2	3	4
1	Elaboration of the design specification	01.06.04	30.06.04
2	Geology studies on the project site	15.05.04	15.06.04
3	Elaboration of the working design	01.06.04	15.10.04
4	Legalization of the working design	15.10.04	01.11.04
5	Obtaining a construction permit	01.11.04	10.11.04
6	Preparation of the documents and obtaining a production license	30.09.04	30.03.05
7	Elaboration of the schedule for the civil works	20.07.04	15.04.05
7.1	Preparation of the project site	20.07.04	30.09.04
7.2	Execution of the civil works	15.09.04	15.12.04
7.3	Delivery of the equipment	30.07.04	15.03.05
7.4	Installation of the equipment	03.01.05	15.04.05
8	Pre-commissioning tests	15.04.05	15.05.05
9	Commissioning tests (72-hour tests)	15.05.05	15.06.05
10	Elaboration of the executive (as-is) documents and drawings for the Handing-Over Committee and the execution of Deed 16	15.06.05	01.07.05
11	**Commencement of regular operations**	**01.07.05**	

1.5.3 Expected capacity factor and project activity level

The observations on the use of General Electric co-generation installations of this type show that the annual use normally exceeds 95 percent or 8320 hours per year.
In terms of higher assurance of the economic results, as well as of the reduction of contaminating emissions, the annual rate for equipment utilization has been set at 8200 hours/per year, i.e. at 93.6 per cent.
The production capacity of the Co-Generation Station have been selected mainly on the basis of the criteria to provide for Biovet's minimum needs of steam. The table in Annex No. 6 quotes the required amounts of steam for technological needs depending on the mean monthly temperatures. The data in the table clearly indicates, that the basic load of 21 t/h, which comprises the most efficient operational regime of the Co-Generation Station, shall be provided by the same, while the peak loads shall be provided by the existing boilers.

A diagram of Biovet's categorized thermal loads is presented below. The basic characteristic has been obtained by calculating the actual average consummation during the last three years.



The load diagram shows that the generated by the co-generation installation steam will be fully utilized by the company.

The forecast production costs for the electric and thermal power produced by the Co-Generation Station, as well as the realized reductions of the CO_2 emissions, are quoted in the table here below for the 2005 to 2012 period. The same comply with the needs of the Plant in accordance with its forecast development, as quoted in Annex No. 3.

No.	Описание	2005	2006	2007	2008	2009	2010	2011	2012
1	Necessity of electrical energy for Biovet [MWh / year]	131,000	140,000	149,000	153,000	157,000	162,000	164,000	166,000
	Produced electrical energy from the co-generation [MWh / year]	139,810	139,810	139,810	139,810	139,810	139,810	139,810	139,810
2	Surplus produced electrical energy for selling to NDC [MWh / year]	8,810	- 190	- 1,400	- 5,400	- 9,400	- 14,400	- 16,400	- 18,400
3	Necessity of heat energy for Biovet [t / year]	262,000	270,000	275,000	278,000	280,000	280,000	280,000	280,000
	Produced heat energy from the co-generation [t / year]	172,200	172,200	172,200	172,200	172,200	172,200	172,200	172,200
4	CO2 emission reduction [kt. /year]	84	80	77	74	71	68	65	62

2. CURENT SITUATION

Currently, the required energy resources for the normal operation of Biovet, e.g. electric power, gas, steam, and compressed air are provided, as follows:

Electric power

The annual electric power consumption for the years following the year 2000 amounts to:

Years	2000	2001	2002	2003
Annual electric power consumption [MWh]	81840	84388	95729	86988

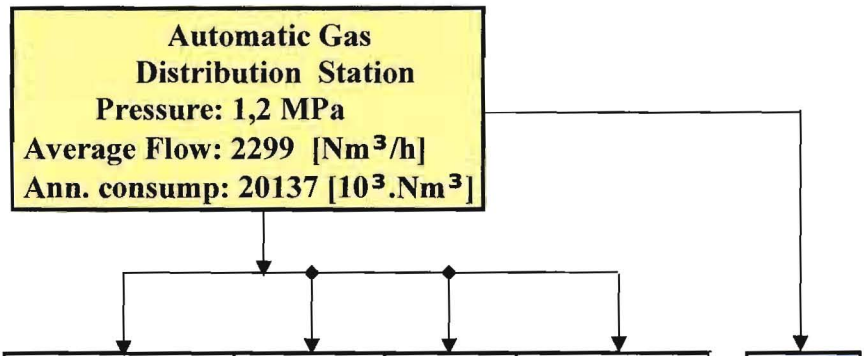
The facilities comprise a consumer of the first category, which, according to the Bulgarian legislation, means that it is supplied from two independent sources. The single-line diagram of the facilities power supply is shown in **Annex No. 8**. The facilities are supplied from the network of NEC at 110 kV voltage by means of two transformers of 110 kV /6 kV and a section busbar system at 6 kV. Each of the transformers has a power capacity of 25 MW and will capable of supplying the facilities individually even after the foreseen increase of the consumption according to the development forecasts, as quoted in Annex No. 3.
Notwithstanding the fact that the power is supplied from two sources, there have been instances, when the power supply from both sources has been interrupted as a result of strong atmospheric storms and damages to the supply circuit of NEC. In such cases, the facilities suffer high production losses.
The single-line diagram in **Annex No. 8** also shows the connection scheme for the new Co-Generation Station to the 6 kV busbars.

Gas

Biovet has erected its own gas supply pipeline. The gas pipeline is approximately 20 km long with a diameter of 329 mm. The capacity of the pipeline is 30000 Nm^3/h, with available free capacity of approximately 25000 Nm^3/h.
The pressure of the natural gas is 1,0 to 1,2 MPa. This pressure is too low for the gas turbine. A pressure of 2,7 MPa is required for its normal operation. The existing pipeline has been tested at a pressure of 8,5 MPa, which will allow the rising of the supply pressure of the gas in the pipeline up to 3,0 to 3,5 MPa.
For this purpose, Biovet is currently conducting negotiations with Bulgargas.
The annual consumption of natural gas for the 2000 to 2003 period amounts to:

Years	2000	2001	2002	2003
Annual natural gas consumption [$10^3.Nm^3$]				
- Biovet	19971	18024	19175	18572
- Town Peshtera	0	573	1101	1409

The distributed gas consumption for the individual consumers is shown here below with average values for the years 2002 and 2003:



	Steam Station	Dryers	WWTP	Prod.Dep.2	Town
Average Flow [Nm³/h]	1796	360	0,0018	0,0015	143
Ann.consump: [10³.Nm³]	15709	3143	16	14	1255

The peak gas consumption amounts to approximately 4500 to 5000 Nm³/h.
The gas supply is reliable. There have been no occurrences of supply failures. The only disruption within the several years has been only once for prophylactic maintenance works.
It is clear that the available free capacity of the gas supply pipeline is fully adequate for the reliable supply of the new Co-Generation Station, as well as for the planned future expansion. This is one of the key factors for the decision to erect this Station.

Steam`

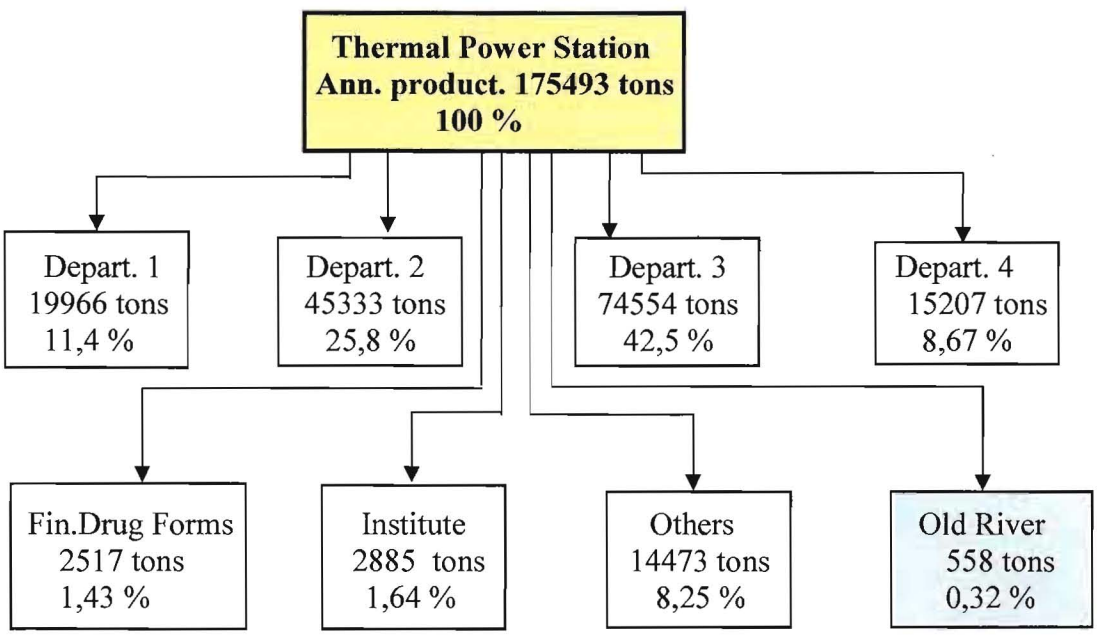
The steam for technological purposes and heating of the Plant is produced by the steam plant. There are a total of 9 steam boilers installed in the steam plant, including 5 units of the EKM 12 type, manufactured, as follows 1981 – 2 units, 1982 – 2 units, 1989 – 1 unit, which are updated for natural gas fuel, as well as 4 units of the ПКМ 12 type, manufactured, as follows: 1968 – 1 unit, 1970 – 1 unit, 1982 – 1 unit, 1989 – 1 unit, which operate on heavy oil fuel. Each of the above boilers has a rated production capacity of 12 tons/h at an initial pressure of 1,05 MPa and at 195°C temperature.
Throughout the year, mainly the five EKM 12 boilers are operated, which use natural gas for fuel. The remaining four boilers of the PKM12 type remain as stand-by units and are not used normally throughout the year. Upon construction of the new Co-Generation Station, the four PKM 12 boilers are foreseen to be decommissioned and dismantled. The remaining 5 units of the EKM 12 type will remain in operation as stand-by units for the new Station and will supplement the same in cases of peak steam consumption by the Plant.
The average efficiency factor for these boilers can be accepted as being equal, according to manufacturer's data, to that of the EKM 12 type boilers, namely 89%. Evidence of the above comes from the measurements performed on Boiler No. 1, quoted in **Annex No. 9**.
The technological characteristics of the used by the Plant steam are quoted in the table here below:

