Environmental Impact Assessment
in relation to the Decision on Environmental Conditions

List of contents

I. SUMMARY IN NON-SPECIALIST LANGUAGE

Comprehensive environmental impact with regard to emission of pollutants into the air, sound distribution, water and sewage management as well as waste management for modernisation of the Group of Combined Heat and Power Plants Bielsko-Biała CHP1 is as follows:

The subject of the study is the characteristics of impact by the planned project consisting in ***modernisation of the combined heat and power plant Bielsko-Biała CHP1*** - construction of the thermal power station unit with electric power output up to 50 MWe and thermal power output up to 110 MWt as well as two water boilers of total capacity up to 80 MWt, inclusive of a partial elimination of the existing facilities.

The Investor is: Południowy Koncern Energetyczny S.A. [Southern Poland Power Company]
40-389 Katowice, 23 Lwowska Street.

Location of the planned project:
The planned project is located **in Bielsko – Biała at 2 Tuwima Street /Group of Combined Heat and Power Plants Bielsko -Biała/** on the plots no 209/10, 209/11, 209/12, 209/22 in the administration district of Lipnik, owned by the State Treasury and held in perpetual usufruct by the Southern Poland Power Company S.A., 40-389 Katowice, 23 Lwowska Street.

Description of the planned operations: The planned project shall cover construction of the thermal power station unit fired with coal at the Group of Combined Heat and Power Plants Bielsko-Biała (CHP1) inclusive of auxiliary facilities and related installations.
The main purpose behind construction of this unit is to replace the exploited basic units of low efficiency, owned by the Southern Poland Power Company based in Katowice – Group of Combined Heat and Power Plants Bielsko-Biała, which shall not meet the future environmental requirements.

The study has been prepared at the request of the Southern Poland Power Company based in Katowice – Group of Combined Heat and Power Plants, Bielsko-Biała, 2 Tuwima Street in order to obtain the decision on environmental conditions of approval of a project.

The site of the project is located in the area not covered by the urban zoning plan. Pursuant to the zoning act, article 67 section 1(Laws Journal 99.15.139 as amended) has ceased to be legally binding on 1 January 2003.

In the Study of Zoning Conditions and Plans for the Municipality of Bielsko –Biała passed by way of the resolution XXII/252/99 of the City Council of 21 December 1999 – **the indicated area around the Combined Heat and Power Plant comprises:** multi- and single-family residential area, as well as preference for minor craft and service business units (Enclosure hereto).

Time of the plant operation: three shifts

Headcount:

The newly designed plant shall involve employing:

120 people, inclusive of;

- *72 workman positions*
- *48 non-workman positions.*

The starting point for preparing this study was a prognosis of environmental impact for the planned project with regard to: natural environment, condition of atmospheric air, acoustic climate of the site, surface and ground water as well as defining the extent of impact of the newly constructed facilities at the stage of construction, operation and liquidation.

The prepared environmental impact assessment demonstrates that:

Environmental impact at the stage of construction will be of temporary character till completion of works connected with the project implementation. In the course of the project implementation the following environmental disturbances may be observed:

>- functional disturbances, deriving from the necessity of temporary limitations in access to the site,

>- pollution of atmospheric air connected with operation of transport and motor vehicles as well as specialist construction equipment,

>- disturbance of the acoustic climate due to noise emitted by the construction machinery and equipment,

>- the flow of rain water as well as ground water will be disturbed,

>- emission of substances to the environment in the form of waste products generated during the construction process,

>- there will be an interference into surface layers of soil,

>- some trees will be cut down.

Environmental impact at the stage of operation will be of the following character:

>- pollutants emitted into the air. The report contains the calculations of emission for nitrogen dioxide, sulphur dioxide, dust and oxygen oxide, whereas on the basis of the aforementioned article 224 section 4 of the act of 27 April 2001 Environment Protection Law (for uniform text see Laws Journal of 2008 No 25, item 150) the permissible levels of emission were proposed for three basic pollutants (nitrogen dioxide, sulphur dioxide and dust) according to the standards defined for the facilities that shall operate at the Group of Combined Heat and Power Plants Bielsko-Biała at 2 Tuwima Street.

>- operation of the designed installation shall not affect the existing acoustic climate of the neighbouring areas,

The performed **acoustic assessment** demonstrated that one may prognosticate that the operation of the designed Combined Heat and Power Plant CHP1 in Bielsko-Biała at 2 Tuwima Street upon the modernisation shall not result in exceeding the permissible standard of noise, i.e. 55 dB(A) for daytime and 45 dB(A) for the night in the areas covered with acoustic protection (multi-family residential buildings) at the southern border. **Environmental impact at the stage of modernisation of** the Combined Heat and Power Plant 1 will be of temporary character but of substantial intensity. In the course of modernisation we may observe significant disturbances of the acoustic climate due to the noise emitted by the machinery and equipment performing the civil works and transport services.

>- operation of the designed installation shall not result in a change of water relations as well as deterioration of the quality of surface and ground water,

>- the process of handling the waste products to be generated pursuant to recommendations thereof shall not pose a threat for the environment,

>- operation of the designed installation shall not affect negatively the condition of soil,

>- operation of the designed installation shall not exert a negative influence on flora and fauna,

>- operation of the designed installation shall not have a negative impact on the NATURE 2000 area,

>- the project shall not constitute a source of extraordinary threat for the natural environment.

Environmental impact at the stage of potential liquidation shall be of temporary character since it will be observed till completion of works connected with the liquidation. One may observe the following environmental disturbances:

The process of the *partial liquidation* shall not involve an occurrence of the environmental disturbances and shall not result in a deterioration of the condition of the environment and its individual components. In the course of the *complete liquidation* one may observe the following environmental disturbances:

- functional disturbances, deriving from the necessity of temporary limitations in access to the site of works performed,
- emission of dust and gas to the atmosphere during the demolition works as well as due to the motor traffic servicing the project,
- disturbances of the acoustic climate caused by works of the heavy construction equipment as well as intensified motor traffic,
- emission of substances in the form of waste products to the environment,
- interference into the surface layers of soil during the foundations elimination.

The analysis of impact of the project, consisting in modernisation of the Group of Combined Heat and Power Plants_Bielsko-Biała, onto individual components of the natural environment, at the stage of the project implementation, operation and potential liquidation, allows for stating that the aforementioned project shall not be of nuisance for the natural environment as well as shall not pose a threat for the health and life of the habitants living in the vicinity of the project site.

II. BASIS FOR PREPARING THE ENVIRONMENTAL IMPACT ASSESSMENT

II.1. Target and scope of the environmental impact assessment

Pursuant to the binding law one of the administrative means that guarantee issuing a proper and balanced decision on implementation of the intended project is the formulation and analysis of the Environmental Impact Assessment. The basic target for drawing the assessment is an identification and recognition of threats and impacts on different elements of the natural environment.

It is a common knowledge that each new project, modification or reclamation changes certain elements of the existing environment.

An extremely significant function of the Environmental Impact Assessment in the process of taking the administrative and investment-related decisions is ensuring the optimum method of project implementation, so as to guarantee a sustained growth for a given region in a long-term perspective (understood for instance as creation of new jobs), with simultaneous consideration of the sustained growth principles.

The process of formulating the environmental impact assessment for the planned projects is a continuous and multi-stage process. The assessment covers the period starting from the project planning and designing, via its implementation, till the recommended monitoring of the environment. Therefore the Environmental Impact Assessment constitutes a document of significance not only for the state administration bodies, which among others based on this study shall issue the relevant decisions and permits, but also for the investor, since while proceeding in accordance with guidelines contained in the Environmental Impact Assessment the investor minimises the potential negative effects of business operations for the environment.

The environmental impact assessment prognosticating the effects of interference into the environment is to constitute:

>- an enclosure to the investor's petition for issuing the decision on environmental conditions of approval of a project,

>- an element characterising the condition of the environment as well as impact of the project at the stage of construction and operation.

Development of this environmental impact assessment has been based on the following legal acts:

- >- Act of 27 April 2001 – Environment Protection Law (Laws Journal of 2006 No 129, item 902 as amended);
- >- Act of 27 July 2001 – on introducing the act Environment Protection Law, the act on waste products as well as amendments to some acts (Laws Journal of 2001 r. No 100, item 1085 as amended);
- >- Act of 3 October 2008 on rendering available the information on environment and its protection, participation of the society in environment protection as well as environmental impact assessments (Laws Journal No 199, item 1227);

>- Act of 13 April 2007 on prevention of damage to the environment as well as remedy measures (Laws Journal of 2007 No 75, item 493);

> Act of 18 July 2001 Water Law (Laws Journal of 2005 No 239, item 2019);

> Act of 27 April 2001 – on waste products (Laws Journal of 2001 No 62, item 628, as amended);

>- Act of 29 July 2005 on amendments to the act on waste products as well as amendments to some other acts (Laws Journal of 2005 No 175, item 1458);

> Act of 16 April 2004 on nature protection (Laws Journal of 2004 No 92, item 880 as amended);

> Act of 7 July 1994 – Civil Law (Laws Journal of 2006 No 156, item 1118);

>- Act of 27 March 2003 on spatial planning and zoning (Laws Journal of 2003 r. No 80, item 717 as amended .);

>- Ordinance by the Council of Ministers of 9 November 2004 on determination of the types of projects that may have a significant impact on the environment as well as detailed conditions connected with classifying the project as eligible for environmental impact assessment (Laws Journal of 2004 No 257, item 2573). In view of the ordinance by the Council of Ministers of 9 November 2004 on determination of the types of projects that may have a significant impact on the environment as well as detailed conditions connected with classifying the project as eligible for environmental impact assessment (Laws Journal of 2004 No 257, item 2573 as amended), the planned project is a project that may have a substantial impact on the environment (§ 3 **section** 1 **point** 4).

This environmental impact assessment contains a description of the conditions of environment usage and exploitation for the purpose of construction and operation of the **modernised Combined Heat and Power Plant in Bielsko-Biała.**

II.2. Legal basis for drawing the assessment

The following legal acts form the basis for preparing the environmental impact assessment:

- Act of 27 April 2001 – Environment Protection Law (for uniform text see Laws Journal 2008, No 25, item 150),
- Act of 27 July 2001 on introducing the act Environment Protection Law, the act on waste products as well as amendments to some acts (Laws Journal 2001, No 100, item 1085),
- Act of 3 October 2008 on rendering available the information on environment and its protection, participation of the society in environment protection as well as environmental impact assess-

ments (Laws Journal No 199, item 1227),

- Act of 13 April 2007 on prevention of damage to the environment as well as remedy measures (Laws Journal of 2007 No 75, item 493),
- Act of 27 April 2001 on waste products (Laws Journal 2007, No 39, item 251 as amended);
- Act of 18 July 2001 Water Law (Laws Journal 2005, No 239, item 2019 as amended),
- Act of 29 July 2005 on exploited electric and electronic equipment (Laws Journal 2005, No 180, item 1495 as amended),
- Act of 11 May 2001 on packaging and package waste (Laws Journal 2001, No 63, item 638 as amended),
- Act of 16 April 2004 on nature protection (Laws Journal 2004, No 92, item 880 as amended),
- Act of 7 July 1994 Civil Law (Laws Journal 2006, No 156, item 1118 as amended),
- Act of 27 March 2003 on spatial planning and zoning (Laws Journal 2003, No 80, item 717 as amended),
- Act of 23 July 2003 on protection and care of monuments (Laws Journal 2003, No 162, item 1568 as amended),
- Act of 13 April 2007 on prevention of damage to the environment as well as remedy measures (Laws Journal 2007, No 75, item 493),
- Ordinance by the Council of Ministers of 9 November 2004 on determination of the types of projects that may have a significant impact on the environment as well as detailed conditions connected with classifying the project as eligible for environmental impact assessment (Laws Journal No 257, item 2573 as amended, Laws Journal of 2005 No 92 item 769 and Laws Journal of 2007, No 158, item 1105),
- Ordinance by the Minister of Environment of 6 June 2002 on admissible levels of some substances in the air, alarm levels of some substances in the air as well as margins of tolerance for admissible levels of some substances (Laws Journal 2002, No 87, item 796),
- Ordinance by the Minister of Environment of 5 December 2002 on reference values for some substances in the air (Laws Journal 2002, No 1, item 12),
- Ordinance by the Minister of Infrastructure of 14 January 2002 on determining the average standards of water consumption (Laws Journal 2002, No 8, item 70),
- Ordinance by the Minister of Environment of 14 July 2006 on the manner of executing the obligations by providers of industrial effluents as well as terms of forwarding effluents to the sewerage systems (Laws Journal 2006, No 136, item 964),
- Ordinance by the Minister of Environment of 24 July 2006 on conditions to be met while introducing effluents to water or soil as well as with regard to the substances particularly hazardous

for the water environment (Laws Journal 2006, No 137, item 984),

- Ordinance by the Minister of Environment of 14 June 2007 on admissible levels of noise in the environment (Laws Journal 2007, No 120, item 826),
- Ordinance by the Minister of Environment of 27 April 2001 on the catalogue of waste products (Laws Journal 2001, No 112, item 1206),
- Ordinance by the Minister of Environment of 21 April 2006 on the list of types of waste products which the waste products holder may hand over to natural persons or organisational units not being the entrepreneurs as well as admissible methods of their recovery (Laws Journal 2006, No 5, item 527),
- Ordinance by the Minister of Economy of 4 August 2004 on detailed procedure for handling waste oils (Laws Journal 2004, No 192, item 1968),
- Ordinance by the Minister of Economy of 9 April 2002 on types and quantities of hazardous substances the occurrence of which is decisive for classifying a given plant as the plant of increased risk or the plant of substantial risk of a serious industrial failure (Laws Journal 2002, No 58, item 535 as amended),
- Ordinance by the Minister of Environment of 21July 2004 on areas of birds special protection Nature 2000 (Laws Journal 2004, No 229, item 2313)
- Ordinance by the Minister of Environment of 16 May 2005 on types of natural habitats as well as species of plants and animals that require protection in the form of allocating the Nature 2000 areas (Laws Journal 2005, No 94, item 795),
- Instruction ITB No 338/96. "Method for determining the emission and immission of industrial noise in the environment as well as software HPZ95ITB". Warsaw 1996;
- Calculation methods of acoustic climate in the environment. Environment Protection Institute Warszawa 1988;
- "Guidelines for the environment protection forces with regard to environment protection in the scope of protection against noise"; Ministry of Environment, Natural Resources and Forestry, Warsaw 1988;
- PN-70/B-02151-"Civil acoustics. Anti-noise protection of rooms".;
- PN-84/N - 01330 - "Noise. Technical method for determining the level of acoustic noise of machinery in free sound field over the sound reflecting surface";
- “Type of natural habitats of European significance, found in Poland and requiring protection" - Dyduch-Falinowska A., Herbach J., Herbichowa M., Mróz W., Perzanowska J. Msc.2001;
- “Nature 2000. European Environmental Network " Ministry of Environment, Warsaw, 2002;
- “System of Environmental Impact Assessments within the European Environmental Network

Nature 2000", EkoKonsult, Gdańsk, 2004;

- Environment Protection Program for the City of Tychy.

II.3. Basic documentation – sources of information

>- Basic design for the boiler and turbine part of the thermal power station unit at CHP 1 - prepared by the **Engineering, Procurement and Construction Management Company "ENERGOPROJEKT-KATOWICE" S.A.**

>- Feasibility Study for the reproduction modernisation of PKE -Construction at CHP 1 Bielsko-Biała of the thermal power station unit 30-50 MW operating in co-generation – prepared by the **Engineering, Procurement and Construction Management Company "ENERGOPROJEKT-KATOWICE" S.A.**

>- Decision on the conditions of site development issued on 20.11.2007.

>- *Letter by the City Council of Bielsko –Biała dated 19.10.2007 with regard to the Study of zoning conditions and plans for the municipality of Bielsko-Biała. A*

>- *General Layout /site development plant / scale 1:1000*

>- Information obtained from the Investor.

II.4. Formal and legal status

> **Site owner**

Owner: STATE TREASURY

Perpetual usufruct: Southern Poland Power Company, Joint Stock Company [PKE S.A.]
40-389 Katowice, 23 Lwowska Street,
Group of Combined Heat and Power Plants Bielsko-Biała
[ZEC] Bielsko-Biała]
43-300 Bielsko-Biała , 2 Tuwima Street.

> **Investor operating the installation**

Southern Poland Power Company, Joint Stock Company [PKE S.A.]
40-389 Katowice, 23 Lwowska Street,

Branch:

Group of Combined Heat and Power Plants Bielsko-Biała
43-300 Bielsko-Biała , 2 Tuwima Street.

On 28.12.2001 **the Group of Combined Heat and Power Plants Bielsko-Biała** merged with the Southern Poland Power Company in Katowice and since then has operated as its branch – Group of CHPs Bielsko-Biała. Therefore the Southern Poland Power Company became the legal successor of the Group of Combined Heat and Power Plants Bielsko-Biała, thus acquiring all the rights and obligations. The Group of Combined Heat and Power Plants conducts the legal transactions as a branch of PKE S.A. Facilities and technological equipment of ZEC Bielsko-Biała constitute the property of PKE S.A. and are listed in its asset registration. They are located on the areas being the subject of perpetual usufruct.

> **Location of the investment project**

Group of Combined Heat and Power Plants Bielsko-Biała

Bielsko-Biała , 2 Tuwima Street

Plots of the following administrative numbers:

- No 209/10, 209/11, 209/12, 209/22 in the administration district of Lipnik.

III. CHARACTERISTICS OF THE PROJECT

III.1. Location of the project

The Combined Heat and Power Plant is located in the southern part of the śląskie province in the city of Bielsko- Biała.

The Combined Heat and Power Plant Bielsko-Biała CHP1 is situated within the territory of the city of Bielsko-Biała between Żywiecka Street, being a fragment of the national road No 69 between Bielsko-Biała and Żywiec, and the railway line between Bielsko-Biała and Żywiec.

CHP 1 is located in Bielsko-Biała at 2 Tuwima Street and borders:

- at the northern side - with Tuwima Street behind which there is the Grunwaldzki Housing Estate with multi-storey buildings (3-storey) buildings – an area designated as CIV3MW and an area designated as CIV 41UH, UK (areas of services, commerce and culture), where the residential buildings at 62 and 64 Broniewskiego Street are located (single-family housing),
- at the eastern side - with Żywiecka Street behind which there are the single-and multi-family residential areas - designated as CIV 7MN, MW (dominated by single-family housing)) and CIV 8MW, MN (dominated by multi-storey housing),

- at the southern side - with Chodkiewicza Street behind which there are the single-family residential areas (terraced and detached housing) - designated as CIV 5 MN as well as industrial areas - designated as CIV 30 P (U),
- at the western side – with railway tracks owned by PKP on the line Bielsko-Biała - Żywiec, behind which the industrial areas are located (Befado and Bielmar plants – designated as CVI 38PN.