№	Parameters	Units	Value
1.	Pressure of steam produced	Mpa	0.85
2.	Temperature of steam produced	0^0 C	175
3.	Pressure of steam for technological needs	Mpa	0.85
4.	Reduced pressure of steam for heating and daily needs	Mpa	0.3
5.	Hour thermal load for technological needs	tons//h MWt	21.0 16.2
6.	Hour thermal load for daily additional needs	Tons/h MWt	1.0 0.6
7.	Maximum hour load for heating	Tons/h MWt	7.5 4.5
8.	Minimum hour load for heating	Tons/h MWt	1.5 0.9
9.	Total maximum hour load	Tons/h MWt	32.0 24.6
10	Total minimum hour load	Tons/h MWt	21.0 16.0
11	Annual use of technological heat load	hours	8760

The main amount of steam for technological purposes is being injected directly into the fermentation equipment, for which reason the condensate quantities are very low at only approximately 10 % of the total steam consumption.
The annual steam consumption for the 2000 to 2003 period is shown here below:

Years	2000	2001	2002	2003
Annual steam consumption [tons]	193406	163089	167704	177775

The distribution of the steam consumption for the individual consumers for the various years and as a percentage of the total are shown here below:



Two steam collectors for a pressure of 0,85 MPa are installed in the boiler plant, which supply the six basic production units of the plant, as well as one steam collector for 0,3 Mpa of pressure, connected to the heating system of the production areas, administrative premises, and daily domestic hot-water needs.
The losses of steam along the distribution network have been calculated as a percentage and amount to approximately 5 to 7%.

Compressed air

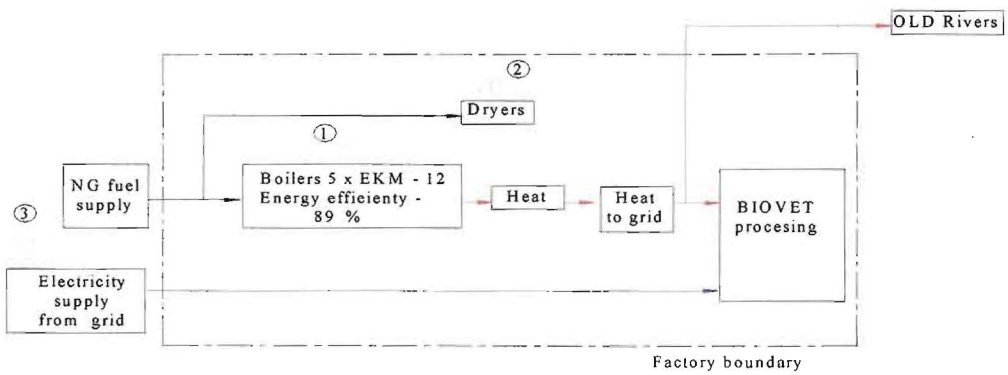
In order to provide for the high oxygen needs of the fermentation processes, the Plant has a large air compression plant to provide for the required compressed air. Three low-pressure turbo compressors work in the compressor plant, which maintain in the Plant network a pressure of 0,23 – 0,25 MPa and provide a discharge of approximately 90000 – 94000 m^3/h. The rated power output of their motors amounts to 2,2 MWe each, which comprises 50-52% of the total electric power consumption of the Plant.

The nature of the technological process does not allow interruption and the plant operates at three shifts throughout the year, with no days off and no stopping. The installed (both technological and power) capacities are higher than the required in order to allow periodical stopping of the individual installations for maintenance, without having to interrupt the operation of the Plant as a whole.

3. GREENHOUSE GAS SOURCES AND PROJECT BOUNDARIES

3.1 **Flowchart of the current delivery system** – separate generation of heat and electricity

Flowchart of current delivery system with it's the main components and their connections.



1 – CO_2 emissions (combustion in boilers)
2 – CO_2 emissions (combustion in dryers)
3 – CO_2 emissions (electricity from grid)

Description of the NG consumers in BIOVET in the current situation:

- Boilers – number:

  N1 to N4: - 4 units EKM 12;

  N9 - 1 unit EKM 12

  All 5 boilers are with steam capacity 12t/h (saturated steam with 8,5 bar,a pressure); boilers N5 to N8

  Boilers: N5 to N8 - 4 units PKM 12 (do not show in the flowchart) with heavy fuel oil burners. They are not in operation from several years ago and in the future they will be dismounted.

  Annual steam productions and NG consumption are presented in Chapter 2. Load profile of steam demand is presented in Chapter1.5.3. The boilers' efficiency is presented in **Annex No. 9** These values are varied, but a conservative mean value of 89% is taken into account into the further evaluations.

- Dryers:

  2 units ANHIDRO - NG consumption: 300 to 600 nm^3/h per unit;

  1 unit IVK - NG consumption: 100 to 300 nm^3/h;

  2 units (small dryers) - NG consumption 2 x 10 nm^3/h.

  Annual NG consumption of the dryers, measured by on-site installed flow measurement device:

  2002 – 3099 . 10^3.Nm^3/y ; 2003 – 3186 .10^3.Nm^3/y.

Electricity supply: by electricity grid

Description of the heat (steam) consumers:

- BIOVET processing;
- export of heat to Old River – 2000 factory, situated near by BIOVET

Heat consumption in "Old River – 2000" factory during last 3 years in tons of steam:

Year	Months				
	January	February	March	December	Total
2002	272	135	54	36	497
2003	205	150	181	124	660
2004	194	142	112	-	448

Operational modes:

- heat and electricity demand for the technology in BIOVET - 24 hours non-stop operational mode;
- heating demand for BIOVET – seasonal operation mode;

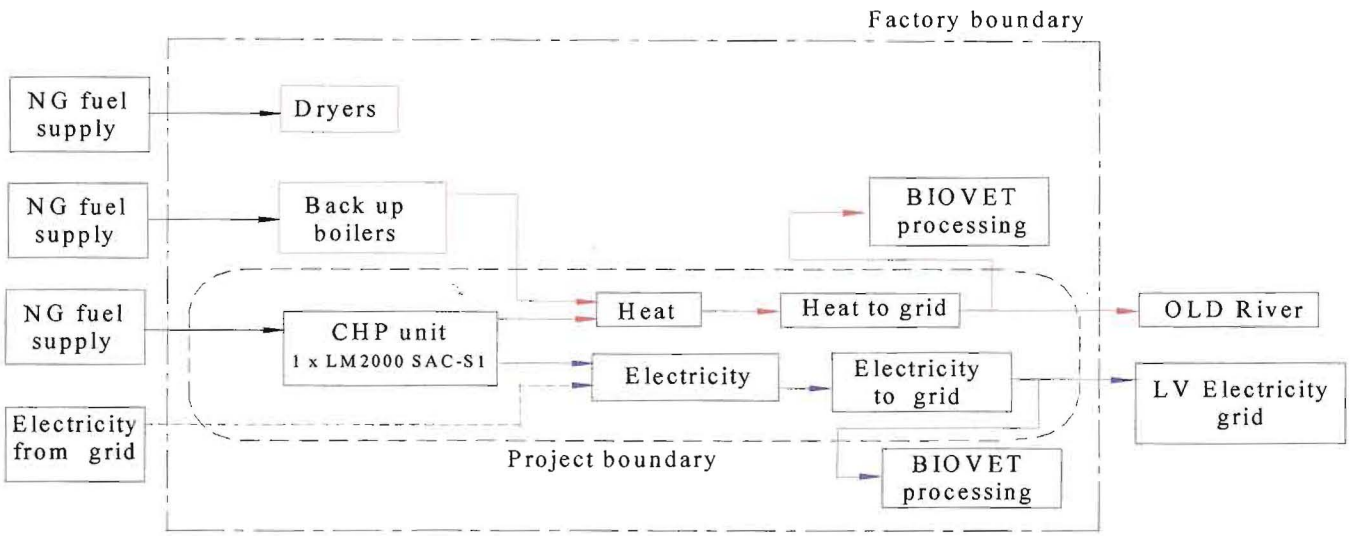
- export heat for "Old River – 2000" - seasonal operation mode, described in Table above. Their annual steam consumption is less than 1 % from the annual steam production in BIOVET

3.2 Flowchart of the project

The following considerations are taken into account in the flowchart construction of the project:

- CHP for combined heat and power generation will be installed.
- The production of heat from CHP will cover only base heat load. The rest of the heat (pick load) will be covered by existing "back up" boilers;
- More than 99 % of the produced heat will cover BIOVET heat demand. The rest by means of heat grid will be exported to "Old river -2000" factory, producing shoes;
- The existing dryers in BIOVET will continue to consume directly NG fuel;
- According to energy demand scenario the production of electricity from CHP during the first years of project implementation will cover entirely electricity demand of BIOVET and the rest of electricity production will be exported to the grid. After that period it will be necessary to import some electricity from the grid. The import/export exchange of electricity to grid is also possible to occur during the shifts mode of operation of BIOVET

Flowchart of the project with its main components and their connections



3.3. Project boundaries

Project boundaries for natural gas fired in CHP is given in fig. 3.3.1.