Practically speaking, there is no option of expanding the area of CHP in any direction.
CHP has a convenient railway connection via the siding from the main line Bielsko-Żywiec as well as road connection via an exit into J.Tuwima and J. Chodkiewicza Street.

Electric power is led out via the network switchgear 110 kV located within the area of CHP in Żywiecka Street and overhead lines over this street.

The new facilities and equipment of CHP could be located only within the current area of CHP 1.

The location of CHP 1 is presented in the fragment of the plan of the city of Bielsko-Biała (drawing enclosed hereto).

III.2. Characteristics of the project

III.2.1. Current status of ZEC Bielsko-Biała - CHP1

The Group of Combined Heat and Power Plants Bielsko-Biała comprises two sources of co-generation of electric energy and heat:

-> **Combined Heat and Power Plant Bielsko-Biała (CHP 1)** – located in Bielsko–Biała at 2

Tuwima Street – a ***subject of the study***

-* Combined Heat and Power Plant "Bielsko- Północ" (CHP 2), located in Czechowice- Dziedzice at 243 a Legionów Street.

The main subject of operation of the Combined Heat and Power Plant Bielsko-Biała CHP1 is the production of heat and electric energy in co-generation. CHP 1 operates in a collector arrangement with a closed cooling system, equipped with one cooling tower.

Currently in the Combined Heat and Power Plant Bielsko-Biała CHP1 four power generation steam boilers are installed: two boilers of type OP 120, one boiler of type OP140 and one of type OP 230 as well as 3 turbine generator sets: two sets of type TUK 25 (bleeding -condensing) and one of type

TP 30 (back-pressure).

Flue gas from all the boilers is emitted into the air via a joint ceramic emitter E2 of height 160 m and outlet diameter d =5.87 m. Emitter El (stack 120 m high) is currently out of operation.

Gross thermal power of the installation (energy contained in a stream of fuel) amounts to 490.4 MW.

The currently operated generation equipment of total electric power output of 81.2 MW and thermal power output of 275 MW will be withdrawn from operation upon 20,000 h (as of 01.01.2008)

(natural derogation). The installed boilers must be switched off from the operation due to the impossibility of adjusting their operation to the emission standards binding as of 01.01.2008 (emission of pollutants into the air).

While maintaining the "natural derogation" the following standards are binding [mg/m3]:

- S02 : 2000
- NOx : 600
- dust: 350

The feasible time of operation, based on a continuous operation of the Combined Heat and Power Plant for the entire year, amounts to 27 months, therefore the Combined Heat and Power Plant CHP1 may be operated in the years 2008, 2009 and by the end of April 2010 (till the end of heating season).

Possibilities of extending the time of operation:

In line with the currently binding regulations it is feasible to extend the time of operation of the Combined Heat and Power Plant by the end of 2013.

Site development – existing condition

The main building is situated in parallel to Żywiecka Street (with the turbine hall set towards the aforementioned street). Between the turbine hall and Żywiecka Street there is the building housing the control room and auxiliaries switchgear as well as overhead network switchgears of 30 kV and 110 kV. Currently along the turbine hall (approximately l 10 m between the turbine hall and Żywiecka Street) there is no space for new facilities. Behind the main building westwards we find the ash removal equipment, two stacks, compressor station, social and service building, cooling tower,

other smaller facilities and coal storage yard (as far as the tracks PKP Bielsko-Żywiec).

At the northern and southern side the area is limited by a tunnel and coal handling slanted bridges from the coal storage yard to the main building.
At the northern side between the main building, administrative buildings and the water treatment station there is no substantial free space.

Ducts and pipelines of cooling water running from the cooling tower to the main building pose an additional difficulty.

Southwards from the main building and in the direction of J. Chodkiewicza Street the area is not occupied (as far as the workshop building and the oil management building).
Currently this area accommodates the ash retention tank and railway tracks. This is an area of average width of approximately 100 m and length of 250 m (from Żywiecka Street to the garage building). This plot is spacious enough for all the new facilities except for the coal storage yard that may remain in its current location.

III.2.2. Design status

III.2.2.1. Designed facilities

It has been assumed that the main target of the project is to cover the needs of the district heating system of the city of Bielsko-Biała while maintaining the adopted design values.
The master design assumption for this project is the design characteristics of demand for heat by the municipal district heating system, determined based on the data recorded for the previous period.
Needs of the district heating system of the city of Bielsko are covered by two combined heat and power plants within **ZEC: CHP1 – located in the city centre and** CHP2 (at its northern border). In the course of works over selection of the optimum model of heat generation for the city of Bielsko-Biała we considered an entire spectrum of options and configurations of generation power reconstruction (location, size of units).

The performed analytical works demonstrated that the optimum variant of modernisation of the Group of Combined Heat and Power Plants is the co-generation of heat and electric energy.
The planned project assumes the construction at CHP1 of a thermal power station unit with a backpressure turbine of thermal energy output of approximately 106 MWt (max. 110 MWt) and electric energy output of approximately 47 MWe (max. 50 MWe) as well as a fluidised bed steam boiler of capacity 220 t/h, which shall be used to cover the basic and extraordinary

needs of the city of Bielsko-Biała in the heating season.

Moreover, this variant assumes construction at CHP1 of two water peak boilers (double-fuel) fired with gas or light fuel oil, of total capacity of approximately 80 MWt.

Total surface assigned for the new project shall be approximately 11,000 m^2.

The planned project shall involve the construction of:

- ➔ **fluidised bed boiler.**

  Thermal power of the fluidised bed boiler is:

  – total power (in fuel): 172 MW

  – useful power: 157 MW

  The thermal power transmitted outside to the district heating network amounts to 106 MW.

- ➔ **two water boilers**

  of the same thermal power 38 MWt each

- ➔ **start-up boiler**

  Thermal power of the start-up boiler (in fuel) amounts to 3.9 MWt.

  Planned time of operation: approximately 50 hours/ year.

Total installed thermal power (in fuel) shall amount to **253.8 MW**, inclusive of:

- **fluidised bed boiler:** 173.2 MW
- **water boilers (peak and reserve):** 80.6 MW (2x40.3)
- **start-up boiler of power (in fuel):** 3.9 MW

Time of operation for individual boilers /fluidised bed, peak, sub-peak, start-up boiler/:

- **fluidised bed boiler**

  - operation at maximum load: 3,000 hours/ year

  - operation at variable load: 1,370 hours/ year

  - operation calculated into maximum load: 3,970 hours/ year

- **water boilers (peak-reserve)**: approximately 1,300 hours/ year
- **start-up boiler 50 hours/ year**

Construction of the basic power generation equipment shall be accompanied by construction of the auxiliary systems such as:

- fuel management
- sorbent management
- water and sewage management,
- furnace waste management.

The basic mode of the installation operation will be the co-generation of heat and electric energy by the thermal power station unit.

Raw materials to be applied in the production process include:

- hard coal,
- natural gas
- light fuel oil,
- water and powdered limestone as sorbent.

III.2.2.2. Liquidation and demolition works

Within the planned project the following liquidation and demolition works are to be performed:

- disassembly of an electrostatic precipitator of the boiler OP (k4) with a flyover as well as induced draft fan and inlet ducts running to the stack 160 m high, located on the aforementioned flyover,
- disassembly of a slanted coal handling bridge,
- disassembly of the transfer tower structure,
- demolition of the building materials warehouse, oil management as well as the building workshop (completely or partially) in order to enable the construction of an access road to the site, also connecting the site with the reserve water tank (basin) situated on the opposite side of Chodkiewicza Street,
- demolition of the garage building,
- demolition of a 4-storey warehouse, if justified.

Upon handing over the installation for operation all the existing boilers will be shut down and eliminated.

III.2.2.3. Fire fighting system

In the buildings of the boiler and turbine part of the thermal power station unit the hydrant fire fighting installations are to be provided (for a detailed description with a list see the Basic Design - Installation of fire fighting protections).

The system of fire fighting water supply covers the supply of fire fighting water to the fire fighting water tank in the relevant pumping station, overground hydrants located in the plant fire fighting water network, external sprinkler installations for oil transformers, internal sprinkler installations, internal hydrants and hydrant valves as well as intake valves with a pipe connector to hose in the buildings equipped with the internal fire fighting water installations.

The fire fighting water will be stored in a relevant tank.

The pumping installation for fire fighting purposes must enable the supply of water 50 dm^3/s at the network pressure of approximately 0.6 Mpa. It has been assumed that such a maximum reception is connected with the operation of the transformer sprinkler installation. The coal handling system will be equipped with a permanent fire fighting installation (water curtains, etc.).

The coal handling facilities are not to be flushed since these facilities are to be serviced by the air tight sealing and vacuuming installations.

III.2.2.4. Consumption of raw and production materials

Basic fluidised bed boiler

The basic fuel for the fluidised bed boiler at the new thermal power station unit at the Combined Heat and Power Plant 1 will be hard coal coming from the mines located along the Vistula river and in the śląskie province.

The coal mines Ziemowit and Piast are to be the basic suppliers and additionally the coal mine Brzeszcze -Silesia, Ruch and Ruch II.

An option of coal supply from the mine ZG Janina is also taken into consideration.

It has been assumed that the coal of granulation 0-6 mm (suitable for a fluidised bed boiler) could be obtained. Nevertheless, we also assume usage in the plant area of the installed crushers /the boiler house under coal bunkers /, which will be used in case of obtaining the fuel of larger granulation.