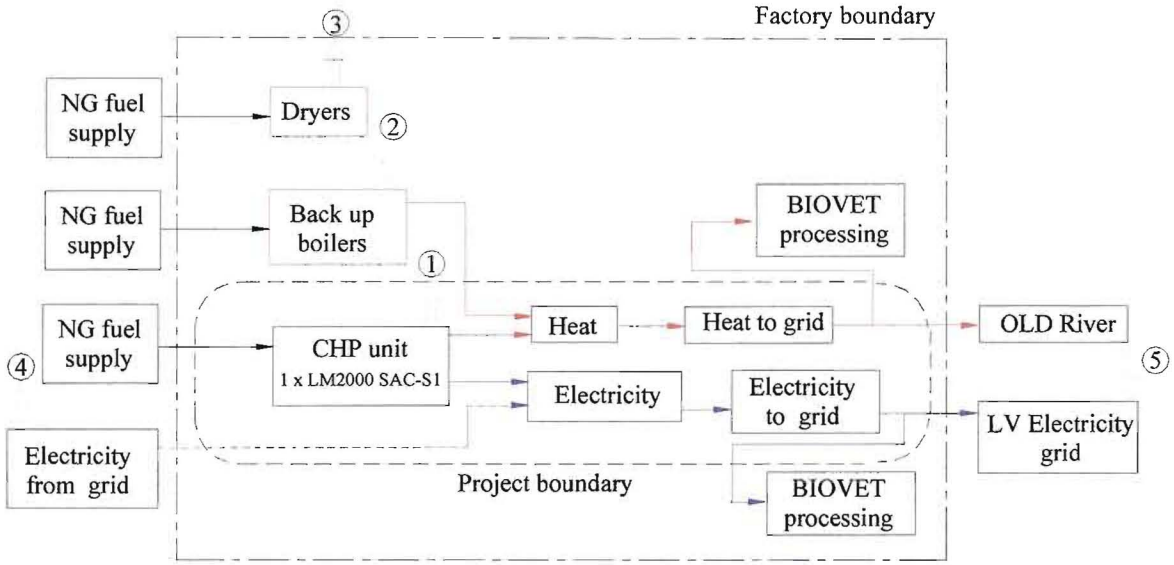


Fig. 3.3.1 Project boundary for natural gas fired in CHP

1 – Direct on-site CO_2 emissions (comb in CHP)
2 – Direct off-site CO_2 emissions (comb in back up boilers)
3 – Off-site CO_2 emissions (comb in dryers)
4 – Direct off-site CO_2 emissions (electricity from grid)
5 – Direct off-site CO_2 avoided emissions (electricity to grid)

The project is the installation of CHP whose input is NG from gas pipeline, and whose outputs are electricity and heat supplied to the relevant grids in BIOVET. Although the project will be installed at the industrial site, the project boundary is strictly the CHP and heat and power connected grids in BIOVET. That is why CO_2 emissions, caused by NG combustion in CHP are direct on-site emissions.
The co-generation system is sized to provide base heat load to the industrial plant. Prior to project installation, the plant acquires all of electricity from the power grid and meets all of its heat requirements by combustion in boilers and dryers of natural gas acquired from the pipeline.
Once the project is realized, the plant acquires heat and electricity from CHP to meet some of its heat and electricity needs. The remaining electricity from the system is met by power grid, outside the project boundary but influenced by it. That is why CO_2 emissions from electricity grid are direct off-site emissions. Similarly, the remaining heat demand is met by existing (back up) boilers and dryers at the plant with natural gas from NG pipeline. The small heat consumer outside the factory boundary – "Old River – 2000" is connected to the heat grid too. CO_2 emissions, caused by NG combustion in back up boilers in order to cover heat demand, are in the factory boundary, but out of the project boundary. They are directly influenced by the project. That is why they are direct off-site emissions. CO_2 emissions, caused by NG combustion in dryers are not influenced by the project and will be the same if the project realization does not occur.

As it is shown in reporting form of project implementation, during the first years of the project it is expected the produced by CHP electricity to cover the whole BIOVET electricity demand and even to sell small amount of it to the power grid. At this case it will shift power load in the grid. It will reduce CO_2 emissions – direct avoided off-site emissions.

The baseline emissions are determined by the electricity and fuel purchases by the plant from the electricity grid and NG pipeline.

As CO_2 emissions from dryers are not influenced by the project, they will be excluded from the further evaluations.

As heat supplied to the "Old River -2000" is less than 1 % from the produced heat in BIOVET and heat consumption of it is not influenced by the project, the relevant CO_2 emissions will be excluded from the further evaluations too.

The project emissions depend on gas input to the CHP, back up boilers and additional electricity purchased or sold by the plant, while emissions avoided can be determined from the difference between baseline emissions and the project ones. The associated monitoring determines both project and baseline emissions.

3.4. Direct and indirect emissions

With this definition of the project boundary, the Project and Baseline emissions, both *On-site and Off-site* are as shown in Table 3.4.1:

Table 3.4.1. Project and baseline emissions, direct and indirect, on and off-site

On-site emissions			
Project	Current situation	Direct or indirect	Include or exclude
CO_2 emissions from NG combustion in CHP	CO_2 emissions from NG combustion in boilers	Direct	Include
	CO_2 emissions from NG combustion in dryers	Direct	Exclude, do not influenced by the project
Off-site emissions			
Project	Current situation	Direct or indirect	Include or exclude
CO_2 emissions from NG combustion in back - up boilers		Direct	Include
CO_2 emissions from NG combustion in dryers		No influence	Exclude, do not influenced by the project
CO_2 emissions from electricity grid	CO_2 emissions from electricity grid	Direct	Include
CO_2 avoided emissions to electricity grid		Direct	Include

4. KEY FACTORS

4.1 Internal key factors

The internal key factors, which we have foreseen, are the following:

1. The variability of water boiler loads leads to a variability of their efficiency within a considerably small range. A comparatively high rate of operation (85 percent) has been set for more pessimistic evaluation of emissions reduction;

2. The means to improve the efficiency of thermal, climate and industrial installations will lead to a considerable reduction of total energy consumption. Such a reduction of the emissions upon execution of the project is expected. However, it has not been taken into consideration.

3. The commissioning of new equipment is expected, which, on the other hand, will lead to a considerable increase of the thermal and electric loads.

4.2 External key factors

4.2.1 Legislation development

As quoted above in item 1.3.1, the main law affecting the development of highly efficient combined production of electric and thermal power is the newly voted Energy Act (published in State Gazette No. 107 dated December 2003), Chapter XI of which concerns primarily the encouragement of energy production based on restorable energy sources and combined energy production.
The producers of thus produced energy will be issued green certificates for the produced and sold by them energy.
In accordance with the quoted above, upon the commissioning of the Station into operation, the surplus produced electric power will by compulsory purchased at preferential prices.
In addition to the above, on the basis of the new legislation with reference to the liberalization of the gas market and, more specifically, to the quoted above Energy Act, Para. III, Art. 176, clause 1 – Annex No. 2, Biovet shall be allowed to purchase natural gas directly from the producer companies, which will provide for lower prices and improved payback capabilities of the investment.

4.2.2 Sectoral reform projects

The foreseen reforms of the energy sector provide for the reconstruction and modernization of certain coal-fueled TPP's, as follows:

- "Maritsa Iztok 3" TPP – updating of 4 blocks of 210 MW each with sulfur filter installations, investment value 518 mln. EURO, completion term 36 months;
- "Maritsa Iztok 1" TPP – construction of replacement facilities, i.e. 2 blocks of 330 MW each with sulfur filter installations, investment value 1056 mln. EURO;

- "Maritsa Iztok 2" TPP – updating of 4 blocks of 150 MW each with sulfur filter installations and of 2 blocks of 210 MW each, investment value 230 mln. EURO;

The high costs of the quoted investments for the reforms of the energy sector will inevitably lead to a price hike for the conventionally produced electric power. This will make the investments for the construction of C-Generation Stations economically more feasible, as is the case with this specific project.

4.2.3 Economic, demographic and social factors

The forecast macro-economic parameters for Bulgaria up to the year 2007 (General National Plan for the Economic Development of Bulgaria as of 2007), according to the State Agency for Economic Analyses and Prognoses dated April 2002 are the following:

- Gross Domestic Product (real growth) - 5.5%
- Inflation rate - 3.5%
- Unemployment rate - 10.0%

Biovet JSC does not comprise an exclusion with reference to the quoted development rates for the country's economy. As can be deduced from the quoted in Annex No.3 data, the annual production growth of the company exceeds 5 %. This is, naturally, reflected in the energy consumption growth.

The demographic factors concern mainly the fluctuation of the human resources at the company. This is a complex issue, since it concerns both the living conditions in the town, and the working conditions. With reference to the above, Biovet has placed as a priority the issue of its employees' qualification and the training of new staff, working in coordination with the Municipality by sponsoring numerous activities of the same.

The local industry within the community has been conserved to a high degree and the unemployment rates are lower than the quoted above average values for the country. The Municipality supports the execution of this project.

4.2.4 Fuel prices and availability

The efficiency and payback potential of the investments for this project are mainly determined by the prices of natural gas in the long term.
The only official forecast on the fluctuation of the gas prices up to the year 2015 has been published in the "REVIEW OF THE ENERGY SECTOR AND THE ENVIRONMENT" IN November 2001 by the World Bank team with the cooperation of the State Agency on Energy and Energy Resources. According to this forecast, the gas prices can be expected to fluctuate according to basic and pessimistic scenarios, as shown on the table herebelow. In order to facilitate the analysis, the table has been supplemented by the current prices for the years 2000, 2003, and 2004.

Scenario	Active [USD]				Expected [USD]			
In years	1999	2000	2003	2004	2000	2005	2010 г.	2015
Main	92,60	118,2	128,5	129,8	129,95	79,92	74,61	74,61
Pessimistic	92,60	118,2	128,5	129,8	147,25	138,98	142,29	150,67

The analysis of the gas prices shows that the forecast of their future fluctuations are very unreliable and lack precision, which is the reason for the lack of other official

forecasts. During the years 2002, 2003, and 2004, the prices remained comparatively stable, for which reason all the calculations on the financial feasibility of the project have been performed on the basis of the prices for the year 2004 in BGN and in EURO, i.e. according to a comparatively pessimistic scenario.
Biovet JSC is supplied by natural gas from the Gas Distribution Plant at the town of Pazardzhik by means of a 300 mm diameter pipeline of 20 km length. The maximum conveyance capacity of the pipeline amounts to 30 000 Nm^3/h. The pipeline and its route are property of Biovet JSC. The town of Peshtera is supplied from the Gas Distribution Plant of Biovet. The total gas consumption (including the consumption of the town's population) amounts to approximately 5000 Nm^3/h. The supply is stable. The rated pressure of the fuel gas at the intake of the gas turbine must be 2,5 MPa. No problems are expected with reference to the natural gas supply both as regards quantitative and qualitative parameters throughout the various seasons and for the future.
The prices of electric power and gas are quoted in detail in Annex No. 10

4.2.5 Capital availability

Approximately 8 000 000 EURO will be required for the realization of this project. The available to Biovet JSC own financing amounts to 750 000 EURO. The remaining required funds are to be provided by means of a bank credit, as well as by the sale of CO_2 emissions of greenhouse gases.
The foreseen financing of the investment is by means of a long term credit for a minimum of six years with a one-year grace period and 8.4 % annual interest rate from Bulbank JSC. The credit contract is expected to be executed by the end of June.

The climate on the Bulgarian credit market is improving every year as a result of the stabilization of the country's economy, but still remains risky. This, indubitably, will influence the interest rate for the credit and its other terms and conditions.
The normal interest rates for credits (including fees and commissions) provided in Bulgaria vary within the range of 12% to 17% depending on the size of the credit, its payback terms, and the credit rating of the debtor.
The table herebelow shows the interest rates for long term credits (excluding fees and commissions) provided in Bulgaria by the Bulgarian banks. A similar statement is provided in **Annex No. 11.**

Years	Mean annual interest rate for long-term credits to corporate clients [%]		
Credits in foreign currencies	BGN	EURO	US Dollars
1998	14.338	11.870	13.108
1999	14.548	11.007	14.368
2000	13.582	12.208	15.329
2001	13.153	12.795	14.914
2002	12.594	10.947	11.453
2003	10.998	9.975	10.945
2004	10.427	9.083	8.883

The contracted by Biovet interest rates are considerably lower than the prevailing rates on the credit market of the country due to the fact that Biovet is a **key customer** of Bulbank, and the latter is the largest credit institution in Bulgaria.
The receipt of funds from the sale of emissions would considerably facilitate the financing of the project, which fact is also evidenced by the letter from Bulbank, enclosed herewith in **Annex No. 21**

4.2.6 Permits

In accordance with the provisions of Para. I, Art. 39 of the Energy Act, the production of electric and thermal power is subject to licensing. In addition to the above, in accordance with the provisions of Regulation for Certification of the Origin of Electrical Power Generated from Renewable and /or Combined Generation Sources – 2004, a certificate of origin will also have to be obtained, which as of the summer of 2006 will be replaced by green certificates.
The licensing and the obtaining of the certificate of origin are foreseen to be achieved after the elaboration of the working design. According to the time-schedule for the realization of the project, this is forecast to be achieved during the period from 15.10.2004 till 15.04.2005.

4.2.7 Available local technology, skills and knowledge

Partial experience and capabilities have been accumulated with reference to the construction and operation of co-generation facilities, as follows:

- The experience of the manufacturers, as well as the experience of Biovet in the field of technological equipment deliveries will serve as the basis for the deliveries of the individual equipment units.
- The experience of the designers of Co-Gen Engineering, the experience of Biovet in the construction and installation of equipment, the experience of PMU in the installation of gas turbines, and the supervision by the equipment manufacturers will serve as the basis for the proper design, construction, and instalation of the equipment.
- The experience of the main equipment suppliers will be counted on for the commissioning into operation of the Station.
- The experience of the local personnel in the operation of large compressor units, the steam plant, the HV substation, and the gas supply facilities will provide for the future operation of the Station.

In addition to the above, a contract for the training of the ;personnel has been executed in the main supplier of the equipment GE. Such contracts will also be executed with the suppliers of the boiler and of the control equipment.
A Maintenance and Service Contract has been executed with GE in addition to the main contract.

4.2.8 Social effect and local support

With reference to the above, the project has received support from the Municipality and the residents of the area in the vicinity of the Plant.. This support is expressed in their letters, enclosed herewith in **Annex No 21.**

Support was also expressed for the project by the Regional Inspectorate for the Environment.

4.2.9 Rate of return of alternative projects

There are no other similar projects executed in Bulgaria till date. Two small projects have been executed with gas engines producing electric energy and hot water, but they cannot serve as a basis for comparison.

4.2.10 National expansion plan

In accordance with the National Energy Strategy in the period from 1996 to 2010 the expected growth of the energy sector is in the limits 23 % - 36 %.
Now with the join to Europian Community and the closing III and IV blocks of Kozlodui no enough dates for the future expansion of the sector.
The development of the energy sector are foresee to be in direction:

- First, for the reconstruction and modernization of certain coal-fueled TPP's and also to build up desulphur instalations to them
- Second, to build new RES and high effeciency CHP;
- Third, to build second Nuclear Power Station – Belene.

5. IDENTIFICATION OF THE MOST LIKELY BASELINE SCENARIO AND THE ASSOCIATED GREENHOUSE GAS EMISSIONS

5.1 Construction of the baseline scenario

Baseline CO_2 emissions correspond to those emissions that are both produced by existed boilers and electricity, supplied to the plant, before CHP project implementation.
Baseline emissions can be collected in the "direct on-site" and "direct off-site" categories and comprise the following components:

- **CO_2 combustion** existed boilers provided heat to the plant.
- **CO_2 electricity** – emission associated with the electricity that would have to be purchased from the power grid in order to cover power demand of the plant

In order to estimate the importance of the project realisation upon the CO_2 emissions, the following estimation are prepared:

- estimation of the baseline CO_2 emissions scenario;
- estimation of the CO_2 emissions from the CHP project;
- reduction of the CO_2 emissions as a result from the project realisation.

The quantity of CO_2 emissions may be expressed by multiplication of emission factor and corresponded energy consumption. Emission factors are determined by:
1) For the first baseline emission component: **CO_2 combustion** is associated with the combustion of NG in existed boilers; the emission factor for natural gas is EFmg =56,1 kg/GJ – source: "Operational guidelines for Project Design Document of JIP" – Ministry of Economic Affairs of the Netherlands, June 2003
2) For the second baseline emission component: **CO_2 electricity** – these emissions associated with the electricity from the power grid depend on annually estimated CO_2 emission factor in Bulgaria. The predicted values - BEF_{el} are presented in Table E 1.

(source: "Operational guidelines for Project Design Document of JIP" – Ministry of Economic Affairs of the Netherlands, June 2003

Table E 1 Annually CO_2 emission factors in Bulgaria at:

1) Generation of power;
2) Generation of power including distribution and transmission losses to the power grid

		Years							
BG	**item**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Generated EFel.gen	gCO_2/kWh	814	797	779	761	743	725	707	689
Generated included grid losses BEF_{el}	gCO_2/kWh	957	934	912	890	867	845	822	800

5.2. Estimation of the baseline emissions

Predicted annual baseline heat energy consumption in BIOVET- ABHEC [TJ/y] up to 2012 are presented in Tabl.B. Annual NG consumption in boilers – ABNG in order to cover expected heat demand ABHEC is given by:

$$ABNG = ABHEC / e_b, \ TJ/y \qquad -1$$

where: e_b – boiler efficiency, determined from engineer's analyses.
ABHEC = Dan * H" / 10^6, TJ/y
Dan – annual steam consumption in BIOVET, t/y
H"- steam enthalpy for 8,5 bar,a saturated – 2771 kJ/kg

The estimations of annual baseline CO_2 emissions – BE_{th} from boilers are given by:

$$\mathbf{BE_{th} = ABNG * EFng, \ t\ CO_2/y} \qquad \mathbf{-2}$$

where: EFng = 56,1 t CO_2/TJ – emission factor for NG combustion in boilers

The estimations of annual CO_2 emissions from electricity supplied by power grid – BEl are given by:

$$\mathbf{BEl = ABEC * BEF_{el} / 1*10^{\wedge 6} \ t\ CO_2/y} \qquad \mathbf{-3}$$

where: ABEC [MWh/y]– annual baseline electricity consumption in BIOVET (Tabl. B)
BEF el [gCO_2/kWh] – annual baseline emission factor for electricity from grid – Table E1

Total baseline emissions are:

$$\mathbf{BE_{total} = BE_{th} + BEl} \qquad \mathbf{-4}$$

The results are presented in Table. B1 below.

5.3. Estimation of the heat and electricity rate in the Project boundary

In Table 5.3.1. and the relevant fig. 5.3.1. is shown the average monthly NG heat rate, as well as heat and power capacities in the chosen BIOVET Package Cogeneration.