It has been assumed that the fractional characteristics of coal will meet the following requirements:

- maximum grain size: 3-10 mm: >99%
- share of grains of granulation < 0.3 mm: < 5%

Basic coal parameters:

- ➔ calorific value 19 MJ/kg
- ➔ ash content 22%
- ➔ sulphur content 1.1 %
- ➔ moisture content 15 %

The annual consumption of coal will amount to **126,480,000 t/year.**

The gas and oil boilers will function as the sub-peak and peak units.

The maximum demand for gas shall amount approximately to **4,400 Nm^3/h.**

The annual consumption of gas: **4,232,600 Nm^3**

The maximum demand for light fuel oil shall amount approximately to: **3.4 t/h**

The annual consumption of light fuel oil: **1,710,000 t/year**

Design start-up fuel for the fluidised bed boiler, peak boiler /gas-oil/ as well as the start-up gas boiler

- natural gas GZ%) of calorific value 33.123 MJ /nm and pressure of 3 bar upfront the boiler; or LFO (light fuel oil – standard DIN51603 T1) of calorific value 42.8 MJ/kg and viscosity at the temperature of 20^0 C.

Properties of light-up fuel and combustion sustaining fuel

The light fuel oil (for instance EKOTERM PLUS) will be used as the light-up fuel and combustion sustaining fuel.

Sorbent

The limestone of reactivity and parameters listed below will be used as sorbent for reduction of sulphur content in flue gas:

- share of $CaCO_3$ in sorbent: 90 %
- content of Mg CO_3 1.6 -2.4
- humidity 0.2 %
- density 1,100-1,450 kg/m^3
- granulation < 800 μm > 99.5%

  <50 μm <10 %

The rated sorbent consumption amounts to 3.57 t/h

The annual sorbent consumption shall amount to 13,600 t/year.

The 25% solution of ammonia water obtained from the chemically pure water will be used to reduce the content of NO_x in flue gas.

Chemicals

We assume the delivery of the following chemicals:

- sodium hypochlorite (for the water treatment installation)
- hydrochloric acid (for the water and sewage treatment installation)
- caustic soda NAOH (for the water treatment installation)
- ammonia
- chemicals for reduction of organics in cooling water

Hot water for central heating

The system for heating of rooms at the unit facilities will be supplied with hot water delivered from the district heating system of the combined heat and power plant.

Demineralised water – to make up the unit steam and water cycles

Water to make up the cooling cycle

Compressed air for transport purposes

Compressed air for sorbent unloading (powdered limestone for the fluidised boiler), reception of fly ash from the electrostatic precipitators as well as other potential needs is to be obtained from the newly designed installation of compressed air delivered to the new unit from the CHP compressed air network. The transported air will have the parameters listed below.

Compressed air for overhaul purposes

Compressed air for the unit overhauls, used among others for driving the overhaul tools (for instance drills) as well as for blowing the installation (e.g. sorbent ducts).

III.2.2.5. Description of the technological process

Type of technology – general information

The Group of the Combined Heat and Power Plants Bielsko-Biała comprises the Combined Heat and Power Plant Bielsko-Biała CHP1 as well as Combined Heat and Power Plant Bielsko-Północ CHP2 in Czechowice - Dziedzice. The basic facility is the existing unit BC 50 of thermal power output of 105 MWt located at CHP2, which will cover the complete thermal needs in summer as well as in the transition period of the heating season (October, April), and some basic needs

connected with supplying auxiliary areas of Bielsko – Biała as well as the needs of the city of Czechowice-Dziedzice. The remaining demand for heat by the city of Bielsko-Biała will be covered from the source installed at CHP l.

Modernisation of the Combined Heat and Power Plant Bielsko-Biała at 2 Tuwima Street will consist in construction of the new thermal power station unit and two water boilers. The basic heat source will be the backpressure turbine generator set producing heat in the form of outlet steam from the turbine (of parameters adjusted to the current requirements of the district heating system) and electric energy in full co-generation. Heat of the outlet steam will be converted into heat in the network water in the by-turbine preheater and then transported for further reheat in the peak units and/ or via heat distribution centres it will be transferred to the district heating system with use of two existing district heating mains DN600. Apart from that, an additional reserve and start-up preheater will be provided, fed with steam by the reducing station that cools bypasses of the turbine generator set. The preheater will be used during the unit start-up and in case of disturbances in the turbine generator set or the power generation system.

The source reconstructed at CHP1 will comprise the following main facilities:

- a thermal power station unit with a steam fluidised bed boiler of capacity 157 MW,
- a peak unit with two water oil-gas boilers of capacity 2 x 38 MW and start-up boiler of capacity 3.5 MW.

At the thermal power station unit (BC-50) a steam boiler will be installed, with a circulating fluidised bed, without a secondary reheat of steam, of the furnace thermal power (chemical energy of fuel delivered to the chamber) of approximately 172MW_t, suspended, with two draughts. The surface of the furnace chamber cross-section will be approximately 50 m^2 with an upper level of the load bearing grating at approximately + 40 m. The furnace chamber will contain the proper surface. The superheater surface will be installed in the cyclone return cycles. The second draught will accommodate the preheaters surface, installation for reduction of nitrogen oxides as well as air preheater.

Coal of proper granulation will be supplied to the coal handling gallery with coal bunkers (adjacent to the boiler house), from which coal will be fed with use of screw conveyors to the fluidised bed. Simultaneously sorbent SOx in the form of powdered limestone will be fed to the fluidised bed.

The air installation covers one fan of air to the furnace, one fan of fluidising air, steam and regeneration air preheater as well as related air ducts. Flue gas from the boiler will be discharged via the electrostatic precipitator and one fan to the installation of the existing stack of height h = 160 m.

The steam drum boiler of capacity 220t/h of live steam will be based on the technology of a

circulating fluidised bed. Due to the high speed of fluidisation (>5m/s) the bed material will be moved upwards the furnace chamber together with flue gas and then in the cyclone separator adjacent to the chamber the larger grains will be separated and returned to the aforementioned chamber. Both the furnace chamber and separator with a siphon element of the bed material return have heatable surfaces for heat exchange (proper, superheaters). Flue gas with minor fractions of the bed (fly ash) upon leaving the separator will be directed to the "second draught" of the boiler, releasing heat on the convection heatable surfaces located thereon. Fly ash will be separated from flue gas at the flue gas return element at the bottom of the second draught, and then in the electrostatic precipitator. In an especially selected point of the second draught, of precisely determined temperature range, ammonium will be dosed in order to reduce NOx content to the permissible level of emission.

Fuel in the form of crushed hard coal will be fed to the furnace with use of screw conveyors via the front wall. Combustion will take place in the fluidised bed boiler at the temperature of approximately 870°C at the rated load.

The bed material is composed mainly of ash and sand with fuel fed. In view of substantial thermal load the process of combustion is run in a stable manner in the range of 40-100% without the addition of auxiliary fuels. Intensive turbulence in the furnaces ensure a proper mixing and burn-up of fuel.

The oil and gas boilers will function as the sub-peak and peak heat sources. Gas will be the basic fuel for the sub-peak boiler, while light fuel oil the reserve fuel. For the peak boiler the light fuel oil will function as the basic fuel, while gas as the reserve one. Both boilers are the identical units, providing reserve for each other.

It has be preliminarily assumed that for needs of the start-up (heating of air for the fluidised bed boiler, heating of feed water) a steam start-up boiler will be built as well, fired with gas and oil, of capacity approximately 6t/h and the following steam parameters: 1.2 MPa, 300°C.

The basic fuel for the fluidised bed boiler at the new unit at the Combined Heat and Power Plant Bielsko-Biała at 2 Tuwima Street will be hard coal coming from the coal mines located along the Vistula river and in the śląskie province . It has been assumed the coal of granulation 0-6 mm (suitable for a fluidised bed boiler) could be obtained. Nevertheless, we also assume usage in the plant area of the installed crushers /the boiler house under coal bunkers /, which will be used in case of obtaining the fuel of larger granulation.

The parameters of coal from different mines range as follows:

- calorific value ranging 18 ÷ 20 MJ/kg
- ash content 20 ÷ 25%
- sulphur content 0.8 ÷ 1.4%

Design start-up fuel for the fluidised bed boiler:

- natural gas GZ50 of calorific value 33.12 MJ/m^3 or LFO (light fuel oil – standard DIN51603 T1) of calorific value 42.8 MJ/kg

Peak and sub-peak gas-oil boiler:

- natural gas GZ50 of calorific value 33.12 MJ/m^3 or LFO (light fuel oil – standard DIN51603 T1) of calorific value 42.8 MJ/kg.

GENERAL DESCRIPTION OF THE TECHNOLOGICAL PROCESS FOR THE BOILER PART

The basic technology covers the basic and auxiliary installations of the steam fluidised bed boiler, main installations of the cycle steam –water for the backpressure turbine generator set of thermal energy output up to 110 MWt and electric energy output up to 50 MWe, main installations of the network water system with a heat battery as well as the system for making up losses.

The basic source of heat will be the backpressure turbine generator set producing heat in the form of outlet steam from the turbine (of parameters adjusted to the current requirements of the district heating system) and electric energy in full co-generation.

Heat of the outlet steam will be converted into heat in the network water in the by-turbine preheater and then transported for further reheat in the peak units and/ or via heat distribution centres it will be transferred to the district heating system with use of two existing district heating mains DN600. Apart from that, an additional reserve and start-up preheater of capacity approximately 100 MWt will be provided, fed with steam by the reducing station that cools bypasses of the turbine generator set. The preheater will be used during the unit start-up and in case of disturbances in the turbine generator set or the power generation system.

The oil and gas boilers will function as the sub-peak and peak heat sources. Gas will be the basic fuel for the sub-peak boiler, while light fuel oil the reserve fuel. For the peak boiler the light fuel oil will function as the basic fuel, while gas as the reserve one. Both boilers are the identical units, providing reserve for each other.

It has been assumed that for needs of the start-up (preheating of air for the fluidised bed boiler, preheating of feeding water) a start-up steam boiler will be built, fired with gas and oil, of capacity of approximately 6t/h and steam parameters: 1.2 MPa, 300°C.

The unit designed at CHP1 will cover the basic and extraordinary thermal needs of the city of Bielsko in the heating season in the period when the average heat demand exceeds 45 MWt as well as it will meet the peak demand by the city (together with oil boilers installed at CHP2).

The heat battery is to be constructed to compensate the daily load fluctuations (particularly in the transition period of the heating season (November, March). It has been assumed that it will be a non-pressure battery operating in a direct cycle.

Electric energy will be produced at CHP1 in full co-generation.

The source reconstructed at CHP1 will comprise the following main facilities:

a thermal power station unit with a fluidised bed steam boiler of capacity 220 t/h and backpressure turbine of 47MWe, 106MWt , a basic district heating unit with the network water pumping station, system for making up losses of network water in the heating cycle, heat accumulation system as well

as the installation of heat separation and release, a peak module with two oil-gas water boilers of capacity 2 x 38 MW as well as auxiliary management systems and installations.

Thermal power station unit BC-50

At the thermal power station unit (BC-50) a steam boiler will be installed, with a circulating fluidised bed, of live steam parameters 540°C, 14.0MPa without a secondary reheat of steam, of the furnace thermal power (chemical energy of fuel delivered to the chamber) of approximately 172MW_t, suspended, with two draughts. The surface of the furnace chamber cross-section will be approximately 50 m^2 with an upper level of the load bearing grating at approximately + 40 m.
The furnace chamber will contain the proper surface. The superheater surface will be installed in the cyclone return cycles. The second draught will accommodate the preheaters surface, installation for reduction of nitrogen oxides as well as air preheater.

Coal of proper granulation will be supplied to the coal handling gallery with coal bunkers (adjacent to the boiler house), from which coal will be fed with use of screw conveyors to the fluidised bed. Simultaneously sorbent SOx in the form of powdered limestone will be fed to the fluidised bed.

The air installation covers one fan of air to the furnace, one fan of fluidising air, steam and regeneration air preheater as well as related air ducts. Flue gas from the boiler will be discharged via the electrostatic precipitator and one fan to the installation of the existing stack of height h = 160 m.

General concept of the fluidised bed boiler

The steam drum boiler of capacity 220t/h of live steam will be based on the technology of a circulating fluidised bed. Due to the high speed of fluidisation (>5m/s) the bed material will be moved upwards the furnace chamber together with flue gas and then in the cyclone separator adjacent to the chamber the larger grains will be separated and returned to the aforementioned chamber. Both the furnace chamber and separator with a siphon element of the bed material return have heatable surfaces for heat exchange (proper, superheaters). Flue gas with minor fractions of the bed (fly ash) upon leaving the separator will be directed to the “second draught” of the boiler, releasing heat on the convection heatable surfaces located thereon. Fly ash will be separated from flue gas at the flue gas return element at the bottom of the second draught, and then in the electrostatic precipitator. In an especially selected point of the second draught, of precisely determined temperature range, ammonium will be dosed in order to reduce NOx content to the permissible level of emission.

Fuel in the form of crushed hard coal will be fed to the furnace with use of screw conveyors via the peak wall. Combustion will take place in the fluidised bed boiler at the temperature of approximately 870°C at the rated load.

The bed material is composed mainly of ash and sand with fuel fed. In view of substantial thermal load the process of combustion is run in a stable manner in the range of 40-100% without the addition of auxiliary fuels. Intensive turbulence in the furnaces ensure a proper mixing and burn-up of fuel.

Basic advantages of the fluidised bed boilers:

- "comprehensive" environment protection due to the fact that small amounts of nitrogen oxides are generated in the process of combustion in low temperatures (800-900°C) and the process of gradual combustion, while by addition of calcium compounds to the furnace the emission of sulphur oxides is reduced by 90-95%,
- an option of obtaining the minimum furnace load to approximately 35 % without sustaining after-burning,
- a high efficiency of the furnace obtained due to the fact that the time of particles' stay in the furnace is long, whereas the mixing of fuel with air is very good,
- an option of quick changes of the boiler load,
- a high degree of desulphurisation in view of good mixing of additives with fuel,
- an option of repeated entry onto load even after several hours of standstill without the use of light-up fuel,
- an option of combustion of coal with high ash content,
- simple process of fuel feeding to the furnace chamber – a smaller number of feeding points due to better mixing in the bed,
- dry discharge of ash from the furnace chamber with an option of its further use,
- a lack of "difficult" effluents.

Best available technique (BAT)

- **Sulphur dioxide**

  The technique of combusting solid fuel in a fluidised bed is regarded as BAT for the boilers of capacity over 50 MW.

- **Nitrogen dioxide**

  The separation of air and recirculation of flue gas is considered the Best Available Technique used in order to remove nitrogen oxides from flue gas from the fluidised bed boilers fired with solid fuel.

- **Dust**

  The application of electrostatic precipitators or fabric filters is regarded as the best available technique used in order to remove dust from flue gas.

- **Identification of potential difficulties connected with the fulfilment of BAT**

  The fluidised bed boiler, proposed for installation at CHP1, will be equipped with the installations and equipment that allow for meeting the requirements of the Best Available Technique.

  We do not foresee any difficulties in meeting the requirements of BAT.

GENERAL DESCRIPTION OF THE TECHNOLOGICAL PROCESS FOR THE TURBINE PART

The unit turbine part is responsible for executing the part of thermodynamic cycle of the thermal power plant (Clausius-Rankine) in the scope of conversion of thermal energy contained in a circulating medium (live steam from the boiler) into mechanical energy (turbine), and then into electric energy (generator) and usable heat (thermal preheater).

The larger the difference in thermal energy between the upper and bottom source of heat flow, i.e. between the live steam parameters and parameters of outlet steam from the turbine , the more efficient the conversion of heat into electric energy is (in accordance with the second principle of thermodynamics). Another factor that increases the cycle efficiency is the so-called Carnotisation (i.e. resemblance to the Carnot cycle) by application of secondary reheat and regeneration. These actions are connected with investment expenditures, due to which there is an optimum range of actions aiming at improving the efficiency, which guarantees the best total economic and technical benefits.

In view of the fact that in the process of heat and electric energy co-generation (that is in the cycle with a back-pressure turbine) there are no significant amounts of heat discharge to the environment, since this heat is used as usable heat (for district heating purposes), for the district heating system that co-operates with the turbine the optimum solutions are the technological systems with a moderately expanded Carnot process (cycles without secondary reheat, with a moderately expanded regeneration). Such a thermodynamic cycle constitutes the basis of the technological design in the

scope of the turbine part. The basic technological process of the turbine covers the following processes:

- expansion of live steam in the turbine in order to reach the parameters set in accordance with the requirements of the district heating system with a conversion of steam into mechanical energy and then into electric energy,
- condensation of outlet steam from the turbine and heat capture by the heating medium (network water) of the district heating cycle in the thermal preheater,
- preheating of the obtained condensate and its degasification in the regeneration system and degasifying station, as a result of which we obtain water feeding the boiler,
- increasing the pressure of feed water to the value required by the boiler and its delivery to the boiler with use of the feed water pumps. Apart from the basic thermodynamic process it is necessary to meet the conditions connected with structural solutions, structural materials, environmental conditions, industrial health and safety as well as fire fighting regulations, transport of equipment and elements, feasibility of maintenance and others.

For this purpose the auxiliary technological installations and auxiliary equipment are used, such as:
oil system for the turbine generator set,
choking sealing systems,
cooling system for auxiliary equipment,
systems for making up losses in technological cycles,
CRM system,
transport and lifting equipment, and others.

General description of the turbine generator set

The basic generation unit of the designed thermal power station unit is the backpressure turbine generator set of the assumed rated electric power of 47 MWe (max. 50 MWe) and thermal power of 106 MWt (max. 110 MWt).

The detailed technical solutions for the turbine generator set will be developed by a supplier of the turbine generator set, to be selected by way of tender.

It has been assumed that it will be a single-cylinder turbine generator set, with a double-coated cylinder in the high temperature part, with a flow system containing an impulse regulation stage as well as gates of reaction or impulse-reaction type. The uniform turbine shaft will be connected by a rigid coupling (SHK) with a synchronic generator cooled with air. The oil system of the turbine generator set will consist of separated cycles operating at different pressures and holding the following functions:

lubricating oil system,

regulation oil system,

jack oil system.

At the steam supply the turbine generator set will be equipped with a set of cut-off and control valves, driven with hydraulic servomotors controlled by EHR - a system of the turbine control and protections. An integral part of the control and protection system will be the turbine BOT software application (enabling an automatic start-up of the turbine).

The turbine generator set will be equipped with gland sealings of labyrinth type with a system of steam that seals the glands as well as steam suction from the gland chambers.

The turbine generator set will be equipped with a turning engine used during the turbine start-up and rundown with a hydraulic drive.

The drainage system of the turbine generator set will operate automatically with a discharge of condensate to the tank of water for making up the steam and water cycle.