These project characteristics for gas turbine LM 2000 with the corresponded HRSG are calculated as a function of the mean ambient monthly temperature in Pestera from the deliver -GE Company. The calculated average values for mean yearly ambient temperature (12,5 °C) in the city of Pestera are also presented. The last values are chosen as heat and electricity rate for the project boundary.
The main characteristics in a base load operation of CHP, concerning CO_2 emissions, are:

- Q_f - heat NG fuel input, kWth;
- Q_{el} - power capacity of the CHP, kWe;
- Q_{th} - thermal capacity of CHP, kWth

TABLE 5.3.1. MAIN CHARACTERISTICS OF BIOVET Package Cogeneration Project - gas turbine type LM2000 with HRSG

	Ta, °C	Qf, kWth	Qel, kWe	Dst, t/h	Qth,kWth
JAN	-5	54334	18124	26	20143
FEB	4	51525	18310	22	17044
MAR	7	50673	18220	21	16269
APR	14	48262	17158	20	15494
MAY	17	47111	16590	20	15494
JUN	22	45312	15703	20	15494
JUL	25	44082	15085	20	15494
AUG	24	44507	15299	20	15494
SEP	18	46744	16411	20	15494
OCT	12	48934	17485	20	15494
NOV	9	49876	17925	20	15494
DEC	3	52158	18291	23	17819
Average	**12,5**	**48627**	**17050**	**21**	**16269**
Power efficiency		**35**			
Heat efficiency		**33**			
Steam enthalpy		**2789 kJ/kg**			

NG hour consumption in CHP, recalculated at LHV 8000 kcal/m3 (BULGARGAS – NG sertificate for 2003 –mean value) is GH_{NG} = 5, 23 10^3.Nm^3/h
If compare heat load characteristics in Chapter 1.5.3. with Dst, this value cover exactly base heat load for BIOVET
Annual average CHP characteristics for operational hours - 8200 h/y

Q_f^a, TJ/y	Q_{el}^a, MWh/y	Q_{th}^a, TJ/y
1435	**139811**	**480**

The following equations are used:

Q_f^a = Qf * 3,6 * 8200 / 10^6, TJ/y

Q_{el}^{a} = Qel * 8200 / 10^3, MWh

Q_{th}^{a} = Qth * 3,6 * 8200 / 10^6, TJ/y

GH_{NG} = Qf/1163/8, th.cub.m/h

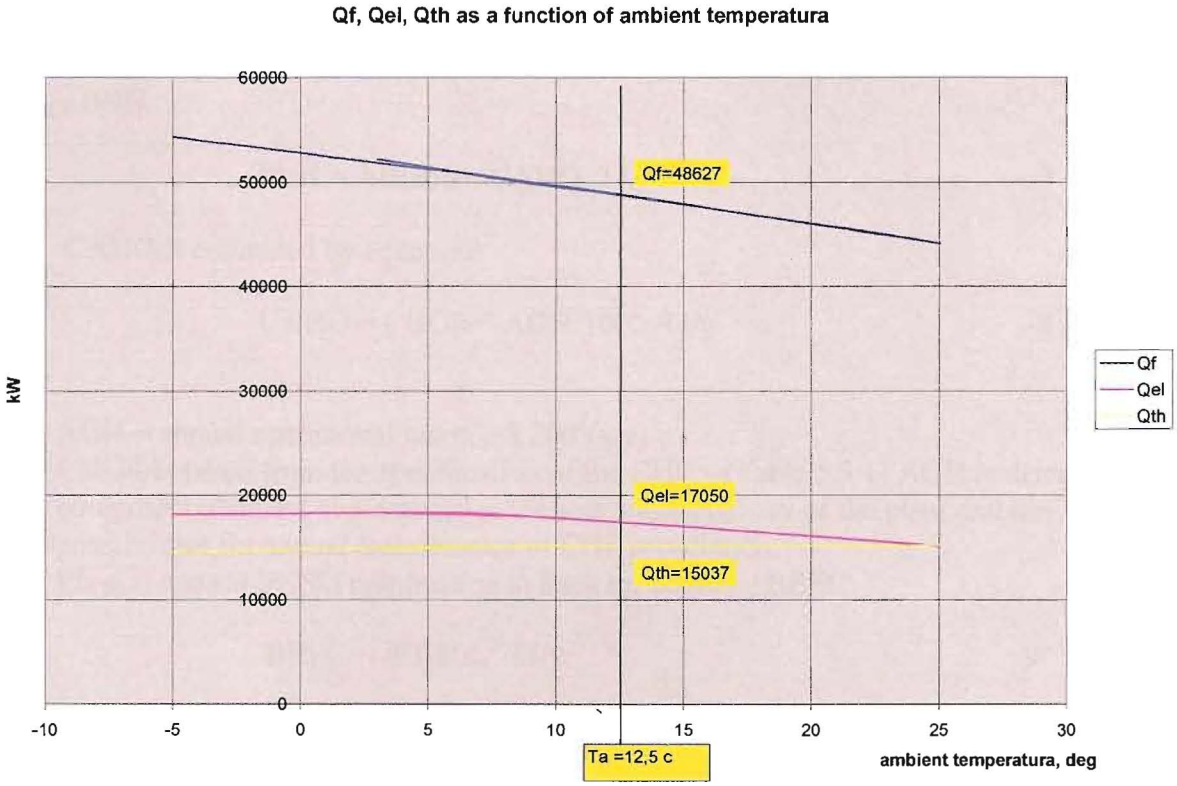


Fig. 5.3.1.

6. ESTIMATION OF CO_2 EMISSIONS FROM THE PROJECT

The main characteristics of CHP, presented in chapter 5.3, are used in the calculation of CO_2 project emission. The following estimation procedure is used for estimation of CO_2 emission in the project boundary:

- Direct on-site emissions into the project boundary are caused by NG combustion in CHP.
  Annual NG energy consumption from CHP, AEC ng, is given by:

$$AECng = EIR_{CHP} * AOH/1000, \ TJ/y \qquad -5$$

Where: EIR_{CHP} is CHP energy NG impute rate (GJ/h) and
AOH – annual operational hours (h/y)
CHOR is taken from the specification of the CHP— (Table 5.3.1). AOH is determined equipment and characteristics of the demand for heat and electricity at the plant.

Direct on-site CO_2 emission from NG combustion in CHP - PE_{CHP}

$$\mathbf{PE_{CHP} = AEC\ ng * EFng} \qquad \mathbf{-6}$$

- Direct off-site emission according to project boundary are:
  - CO_2 emissions caused by NG combustion in back up boilers –PE_{bb}, are estimated as:

Annual baseline heat energy consumption in BIOVET- ABHEC, are presented in Tabl.B and respectively in Tabl.P too. The difference between ABHES and annual heat energy output from CHP - CAHO is equal to annual back up boilers heat energy output – BBH

$$BBH = ABHES - CAHO, TJ/y \quad -7$$

CAHO is estimated by equation:

$$CAHO = CHOR * AOH/1000 \ TJ/y \quad -8$$

AOH – annual operational hours – 8 200 (h/y)
CHOR is taken from the specification of the CHP – (Table 5.3.1) AOH is determined by equipment, demand characteristics for heat and electricity of the plant and the possibilities for annual maintenance of CHP installation.
PE_{bb} is caused by NG combustion in back up boilers – BBEC:

$$BBEC = BBH/ e_{b,} \ TJ/y; \quad -9$$

where: e_b – back up boiler efficiency, determined from engineer's analyses

Direct off-site CO_2 emission from NG combustion in back up boilers - PE_{bb}

$$\mathbf{PE_{bb} = BBEC * EFng} \quad \mathbf{-10}$$

  - CO_2 emissions caused by additional electricity from grid, in order to cover base line electricity consumption of BIOVETY if needed–PE_{grid}, are estimated as:

The positive difference between annual baseline electricity consumption of BIOVET - ABEC and annual electricity output of CHP – CEO [MWh/y] is equal to the additional electricity coming from grid in order to cover baseline electricity consumption of BIOVET – AEl [MWh/y].

$$AEI = ABEC - CEO, MWh/y \quad -11$$

The annual electricity output of CHP – CEO is estimated as:

$$CEO = CPO * AOH, MWh \quad -12$$

where: CPO is CHP net power rate (capacity), MW_e
CPO is taken from the specification of CHP – (Table 5.3.1).

Direct off-site CO_2 emission from additional electricity from grid - PE_{grid}

$$PE_{grid} = AEI * BEF_{el} \quad -13$$

- Direct off-site avoided emissions - replaced electricity. to grid – PE_{rgrid}

The negative difference between annual baseline electricity consumption of BIOVET - ABEC and annual electricity output of CHP – CEO [MWh/y] is equal to the additional electricity coming from grid in order to cover baseline electricity consumption of BIOVET – AEl [MWh/y].

$$(-)\ AEI = ABEC - CEO, MWh/y \quad -14$$

The annual electricity output of CHP – CEO is estimated as:

$$CEO = CPO * AOH, MWh/y \quad -15$$

where: CPO is CHP net power rate (capacity), MW_e
CPO is taken from the specification of CHP – (Table 5.3.1).

Direct off-site avoided CO_2 emission - replaced electricity to grid - PE_{grid}

$$(-)\ PE_{grid} = AEI * EFel_{,gen} \quad -16$$

where: Feel,gen – is emission factor for generated electricity in Bulgaria (Tabl. E1)

Total CO_2 emissions from the project implementation are:

$$PE_{total} = PE_{CHP} + PE_{bb} + PE_{grid} + (-)\ PE_{rgrid}, t\ CO_2/y \quad -17$$

The project emissions results are presented in Table P below.

7. ESTIMATION OF CO_2 EMISSION REDUCTIONS

The difference between total baseline emissions and total project emissions (eq. 4–eq.17) represent the emission reduction from the project activity:

$$ER = BE_{total} - PE_{total}, t\ CO_{2-eq}/y \quad -18$$

CO_2 emission reductions from the project activity are presented in Table. R below.

The calculations of the CO_2 emission reductions for more reliability are made additionally and by other methodology. The calculations are shown in Annex No. 14.