In order to lead out the heat generated during the operation of the turbine generator set, a cooling system will be installed to take over heat discharged by the oil system as well as heat from the air-based cooling system of the generator in the generator air coolers, and heat from the distillate cooling.

The CRM system of the turbine generator set (electro - hydraulic) will co-operate with the master unit control and regulation system (DCS) as well as will enable an automatic start-up of the turbine generator set.

At the technological side the turbine generator set will co-operate with the auxiliary equipment and installations such as: oil system, system for regeneration and degasification of feed water supplying the system of heat led-out (network water), start-up and reserve system.

The turbine generator set with a generator will be set on a joint reinforced concrete foundation by means of racks with hydrodynamic bearings (load and thrust-load bearing).

The turbine generator set will have bleedings to supply the LP regeneration preheater, feed water degasifying station as well as HP regeneration preheater. Preliminarily we assumed the following rated values of bleeding pressure in rated conditions, i.e. at the following live steam parameters: 135 bar(a), 535°C and live steam stream: 218.7 t/h and pressure at the outlet of the feed water turbine generator set: 1.51 bar(a)

bleeding no 1 (to LP regeneration preheater): 5 bar(a) bleeding no 2 (to feed water degasifying station): 12 bar(a) bleeding no 3 (to HP regeneration preheater): 20 bar(a).

The regulation of load for the turbine generator set will take place at gliding pressure of live steam at the boiler outlet.

The degasifying station shall operate at the maximum working pressure: 6 bar(a). At the low load of the turbine generator set (operation during the transition period of the heating season) we assume an operation at a lower gliding pressure of the degasifying process (adjusted to pressure in bleeding no 2).

Facilities of the boiler and turbine part apart from the traditional facilities such as:

a) boiler house with a fluidised bed boiler, by-boiler tanks of sorbent, ash, inert material as well as auxiliary equipment;

b) coal handling gallery with 4 coal bunkers as well as conveyors and crushers located beneath;

c) electrostatic precipitator with induced draft fan and flue gas ducts to the stack;

d) gallery of the water degasifying station and feeding pumps;

e) turbine hall with a backpressure turbine generator set, network water preheaters and adjacent gallery of network water pumps;

f) electric equipment of power leadout with the unit transformer and auxiliaries with a tap and reserve transformer;

g) Unit CRM system with control room;

also include:

h) boiler house: peak and reserve with two water boilers and one steam boiler fired with natural gas or oil;

i) heat battery for heating network water with connecting pipelines;

j) wet cooling tower for motor water with connecting pipelines;

k) rooms for the new water treatment station.

Apart from the cooling tower the above mentioned facilities will be situated in the area southwards

of the existing main building.

Space demand for facilities of the thermal power station unit

The space for new facilities is limited by borders of the territory of the Combined Heat and Power Plant as well as the existing buildings. Overall dimensions of the new facilities should not be larger in a horizontal projection than the dimensions presented below and adopted for location purposes in the general layout.

Ad. a) boiler house 24 x 27 m + pylon of vertical communication

Ad. b) coal handling gallery and transfer tower 9 x (24 + 2) m

Ad. c) electrostatic precipitator with flue gas ducts 8 x 9m

III.2.2.6. Technical description pertaining to the management systems and installations situated within the area of the boiler house and turbine hall

➔ coal handling system

Hard coal will be the basic fuel for the thermal power station unit.

Maximum coal consumption for the unit has been determined as:

- 33.2 t/h (800 t/24 hours) for coal with design parameters
- 34.8 t/h (835 t/24 hours) for coal with limit parameters

It has been assumed that coal will be delivered to the combined heat and power plant area with use of railway transport (dumping cars of Talbot type). A slot unloading bunker of volume of approximately 900 $m^{3,}$ has been provided for coal unloading. It enables a simultaneous unloading of 4 railway cars of Talbot type. The system of fuel feeding from unloading at the storage yard or to the by-boiler bunkers is designed in a double arrangement, i.e. one conveyor in operation and one in reserve.

Coal storage yards – it has been assumed that the coal storage yard will be divided into two piles: no 1 and no 2 – similarly as it is the case right now.

The stacker-reclaimer (X1EAD01AF801) will constitute the main piece of equipment operating at the storage yard. The stacker-reclaimer will perform two basic functions:

- coal stacking into piles
- feeding coal from piles onto conveyors.

Within the storage yard for each pile a backfill well will be provided for emergency feeding of fuel to the coal handling system.

Within the existing storage yard some surfaces were separated and assigned for:

- construction of garages for bulldozers with social rooms since the existing garages are to be demolished,
- an overhaul bay for the stacker-reclaimer.

Additional installations – in line with the binding standards the fuel feeding installation will be equipped with the system of transferred material air-tight sealing and vacuuming.

Installation for air-tight sealing pertains to the following facilities:

- slot bunker(X1EAE01BB101)
- P1 transfer building
- bunker gallery

Installation for vacuuming pertains to the following facilities:

- slot bunker
- M1 tunnel
- P1 transfer building
- M2 slanted bridge
- bunker gallery
- boiler house

➔ oil management system

The oil installation shall base on the light fuel oil of ignition temperature above 55 ^{0}C. The oil management system will comprise the following facilities:

- installation for unloading of oil from railway cars
- oil storage tank V =1000 m^3 (X1WGB10BB601)
- oil storage tank V=1000 m^3 (X1WGB20BB601)
- fuel oil pumping station with transport pipelines to the boilers
- installation for washing oil
- oiled effluents installation

The installation's task is to supply light fuel oil to burners of:

- fluidised bed boiler CFB - 1 pcs
- peak oil and gas boiler - 2 szt
- start-up boiler - 1 szt

Installation for oil unloading from railway cars and motor vehicles

The light oil will be unloaded from the newly designed unloading collector for railway cisterns. Four unloading stations will be provided for simultaneous unloading of 4 railway cisterns, of

volume 50t each.

Additionally, it will be possible to unload oil from the car cistern, with an unloading point near the unloading collector of railway cisterns. Oil from a cistern will flow gravitationally to the unloading pump (X1EGA10AP501 or X1EGA20AP501) of capacity Q=~55.0m^3/h, p= 0.4MPa situated in the pumping station, and them pumped to the storage tanks 2x V=1000 m^5 (X1EGB10BB601 and X1EGB20BB601).

Oil storage tanks (X1EGB10BB601 and X1EGB20BB601)

Two steel vertical tanks are designed for storing the light fuel oil – with double shell, insulated, of volume V=1,000m^3 each.

In order to prevent the oil seeping into the soil, the tanks are to be equipped with a double bottom and oil leakage monitoring.

Fuel oil pumping station with transport pipelines to the boiler

Two lines are to be provided for the transport of light fuel, comprising the moderately precise filter (X1EGC10AT001 and X1EGC20AT001), pumping aggregate (X1EGC10AP501 and X1EGC20AP501) of parameters: Q=~8.0m^3/h , p= 0.6MPa and one precise filter X1EGC10AT002 and X1EGC10AT002) , each of flow capacity 100%. It has been assumed that one line would operate for the peak boiler and potentially for lighting up the fluidised bed boiler, while the other line would constitute an operational and overhaul reserve.

The system for transport of light fuel oil will be equipped with a control valve responsible for sustaining the fixed pressure of approximately 0,3 MPa upfront the boilers. The pumps for transporting fuel (X1EGC10AP501 and X1EGC20AP501) to the boilers will be installed in the pumping station together with unloading pumps (X1EGA10AP501 and X1EGA20AP501). The light fuel oil will be transported with two pipelines (supply – recirculation) at the newly designed flyover.

The pipelines transporting oil will be electrically heated and insulated as well as equipped with the thermostatic regulation system to sustain the required temperature >5°C (i.e. the required oil viscosity upfront the burners). The pipelines will run with a slope downwards towards the pumping station. The maximum consumption of light oil has been assumed for the operation of one peak boiler and for lighting up the fluidised bed boiler (CFB), which usually takes approximately 10 hours.

Installation for washing oil

An installation with hot water of temperature approximately 50"C shall be provided for washing the

floor at unloading stations as well as the floor of the pumping station.

At each unloading station and in the pumping station there will be installed a hose with a wash pipe for washing the floor.

The produced oiled effluents will flow off into the oil separator located nearby the pumping station.

Installation of oiled effluents

Effluents produced as a result of leakage or errors in service from the unloading station and pumping station will flow off to the newly designed oil separator.

A coalescent oil separator of capacity approximately V=6l/s is to be provided.

➔ gas management

Natural gas GZ-50 for the boilers will be supplied from the newly designed reducing and measuring station of gas p=0.5/0.3MPa.

The installation's task is to supply gas to the burners of:

- fluidised bed boiler CFB (1 pcs),
- peak oil and gas boiler (2 pcs),
- start-up boiler (1 pcs).

The reducing and measuring station will be installed outside the boiler house in the form of a container. The route of the gas pipeline from the reducing and measuring station to the boiler house will run in the ground at the depth of approximately 1.0m. The gas pipeline running in the ground at the point of crossing with railway tracks, roads, power cables will be protected by a protecting tube.

On the pipeline supplying gas to the boilers the following valves are to be installed: a manually operated cut-off valve as well as a quick closing valve (01EKG30AA701), which will enable remote cutting off gas to the reception points via a control modem based on a signal from the gas concentration sensors and smoke detectors as well as based on a command from the central control room.

On pipelines running to individual boilers the gas paths will be installed, being the modules incorporating: control valves, filters, cut-off valves, blow-off valves as well as CRM equipment.

This paths constitute an integral part of the burner and will be delivered together with the boiler.

The maximum consumption of gas is assumed in case of operation of one peak boiler and it amounts to:

$I = 4{,}382\ [m^3/h]$

➔ fly ash installation

Fly ash from the fluidised bed boiler will be collected from hoppers of water preheater (ECO), air

preheater (AH) and hoppers of electrostatic precipitator (ESP). The ash will gravitationally be fed to the pneumatic transport pumps installed under each hoppers, i.e.:

pneumatic transport pump (X1ETG01AF701) ECO, pneumatic transport pump (X1ETG01AF702) ECO, pneumatic transport pump (X1ETG01AF703) AH, pneumatic transport pump (X1ETG01AF704) AH, pneumatic transport pump (X1ETG11AF701) ESP, pneumatic transport pump (X1ETG11AF702) ESP, pneumatic transport pump (X1ETG12AF701) ESP, pneumatic transport pump (X1ETG12AF702) ESP, pneumatic transport pump (X1ETG13AF701) ESP, pneumatic transport pump (X1ETG13AF702) ESP, pneumatic transport pump (X1ETG14AF701) ESP, pneumatic transport pump (X1ETG14AF702) ESP,

It has been assumed that the pumps with ECO and AH will operate for a joint transport collector. Pumps with ESP will operate for two joint transport collectors. The system will be fed with transport air from the newly designed compressor station of pressure p=0.6MPa and drying degree -40°C. The transport pipelines will run on a flyover to the region of ash tank – over one tank the two-way valves with pneumatic drives will be installed.

It has been preliminarily assumed that fly ash will be forwarded to two tanks:

- newly designed fly ash tank Vu=1 OOOm^3 (X1ETH1OBB101),
- newly designed fly ash tank Vu=1 OOOm^3 (X1ETH20BB101) to replace the existing ash tank.

The blower will function as a reserve aeration blower for both installation (X1ETH30AN601).

At the section between retention tanks and boiler house wall the sorbent pipelines will run on a newly designed flyover.

➔ bottom ash installation

Bottom ash from the fluidised bed boiler will be released from hoppers of the by-boiler bottom ash tank (01ETH10BB101). The ash will be gravitationally fed to the pneumatic transport pumps installed under each hopper, i.e.:

- pneumatic transport pump (X1ETF01AF701),
- pneumatic transport pump (X1ETF01AF702).

It has been assumed that each pump will operate for its own transport collector. The system will be fed with transport air from the newly designed compressor station of pressure p=0.6MPa and drying degree -40°C. The transport pipelines will run on a flyover to the region of ash tanks. It has been preliminarily assumed that bottom ash will be forwarded to:

- newly designed fly ash tank Vu=1 OOOm^3 (X1ETJ01BB101).

At the section between the retention tank and boiler house wall the sorbent pipelines will run on a newly designed flyover.

➔ sorbent management

Sorbent for needs of the unit will be delivered to the CHP area by:

- railway transport
- motor vehicle – as a reserve.

It has been assumed that sorbent will be stored in a newly designed sorbent tank V_u =1000 m^3.

Balances of the sorbent consumption depend on the coal quality.

➔ compressed air installation

For needs of the unit (recipients of the boiler and turbine part) a uniform quality of compressed air has been adopted. We have assumed the air of pressure 0.6 Mpa (at the reception points) cleaned from oil content max 10 mg /Nm^3 and dried to the dew point temperature -40 ^{0}C.

Total demand for compressed air will amount to 6,300 Nm^3 /h. The operation of maximum 3 compressors has been assumed, while the fourth compressor will provide reserve both for operation and overhauls.

In order to maintain a proper retention in the compressed air network and to stabilise pressure the accumulating and equalizing tanks will be installed upfront the driers, of capacity V=5m^3.

➔ ammonia management

The ammonia installation's task is to reduce the NOX content, which is performed by injection of 25% solution of water and ammonia to the boiler (separators).

The installation comprises:

- station for ammonia unloading from a auto-cistern,
- pump for ammonia unloading from a auto-cistern (X1OCB01AP701),
- ammonia tank (X1QCB01BB701),
- ammonia vapours washer/ neutraliser (X1QCB01AT901),
- ammonia transport pump (X1QCB1OAP701),
- ammonia transport pump (X1QCB20AP701).

The station for ammonia unloading from an auto-cistern will be equipped with a leak proof tray with an option of discharge of ammonia from potential leakages and of rain water. An identical solution is applied for the ammonia tank. The pump sets will be installed in a prefabricated container adjusted to the installations of this type (for example eyewasher, etc.).

The ammonia pipeline at the section between the pumping station and boiler house wall will run on the newly designed flyover.

According to the data assumed for the boiler the ammonia feeding installation will enable an injection of approximately 30 kg of ammonia per hour into nozzles, i.e. approximately 0.12m^3/h (25% solution of water and ammonia). The ammonia injection nozzles will enter the right and left boiler separator.

- **➔ air tight sealing and vacuuming installation**

The boiler and turbine parts include a complete vacuuming installation for the boiler house. The installation ensures an option of dust removal from the main boiler service levels, i.e. O.OOOm; +7.50m; +12.0m; +18.40m; 23.50m; 28.30m; +33.0m ; +39.60m. The installation comprises a suction and filtering module (industrial vacuum cleaner) 01SDA02AT280 installed at the level +7.50 and piping. The installation in its piping part will include 4 main risers DN100 running on the main boiler structure, flap branches DN70 at each main level and suction hoses. The capacity of the vacuuming installation allows for simultaneous use of two suction connectors.

The material upon dust removal will be discharged to a mobile container set on the level ±0 OOOm The suction and filtering module is fully protected against explosion.

- **➔ overhaul management**

The scope of overhaul installation includes in the turbine part:

- manual hoist over the return station,
- manual hoist over the unloading station,
- manual hoist over the suction aggregate of the installation for air tight sealing in the boiler house.

III.2.2.7. Ventilation, air conditioning

HVAC installation for the unit BC 50 MW – main building.

The heating installation will be supplier from the auxiliaries distributor in the room of gas and oil boilers.

The boiler house shall accommodate a unit for separation into individual cycles for the main building.

Boiler house

The boiler house shall be ventilated with use of external fresh air in a gravitational manner in line with the principle of "increasing heat convection".

The air supply equipment includes:

- heating and ventilation apparatus AGW
- air supply set – mixing ZM
- air supply sets - intakes - CZ

The air exhaust equipment includes:

- intake of ventilation air by the process equipment, i.e. fans of the boiler combustion process.

Description of the smoke removal process:

The gravitational smoke removal installation will be provided for the boiler house.

The smoke removal installation ensures:

- removal of smoke from evacuation routes,
- quick and regular action by the fire fighting forces,
- protection of the building structure and its equipment from high temperature.

The smoke removal process is to be electrically controlled (close-open command) for regulated dampers (servomotors with a return spring).

Coal handling gallery, transfer tower – ventilation and smoke removal installation

Ventilation system for the **coal handling gallery** has been assumed with natural air supply and mechanical exhaust.

Air supply equipment:

- air wall intakes located on an external wall, with multi- blade dampers (open in summer – fresh air is collected from the outside),
- air wall intakes located on an internal wall with multi- blade dampers (installed at the boiler house wall).

Exhaust equipment:

Roof exhaust fans, operating in the function of exhaust and smoke removal.

The process is to be electrically controlled (close-open command) for regulated dampers (servomotors with a return spring).

Ventilation of **the coal handling transfer tower** has been adopted as natural air supply and mechanical exhaust.
Air is supplied via technological openings, while the exhaust takes place mechanically via two roof exhaust fans with a return flap operating in the function of ventilation and smoke removal.

Electric rooms of the boiler house
Electric rooms in the boiler house include: switchgear kV- BBB, BBA, switchgear 0.4 kV – BFC, BFD with cable rooms.
The ventilation engine room services the aforementioned rooms (air supply and exhaust ventilation system).
Inverters for the boiler house
The room of frequency converters for air fans is located in an annex to the boiler house. For the aforementioned room a system of mechanical overpressure supply and exhaust ventilation system will be provided with a re-circulating heat recovery.
Turbine hall
The turbine hall constitutes one ventilation zone.
In line with the input data for the aforementioned hall we adopted the natural supply and exhaust ventilation system with a partial support of the mechanical ventilation.
Electric rooms – in the turbine hall – ventilation installation.
Electric rooms are located in different parts of the turbine hall.
For electrical rooms in axes GA/27-28 the ventilation engine room will be provided.
Two air supply and exhaust units have been adopted as the ventilation equipment.
A room of frequency converters for network water pumps
For the aforementioned room a system of mechanical overpressure supply and exhaust ventilation system will be provided with a re-circulating heat recovery.
Cable tunnels at the level of -3.00 m.
For cable ducts the natural air supply ventilation will be provided, while the mechanical exhaust ventilation will be switched on periodically according to the service needs.
Smoke removal for cable ducts based on mechanical exhaust ventilation.
Natural air supply via a ventilation intake. Exhaust via a ventilation duct and roof exhaust fan operating in the smoke removal function. Manual start.
Communication passage - ventilation installation

Staircase – natural ventilation

Gravitational smoke removal system.

Vestibules – gravitational exhaust ventilation

Mechanical smoke removal installation.

Lift shaft – natural ventilation

HVAC installation for the region of the electrostatic precipitator.

Fan room - exhaust ventilation

Switchgear room - 0.4 kV BFE - mechanical air supply ventilation equipped with an air supply ventilation unit operating in overpressure and exhaust fan.