REPORTING FORM FOR A BASE LINE STUDY FOR A CHP PROJECT

B		Unit	2005	2006	2007	2008	2009	2010	2011	2012	2008-12	Prec
	Emisson factors - EF											
B1	CO2 EF from gas combustion	Kton/TJ	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	H
B3	CO2 EF from el. generation in BG	gCO2/kWh	814	797	779	761	743	725	707	689	725	H
B4	CO2 EF from electricity grid	gCO2/kWh	957	934	912	890	867	845	822	800	844,8	H
	Additional data											
B5	Natural gas density at 20 C	kg/Nm3	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	H
B6	Natural gas calorific value	kJ/Nm3	8000	8000	8000	8000	8000	8000	8000	8000	8000	
B7	Losses in grid	%	17,6	17,2	17,1	17,0	16,7	16,6	16,3	16,1	16,5	H
B8	Efficiency of existed boilers		0,89	0,89	0,89	0,89	0,89	0,89	0,89	0,89	0,89	H
B9	Annual mean temperture in Pester	° C	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	
B10	Annual steam production	t/y	262000	270000	275000	278000	280000	280000	280000	280000	279600	H
B11	steam enthalpy-H", P=8,5 bar,a	kJ/kg	2771								2771	H
	On-site consumptions											
B12	On-site el. consumption	MWh	131000	140000	149000	153000	157000	162000	164000	166000	160400	H
B13	On-site heat consumption	TJ	726								775	H
	Heat production											
B14	LHV Heat - boilers on-site	TJ	816	841	856	866	872	872	872	872	871	H
	Electricity production											
B15	El. produced by sources on site	MWh	0	0	0	0	0	0	0	0	0	
B16	CO2 EF of electricity on site	Kton/MWh										
B17	Electricity coming from grid	MWh	131000	140000	149000	153000	157000	162000	164000	166000	160400	H
B18	CO2 EF of electricity from grid	Kton/MWh	0,001	0,001	0,001	0,001	0,001	0,001	0,0008	0,001	0,001	H
	Indirect off-site baselineemissions											
B19	CO2 combustion in boiler	Kton	46	47	48	49	49	49	49	49	49	H
B20	Emissions from electricity grid	Kton	125	131	136	136	136	137	135	133	135,4	H
B21	**Total CO2 baseline emission**	**Kton**	**171**	**177**	**183**	**185**	**185**	**186**	**184**	**182**	**184**	H
B22	**Total CO2 emission - monitoring**	**Kton**		**360**				**922**				**H**

REPORTING FORM FOR A CHP PROJECT

Description of functional units		
1	Purposes for which heat is produced	1. To cover steam demand for technological purposes 2. To cover heat demand for heating and tap water
2	Number of functional units produced or services	4 boilers EKM 12 and 1 boiler PKM12 (steam capacity 5 x 12 t/h)
3	Temperature and presure of heat	Saturated steam with 8 bar,a (170,4 C)
4	Expected annual heat demand within the system boundary for all years for the start of the project	722 TJ
5	95% confidence interval range for annual heat demand within system boundary (TJ)	686 to 758 TJ
6	Annual patern of heat demand	almost constant, increased negligible
7	Other connected heat generation equipment	2 old boilers KM 12 - not in operation now

Description of equipment		
1	**CHP plant**	
	Brand and model type of CHP device	Package Cogeneration-gas turbine LM 2000 "General Electric"
	Heat generation capacity, MWth	15 MWth
	Electricity generated capacity, MWe	17 Mwe
	Average fuel to heat efficiency, %	31 %
	Average fuel to electricity efficiency, %	35 %
2	**Heat transport and distribution**	
	Efficiency of heat distribution – approx.	5-8 %

Table P. Estimation of the project emissions:											Average	
P		Unit	2005	2006	2007	2008	2009	2010	2011	2012	2008-12	Prec
P1	LHV mean value of NG fuel for CHP	kWth	48627	48627	48627	48627	48627	48627	48627	48627	48627	
P2	On-site fuel heat	TJ	1435								1435	H
P3	CO_2 eq. emission factor of fuel used	Kton/TJ	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,056	H
	Heat production											
P4	On-site heat consumption	TJ	726								722	H
P5	Heat produced by CHP	TJ	480								480	H
P6	Heat produced by other sources	TJ	246	268	282	290	296	296	296	296	295	
P7	CO_2 eq. EFof fuel used from other sources	Kton/TJ	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	0,0561	H
	Electricity production											
P8	On-site electricity consumption	MWh	131000	140000	149000	153000	157000	162000	164000	166000	160400	H
P9	Average power rate of CHP	kWe	17050								17050	
P10	Electricity produced by CHP	MWh	139811								139811	H
P11	Electricity from other sources on-site	MWh	0	0	0	0	0	0	0	0	0	
P12	Electricity coming from grid	MWh	-8811	189	9189	13189	17189	22189	24189	26189	20589	H
P13	Losses in grid	%	17,6	17,2	17,1	17,0	16,7	16,6	16,3	16,1	17	H
P14	CO2 EF of electricity from grid	Kton/MWh	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	H
	Direct on-site emissions											
P15	CO2 emissons from combustion in CHP	Kton	81	81	81	81	81	81	81	81	81	H
	Direct off-site emissions											
P16	CO2 emissons from combustion in back up boilers	Kton	15	17	18	18	19	19	19	19	19	H
P17	CO2 emissions from electricity grid		0	0	8	12	15	19	20	21	17	
	Indirect off-site emissions											
P18	CO2 avoided emissions due to load shift -el. grid	Kton	-8	0	0	0	0	0	0	0	0	H
P19	**Total CO2 emission**	**Kton**	**88**	**98**	**107**	**111**	**114**	**118**	**119**	**120**	116	H
P20	**Total emission during monitoring period**	**Kton**		**204**		**582**						H

Table R. Estimation of emission reduction											Average	
R		Unit	2005	2006	2007	2008	2009	2010	2011	2012	2008-12	Prec
R1	Heat and electricity production	Kton	81	81	81	81	81	81	81	81	81	H
R2	Heat from grid	Kton	46								49	H
R3	Electricity from grid	Kton	125	131	136	136	136	137	135	133	135	H
R4	Replaced heat to grid	Kton	0	0	0	0	0	0	0	0	0	H
R5	Replaced electricity to grid	Kton	-8	0	0	0	0	0	0	0	0	H
R6	Other direct emissions from back up boilers	Kton	15	17	18	18	19	19	19	19	19	H
R7	Other indirect emissions from add. El. from grid	Kton	0	0	8	12	15	19	20	21	17	H
R8	**Anual emissions TOTAL reduction**	Kton	84	80	77	74	71	68	65	62	68	H
R9	**TOTAL CO2 reduction - monitoring period**	Kton	**42**	**158**		**339**						H

8. MONITORING PLAN

Considering the project boundary, the following data need to be monitored in order to estimate project and baseline emissions, and emission reductions:

- Natural gas used by the CHP, m^3
- Net electricity supplied by CHP to factory, MWh
- Electricity exchange with the power grid, MWh
- Heat output supplied by CHP to factory, GJ
- Heat output supplied by back up boilers, GJ
- Efficiency of the existed boilers in the plant, whose heat output would be reduced because of heat output from the CHP

CO_2 emissions within the project boundary arise from NG combustion in the CHP.

8.1 Monitoring methodology

8.1.1 Brief description of methodology

This project comprises the installation of a natural gas-fired cogeneration system at an industrial plant, where electricity and heat are provided separately, prior to project implementation. The Monitoring and Verification Plan is based on recording natural gas used by the cogeneration plant, and electricity and heat supplied by cogeneration plant to the factory, as well as heat production from back up boilers and exchanged electricity with the power grid. Data will be collected on a monthly basis for the duration of the project lifetime and crediting period (7 years). CO_2 emissions following project implementation are determined from the parameters monitored, as described above. The monitoring plan describes the procedures for data collection, and auditing required for the project, in order to determine and verify emissions reductions achieved by the project. This project will require only straightforward collection of data, described below.
Considering the project boundary, the following data need to be monitored in order to estimate project and baseline emissions, and emissions reductions:

- Natural gas used by the cogeneration plant, m3.
- Net electricity supplied by cogeneration plant to factory, MWh
- Exchanged electricity with the power grid, MWh
- Net heat supplied by cogeneration plant to factory, GJ
- Heat supplied by back up boilers, GJ
- Efficiency of boiler(s) providing heat to the factory.

For the specific project considerrations in this PDD, a monitoring model has been designed. It is prepared in exel format in spreadsheets as they are presented in ANNEXE. With minimal changes in the monitoring, mainly for modifying parameter estimates to suit individual project circumstances, this model can be applied to any package cogeneration project based on natural gas.

The monitoring model takes monitored data as input, and automatically calculates both project and baseline emissions, for each year following project implementation, in a

dynamic manner. As we have mentioned, baseline emissions are emissions avoided at the industrial plant because of heat and electricity supplied by the cogeneration system. Thus, during project implementation, baseline emissions are best determined from monitored data on heat and electricity output from the cogeneration system.

The model is an electronic CO_2 monitoring and calculation worksheets for package cogeneration projects. The electronic worksheets serves as the data management
and analysis system for the project managers and operators, and can be used throughout the lifetime of the project.

The staff responsible for Project monitoring should complete the electronic worksheets on a monthly basis. The model automatically provides annual totals in terms of GHG reductions achieved through the implementation of the cogeneration system.

The exel monitoring model determines the emissions associated with cogeneration system. The model contains a series of worksheets with different functions:
Data entry sheets:
Natural gas consumption,
Cogeneration electricity supply to plant
Electricity from and to the grid
Cogeneration steamt supply to plant
Back up boilers steam supply to plan

Calculation sheets:
- o *Project emissions*
- o *Electricity baseline*, and
- o *Heat baseline*

Result sheet:
- o *Emissions reduction*

8.1.2 Assumptions used in elaborating methodology:

The monitoring methodology and its application is compatible with the baseline methodology and the development of the baseline scenario for this type of project. The assumptions regarding heating value and emissions factors of fuels are the same in each case, and are unchanged throughout the project. These factors are country specific and are listed in the PDD.

Table 7.1 Data to be collected in order to monitor emission from the project activity, and how this data will be archived

№	Data type	Data variable	Data unit	Measured (m), calculated (c) or Estimated (e)	Recording frecuency	Proportion of data to be monitored	How will the data archived? (electronic/paper)	For How long is archived data to be kept?
1	Volume of natural gas consumed from CHP;	V_{NG}	Nm^3	m	Mont	100%	Paper (field record) Electronics (spreadsheet)	Paper 1 years Electronics 7 years
2	Co-generation electricity to industrial plant	E_{CHP}	MWh	m	Mont	100%	Paper (field record) Electronics (spreadsheet)	Electronics 7 years
3	Steam generation from CHP to industrial plant	G_{STEAM} Q_{steam}	Tons MWh	m	Mont	100%	Paper (field record) Electronics (spreadsheet)	Paper 1 years Electronics 7 years
4	Efficiency of existed boilers	η_{SG}	-	m	Year	100%	Paper (field record) Electronics (spreadsheet)	Paper 1 years Electronics 7 years
5	Lower calorific value	LHV	KKal/Nm^3	m	Mont	100%	Paper (field record)	Paper 1 years
6.	Steam generation from back up boilers	G_{STEAM} Q_{steam}	Tons MWh	m	Month	100%	Paper (field record) Electronics (spreadsheet	Paper 1 years Electronics 7 years
7	Electricity exchanged with the grid	Eg	MWh	m	Month	100%	Paper (field record) Electronics (spreadsheet	Paper 1 years Electronics 7 years

The table below describe QA/QC procedures for with each data variable together with additional relevant information on each variable

Table 7.2 Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

. Data	Uncertainty level of data (High / Medium / Low)	Are QA / QC procedures planned for these data?	Outline explanation why QA/QC procedures are or are not being planned.
1	Low	Yes	These data will be directly used for calculation of emissions reductions
2	Low	Yes	These data will be directly used for calculation of emissions reductions
3	Low	Yes	These data will be directly used for calculation of emissions reductions
4	Low	Yes	These data will be directly used for calculation of emissions reductions
5	Low	Yes	These data will be directly used for calculation of emissions reductions

7.2 Potential strengths and weaknesses of this methodology

Since there are no methodologies approved by the UNFCCC, at this time, specific to this type of project, the strengths and weaknesses of the methodology need to be evaluated on their own merits.
The *strengths* of the methodology are:
Simple and easy to use, based on data that will need to be collected at the project site, for the purpose of metering and billing of heat and electricity output of the CHP and the heat and electricity grids. Complete compatibility with calculation of baseline emissions. Baseline emissions are automatically determined in the spreadsheet model, based on continuously monitored cogeneration system heat and electricity output data, and periodic measurements of efficiency of the industrial boiler. The model permits CO_2 emission reductions to be automatically calculated, taking into account the above considerations.
There are no known weaknesses of the methodology.

The Monitoring Model is Presented in Appendix No. 15

9. ADDITIONALITY TEST

9.1 Project test by the instructions of Test No. 2

There is no law in the Bulgarian Legislation, which requires the building of Co-Generation Gas Plants for combined generation. In fact, according to the provisions of the Energy Act, preferences are granted to producers of electric energy at highly efficient plants for combined generation of electric and thermal energy. However, the law does not treat the necessity of building such projects.

9.1.1 Calculation incomes and costs

The tables "Calculations incomes and costs for Co-Generation Biovet", shown in **Annexes No. 18, 19, and 20** for the various cases, show the calculations of all necessary input data for the software, used to determine the IRR of the project, , e.g. investment value, credit costs at 8.4 % interest rate, expenses for servicing the credit and its interest, expenses for gas, operational costs, income from the generated energy, income from the sold energy.
The Interest costs are calculated with a program in **Annex No.16**.
The data on the prices of the various types of energy in accordance with the latest limit prices specified by the State Committee on Energy Regulation have been used in the calculation of the income and expenses. Excerpts from these prices are shown in **Annex No. 10**.
The price of natural gas for the consumers, connected to the gas distribution network, used in the calculations, amounts to 112,9 EUR/1000 Nm^3.
The natural gas consumption has been calculated at an average hourly consumption of 5230 Nm^3/h (see item 5.3 – Table 5.3.1), which corresponds to the annual energy production.
The sales price of the provided to the NEC network electric energy has been determined on the basis of the provisions of Art. 33, clause 2 of the Energy Act, namely, that this price shall not be less than 80% of the average price for domestic consumers, which, according to the prices quoted in **Annex No. 10** amounts to 55,22 EUR/MWh. The thus calculated price per 1 MWh of sold electric energy amounts to 44,2 EURO.
For the purpose of achievement of the program of Biovet AD for improving the compatibility of its products, constant prices for the purchased energy from the new co-generation station were used for the studied 10-year period, determined on the basis of the current prices, as well, as follows:

- The price of steam at 11 EUR/ton, which is approximately equivalent to the price of steam, produced by the plant TPS according to the prices quoted in **Annex No.10**.

- The sales price of electric energy at 33,35 EURO/MWh, calculated according to the price list quoted in **Annex No. 10**, as follows:
  - Para. VI – prices for corporate customers was used to calculate the average price in the case of tariff measurements of 34.6 EURO/MWh;
  - Para. VII – prices for privileged customers was used to calculate the average price for the holidays and rest days (2668 hours per annum) in the case of tariff measurements of 30.53 EURO / MWh;
  - On this basis, the mean annual prices, paid by Biovet for the supplied to it electric energy by NEC, were calculated. The calculations are – (34.6*6072 + 30.53*2688) / 8760 = 33.35 EURO/MWh.

The operational and maintenance costs were calculated on the basis of the following:

- The contract for maintenance and service with GE provides for 10 EURO/h for the performance of the activities quoted in **Annex No. 17** – Estimated Scheduled Maintenance, which in the case of the planned utilization of 8200 hours per annum amounts to 82000 EURO per annum.
- In addition to the above, the membership in the club of gas turbine owners, which guarantees the temporary replacement of the turbine in cases of repairs, costs 84000 EURO per annum;
- The amount of 35 000 EURO per annum has been foreseen for consumables (filters, oil, etc.) and unforeseen operational costs;
- The amount of 44271 EURO per annum has been foreseen for the salaries of the operational personnel.

The revenues from selling claims of ERUs and AAUs are taken in accordance with the proposed Offer of Emissions Reduction in guarantee save mode of delivery on the base of the calculation in Table R, p. 7 corrected with a coefficient of assurance are shown in **Annex No.20**:

9.1.2 Calculation of the IRR for the project, excluding the revenue from the sale of AAUs and ERUs

The calculation of the Internal Rate of return (IRR) excluding the revenues from the sale of AAUs and ERUa are shown in detail with the aid of the specialized software for their calculation in **Annex No.18**.

The same have been calculated for a 10-year operational period of the Plant. The initial data, e.g. investment value, nominal opportunity cost (long term interest rate on the credit), income and expenses, net cash turnover, etc., have been taken from the incomes /costs table in **Annex No. 18** .

The following results characterize the analysis on the feasibility of the project:

- For the studied 10-year period, the Net Present Value (NPV) is a positive value, which shows that the project as a whole is feasible;
- The expected values of the profit impact resulting from the realization of the project are positive except the eighth year of operation due to the overhaul of the gas turbine;
- The term for payback of the credit, i.e. the project payback term is approximately at the middle of the ninth year of operation;
- The calculated Internal Rate of Return (IRR) for the project for the studied period at 13,2% determines a rate of return, at which the NPV has a positive value, i.e. the project as a whole is feasible.

As a conclusion on this alternative, we can state that the project is feasible, but insufficiently attractive as regards the terms for pay back, the profit impact and the internal rate of return, which makes its financing by a Bulgarian bank /Bulbank/ rather difficult, independently from the preliminary negotiations.

9.1.3 Calculation of the IRR for the project, including the revenue from the sale of ERUs

The calculation of the IRR for the project, including the revenue from the sale of ERUs for the 2008 – 2012 period are shown in detail in **Annex No. 19**. The input data for the program have been taken from the incomes /costs table in **Annex No. 19**.
The effect from the revenues from the sales of ERUs is shown as a net cash flow for the years of their income.
The final results from the calculation of the IRR show a considerably higher feasibility of the project, expressed by:

- An increased Net Present Value from 1 929 300 EURO to 3 479 300 EURO;
- An increased IRR up to 17,3 %;
- A reduced term for the payback of the initial investment by approximately three and half years;
- Kept the positive profit impact on the same level.

As a conclusion on this alternative, we can state that the alternative including the revenue from the sale of ERUs for the 2008 – 2012 period has a higher feasibility and attractiveness for commercial financing.

9.1.4 Calculation of the IRR for the project, including the revenue from the sale of AAUs and ERUs

The calculation of the IRR for the project, including the revenue from the sale of AAUs and ERUs for the 2008 – 2012 period together with the incomes/costs table are shown in detail in **Annex No. 20.**
The additional revenues from the sales of AAUs for the 2006 – 2008 period are shown as a net cash flow for the years of their income.
As can be deduced from the results of the calculations, the IRR grows up to 19,5 %, the NPV grows up to 4 374 200 EURO, and the number of years required for the payback of the initial investment drops to the middle of the fifth year of operation, while expected values of the profits resulting from the realization of the project become positive also like in the variants before remain eight years. The big cost amount for overhaul of the engine in 2011 is the reason for this.
According to this alternative, the project becomes attractive and provides real chances to receive financing from a Bulgarian bank.

9.2 Project test by the instructions of Test No. 3

Since the main additional test of the project is based on Test No. 2, this test is used for providing certain detailed clarifications.

Investment obstacles

The investment obstacles mainly refer to the general difficulties in the provision of the required financing. As can be deduced from the analysis in **Annex No. 12**, the credit

market for the financing of projects related to energy efficiency in Bulgaria is rather narrow. Credits are being provided at high interest rates and at comparatively low values. The required credit for the realization of this investment amounts to approximately 8 000 000 EURO. This amount is too big for the Bulgarian banks. In this case, we count on the largest Bulgarian bank, i.e. Bulbank to finance the investment. Biovet JSC has the required credit rating (like key partner) with Bulbank.
Negotiations are being conducted in parallel with a foreign bank.
The expressed by Bulbank statement as an eventual creditor, quoted in **Annex No. 21**, refers to the recommendation to facilitate the financing by means of the sale of AAUs and ERUs.

Technologic obstacles

The technologic obstacles in this case originate in the following:

- As of date, no similar co-generation plant has been built in Bulgaria, which, naturally, increases the risks for its realization;
- There is no accumulated experience with reference to neither construction nor operation of similar plants. The experience of the individual equipment suppliers and mainly the experience of General Electric is counted on, as well as the local experience in the design, installation and operation of similar equipment;
- Biovet JSC has an entirely different scope of activities, which will additionally hinder the execution of the construction works and the operation of the plant. The eventual incorporation of a new company within the Bulgarian Pharmaceutical Company Holding structure, which is the majority shareholder of Biovet JSC, is being studied at present for the purpose of avoiding the above problems in the construction and operation of the co-generation plant.

9.3 Conclusions

The proposed project for the construction and operation of a Co-Generation Gas Plant at the facilities of Biovet JSC of the town of Peshtera should be considered as an additional project due to the following considerations:

- The feasibility of the project, determined on the basis of IRR at 13,2% and a payback term of 9 years according to the alternative, which excludes any revenues from the sale of AAUs and ERUs, is not sufficiently attractive to provide financing from the Bulgarian banking credit market and the required value of the credit is very high.
- Biovet JSC does not have the required credit rating to allow favorable financing by foreign banks.
- The project has risk characteristics due to the fact that there is not similar project executed till date in Bulgaria and there is no accumulated experience in the construction and operation of similar plants.

Taking the following into consideration:

1. That the project is supported by all the interested parties and institutions, as well as by the new legislative framework for the energy sector;

2. That it provides for a significant reduction of the greenhouse gases emissions in the energy sector, which are expected to grow as a whole due to the fact that expansions of the coal fueled TPS's are foreseen, and can become a prospective alternative for the future development of the energy sector of the country;

3. That due to its non-attractive Internal Rate of Return and the risks resulting from its execution, the project faces difficulties in the provision of the required financing.

The project should be considered as an additional one and the revenues from the sale of AAUs and ERUs should be used to facilitate its realization.

10. STAKEHOLDERS COMMENTS

With reference to the planned construction of the Co-Generation Gas Powered Station at Biovet, the Mayor's Office, the neighboring companies, the people living in the vicinity of the project site, as well as, naturally, the bank, which is expected to finance the project, were acquainted in detail with the planned project. The aims and expected advantages from its realization for the future development of Biovet were explained in detail. The environmental effects from the project were also discussed. Various opinions and comments were heard with reference to the realization and operation of the station. The comments of the interested parties on the project are positive as a whole. Enclosed herewith please find a brief summary of the comments of several interested parties on the realization of the project:

Bulbank Financing Bank– Unicredit Group

Regarding to your intention to realize the project we declare the following:

- Bulbank intends to support the construction of an environmentally friendly power source of Biovet JSC, which will prevent the Company from possible future losses;
- The replacement of the conventional power sources is the right approach, moving to the improvement of our country's ecology;
- We are sure that such kinds of projects are very appropriate considering the shutting down of some of Kozlodui blocks for the country's ecology;
- We are sure that Biovet's project will be efficient and therefore appropriate to be financed;
- With the ratification of Kioto Protocol, Bulgaria is due to reduce the emissions of greenhouse gas by 8.0 % in comparison to 1988.

In conclusion we would like to emphasize, that the development of Bulgarian Industry is still very risky. That's we support, which Biovet JSC would receive from selling GHG emissions credits, will be very important for this project and will make its financing more flexible and less risky.

Municipality of Peshtera

Our attitude to your intentions to construct a TPP for combined generation of electric energy and steam (co-generation) has been formed on the following basis:

- Biovet JSC is the largest company on the territory of the Municipality and its optimum development will positively effect the prosperity of the Municipality and its citizens;
- The construction of such an energy source will create an opportunity for the construction (when it becomes necessary) of a thermal power transfer network in the town;
- The generated electric energy, which exceeds your needs, can be used at times of emergency circumstances as one more energy source for the important consumers in the town;
- The investment project will improve the environment, because it will substitute the energy generation by outdated non-efficient plants, which are fueled by coal.

In conclusion, we support your decision for the realization of the project; however, we would like to underline that the legislation of the Republic of Bulgaria must be complied with during its construction and operation.

Citizens living in the neighborhood of the site

We have been introduced to your project to construct your own power plant fueled by natural gas. Our position is not unidirectional. On one hand, we are pleased that the largest company of the rank of Biovet in our community foresees to expand its generation facilities and stabilize its energy supply. However, on the other hand, we are worried by the eventual noise, which might be caused by the working installation during the operation of the works in our neighborhood. With reference to the above, we kindly request, all the necessary precautions to be made during the design and installation, so that the noise shall be within the admissible values in accordance with the provisions of the law.
We support the realization of the project with only this remark.

A company located near the platform – Old River LTD

Ref. No. 136 dated 29.04.2004 of Old River Sole-Owned Shareholding Company of the town of Peshtera, addressed to Biovet.
We have become acquainted with your project to construct your own station for thermal and electric energy generation.
As consumers of thermal energy from your facilities, we are interested in the improved reliability and quality of the supplied energy, as well as in the improved environment of the area.
Taking into consideration our long-term business relations, we hereby express our full support for the realization of the project and hope that the effects from its implementation will be mutually profitable for both our companies and will guarantee the future deliveries of thermal energy.
Appendix No. 21 consists of the original positions of the interested parties, along with their translations in English.

11. ENVIRONMENTAL IMPACT

It is an established fact that projects of the kind for construction of Co-generation plants fueled by natural gas are not a source of hazardous air and soil pollution. In this case, in accordance with the provisions of the Environmental Protection Act of the Republic of Bulgaria, Article 93, paragraph 1, item 3, this project is subject to an assessment of the necessity for elaboration of an Assessment of the Environmental Impact Report (AEIR). This is the official position of The Ministry of Environment and Waters, expressed by the statement of the Preventive Activities Department.

In accordance with these requirements, Biovet JSC has submitted the required documents for the elaboration of this assessment to the District Environmental Impact Inspection of the town of Pazardzik, in accordance with the requirements of the Regulation on Terms and Conditions for the Elaboration of Assessment of the Environmental Impact Reports for Buildings, Activities, and Technologies (State Gazette, No. 25 dated 18.03.2003).
The following documents have been submitted:

I Information for correspondence with the investor
1. Name, PIN, residence, citizenship – a physical person, head office and unique identity number of a corporation.
2. Full post address
3. Telephone, fax, e-mail
4. Person for correspondence

II Characteristics of investment proposal
1. Proposal's summary
2. Proving the necessity of investment proposal
3. Connection with other existing approved with organization or other type of plan activities.
4. Detailed information for examined alternatives.
5. The building site, including the necessary area for temporary activities during the construction.
6. Main processes description (under catalogue data), capacity.
7. Scheme of a new or already existing road infrastructure.
8. Activity programme, including those of construction, operation and stages of closing, restoration and subsequent usage.
9. Suggested methods for construction.
10. Natural resources forecast for use during construction and operation.
11. Refuses that is expected to be generated – types, quantities and ways of treatment.
12. Information on discussed measurements and precautions for reducing negative effects on the environment.
13. Other activities, connected with investment proposal (for instance building material output, new water-supply system, output and energy transferring, residential building, treatment of sewage).
14. Necessity of other licenses, connected with investment proposal.

III Site of the investment proposal

1. Plan, mapping and photos, showing the limits of the investment proposal, giving information about physical, natural and anthropogenius characteristics, as well information about near-situated elements from the National ecological net.
2. Existing land users and their adaptation to the building site or site trace of the investment proposal and future planned land users.
3. Zoning and land use in accordance with approved plans.
4. Sensitive territories, including sensitive zones, vulnerable zones, protected zones, sanitary-guarded zones and others; National ecological net.
5. Detailed information about all discussed alternatives for site and situation.

IV Potential affects characteristics

A brief description of the possible influences in sequence of the realization of the investment proposal):

1. Affects on people and their health, land use, material assets, atmospheric air, the atmosphere, water, soil, bowels of the Earth, landscape, natural objects, mineral diversity, biological diversity and its elements and protected territories of single and group monuments, as well the expected affects from natural and anthrop genius substances and processes, different kinds of refuse and its location, risky energy resources – noises, vibrations, radiations and some genetic modified organisms as well.
2. Influence upon elements from the National ecologic net, including elements located near the object of the investment proposal.
3. Type of the affect (direct, indirect, secondary, cumulative, momentary, middle- and long-lasting, permanent or temporary, positive or negative).
4. Affect range – geographical area; concerned population; residential sites (name, type – a town, a village, a resort, a number of population and others).
5. Durability, frequency and turn and change of the impact.
7. Precautions and measurements that is necessary to be included in the investment proposal, connected with prevention or avoidance, reducing or compensating of the considerable negative impacts upon environment.
8. Global characteristics of impacts.

Biovet JSC received official answer from Regional Inspection of Environment, that to 30.04.2004 they will issue Assessment for the necessity of Environment Impact Report As a result, we have received a reply from the Regional Inspection of the Ministry of the Environment and Waters at the town of Pazardzhik with their resolution that an Assessment of the Environmental Impact Report does not have to be elaborated for this project due to the following reasons, quoted as the motives for their resolution:

MOTIVES:

1. The realization and operation of the investment project is not expected to significantly affect the population, its health, the flora and the fauna, the landscape, the hydrology and the quality of the waters and of the air;
2. The realization of the investment project will result in a reduction of the hazardous emissions due to the replacement of the fuel.

3. The site for the realization of the investment project is not located in an environmentally sensitive area and no protected sites, territories, or areas, which are populated by protected important or sensitive species of the flora and fauna, will be affected;
4. No written nor verbal objections on behalf of the public or the municipal administration of the town of Peshtera have been submitted.

The full text of the reply on the required performance of an assessment is quoted in **Annex No. 22.**