A room under the electrostatic precipitator - mechanical air supply ventilation equipped with an air supply ventilation unit operating in overpressure and exhaust fan.

HVAC installation for the building of the former boiler house WP -120

Oil and gas boilers room – the amount of air collected by the boilers exceeds the needs of the room ventilation, air for the boilers will be collected both from the hall inside and outside.

SUW rooms – mechanical air supply ventilation and additionally ventilation of split type.

Control rooms – supply and exhaust ventilation equipped with a ventilation unit operating in a recirculation system.

Cable and crossover cabinet rooms – mechanical supply and exhaust ventilation from the ventilation unit. Additionally ventilation of split type.

IV. ENVIRONMENTAL IMPACT – CONSTRUCTION STAGE

DESCRIPTION OF ANALYSED VARIANTS FOR THE PLANNED PROJECT

IV.1 Variant proposed by the applicant and rational alternative variant.

The variant proposed by the applicant would consist in implementation of the project – ***modernisation of the Combined Heat and Power Plant Bielsko-Biała CHP1.***

The master design assumption for this project is the design characteristics of demand for heat by the municipal district heating system, determined based on the data recorded for the previous period.

Needs of the district heating system of the city of Bielsko are covered by two combined heat and power plants within **ZEC: CHP1 – located in the city centre and** CHP2 (at its northern border).

In the course of works over selection of the optimum model of heat generation for the city of Bielsko-Biała we considered an entire spectrum of options and configurations of generation power reconstruction (location, size of units, conditions of the district heating network).

In view of the most favourable conditions of the thermal network the optimum solution is the modernisation of **the Combined Heat and Power Plant Bielsko-Biała CHP1.**

The performed analytical works demonstrated that the optimum variant of modernisation of the Group of Combined Heat and Power Plants is the co-generation of heat and electric energy.

The environmental impact assessment has been prepared with consideration of the current environmental requirements and is consistent with the regulations currently binding in the scope of environment protection. The assessment defines the principles of the project implementation and operation, preventing an occurrence of negative effects of the changes introduced.

The project implementation in line with the requirements and recommendations contained in this stud, shall not cause permanent changes in the natural environment.

The site assigned for the project is covered with the existing facilities, installations, roads and railway track system.

The rational alternative variant would consist in a failure to implement the project and keeping the current status unchanged.

Existing condition

The main subject of operation of the Combined Heat and Power Plant Bielsko-Biała CHP1 is the production of heat and electric energy in co-generation. CHP1 operates in a collector system with a closed cooling system, equipped with one cooling tower.

Currently in the Combined Heat and Power Plant Bielsko-Biała CHP1 four power generation steam boilers are installed: two boilers of type OP 120, one boiler of type OP140 and one of type OP 230 as well as 3 turbine generator sets: two sets of type TUK 25(bleeding -condensing) and one of type TP 30 (back-pressure).

Gross thermal power of the installation (energy contained in a stream of fuel) amounts to 490.4 MW.

In view of the necessity to exclude from operation the installed boilers and due to the lack of possibility of meeting the standards of emission into air binding as of 01.01.2008.- **the alternative variant would not be advantageous for the environment.**

A total liquidation of the Combined Heat and Power as well as failure to initiate the modernisation works would result in a growth of low emission within the city area, which would derive from the lack of control over the type and quality of fuel burned in individual heat sources. Such situation would undoubtedly have a negative impact on the condition of natural enviroment.

In the course of works over selection of the optimum model of heat generation for the city of Bielsko -Biała we considered an entire spectrum of options and configurations of generation power reconstruction (location, size of units, conditions of the district heating network).

All the arguments demonstrate that the modernisation of the Combined Heat and Power Plant Bielsko-Biała CHP1 the best solution to the problem connected with covering the needs of the district heating system of the city of Bielsko- Biała.

IV.2. Variant most beneficial for the environment with justification

The variant most beneficial for the environment will consist in implementation of the project, that is ***modernisation of the Combined Heat and Power Plant Bielsko-Biała CHP1***

Based on an in-depth technical and economic analysis, with consideration of the project's environmental impact, with regard to the current status, we propose accepting the selected variant as most beneficial for the environment, that is the implementation of the project connected with ***modernisation of the Combined Heat and Power Plant Bielsko-Biała CHP1.***
The variant proposed by the applicant is supported by the so-called **social interest.**
It has been assumed that the main target of the project is covering the needs of the district heating system of the city of Bielsko-Biała, while maintaining the assumed design conditions, which allows for meeting the standards of emission into air binding as of 01.01.2008.

The master design assumption for this project is the design characteristics of heat demand by the municipal district heating system prepared on the basis of data recorded for the previous period.
All the considered options demonstrate that the modernisation of the Combined Heat and Power Plant Bielsko-Biała CHP1 is the best solution to the problem connected with covering the needs of the district heating system of the city of Bielsko- Biała.
The following activities are recommended during the project implementation:

Before staring the investment-related:

- arrange a suitable secured place for storing the building materials,
- properly organise a place for storing of waste products generated in the course of works,
- properly prepare and label access roads to the site.

In the course of the investment-related works

- if possible, limit the acoustic impact connected with works run as well as minimise its negative influence on the acoustic climate of adjacent areas,
- if possible, run on a regular basis the cleaning process,
- organise works in such a way so as to prevent potential dusting,
- limit the amount of generated waste products.

Upon completion of investment-related works

- utilise the generated waste products in a proper and lawful manner,
- clean up the site.

Any works connected with the project implementation should be run in such a way so as to:

- if possible, limit a growth of acoustic impact connected with works run as well as minimise negative influence of noise on the acoustic climate of adjacent areas,
- limit the emission of dust and gases connected with executed works,
- limit the amount of generated waste products and ensure their utilisation in accordance with relevant regulations,
- ensure the proper functioning and communication service of access roads, especially during the transport of building materials.

IV.4. Determination of prognosticated environmental impact

IV.4.1. Air pollution

Works run at the stage of construction shall be of no significance on the condition of air pollution.

In the course of works there will be a slight emission of dust and gas pollutants. The emission of dust pollutants will be caused by civil works and traffic of motor vehicles that service the site. This emission will be observed in the close vicinity of works performed. The emission of gas pollutants will be connected with the operation of combustion engines of the building and transport equipment servicing the site.

Taking into consideration the scope and duration of works, one may state that the pollution of air connected therewith will be of no significant impact on the condition of air pollution in the neighbouring environment.

IV.4.2. Acoustic impact

In the course of civil works the main noise sources will be:

- construction equipment in operation, preparing the site and foundations, preparing excavations,
- equipment in operation used for assembly of the structure elements and technical infrastructure,
- civil works, i.e. placing the concrete, finishing works, etc.,
- transport of materials.

The operation of heavy construction equipment will be of most nuisance in terms of noise emission (the source of noise of maximum level exceeding 85 dB). The motor transport will generate the

noise of 65 - 85 dB(A).

Noise emitted to the environment will be of variable value, periodically of high dynamics exceeding 20-30 dB.

IV.4.3. Water and sewage management

The run civil works shall also interfere with the defined flow of rain and ground water.

This interference will be caused by planned excavations and other civil works. However, the interference will be of local character and limited to the area to which the investor holds the legal title.

IV.4.4. Waste products management

The following waste products will be generated in the course of civil works:

Waste products other than hazardous

- welding waste products 12 01 13
- grinding waste products that do not contain hazardous substances 12 01 17
- paper and cardboard packing 15 01 01
- glass packing 15 01 07
- concrete waste products as well as crushed concrete from demolitions and overhauls 17 01 01
- crushed brick 17 01 02
- wood 17 02 01
- glass 17 02 02
- iron and steel 17 04 05
- soil and rocks 17 05 04
- soil from excavations 17 05 06

Hazardous waste products *

- waste paints and varnish that contain organic solvents or other hazardous substances 08 01 11*
- packaging that contains the remains of hazardous substances 15 01 10*

In the Combined Heat and Power Plant area the waste products generated at the stage of construction will be selectively stored (in bags, capsules, containers) and then collected by the companies holding relevant permits in line with requirements of the act on waste products of 27.04.2001, and then forwarded to the place of their recovery or neutralisation.

Soil and rocks will be used for levelling, while their surplus will be forwarded to a specialist company, of relevant formal and legal status in the scope of waste products management, for their utilisation or neutralisation.

The actions aimed at limitation of the amount and types of waste products generated due to the phase of construction will be commissioned to separate business entities.

Such procedure meets the requirements of the act of 19.12.2002 which reads that "the party responsible for production of waste products generated as a result of rendering services in the scope of construction, demolition, overhaul of facilities, cleaning of tanks or equipment, as well as cleaning, maintenance and repairs is the entity that renders such service unless the service agreement states otherwise".

IV.4.5. Impact on soil

In the course of civil works there will be an interference into surface soil layers connected with:

- excavations to be made for foundations – construction of the new facilities,
- demolition and liquidation of some existing facilities.

However, the interference will be of local character and limited to the area to which the investor holds the legal title.

IV.4.6. Impact on flora and fauna

The planned project consisting in the ***modernisation of the Combined Heat and Power Plant Bielsko-Biała CHP1*** will involve cutting down the trees growing on the site.

Currently the green areas occupy approximately 33% of the site surface.

The greed areas are formed mainly by lawns and to a small extent – also by trees (domination of poplar) and bushes.

Some greenery growing on the site assigned for the project in the form of trees (lime, maple, ash, willow, birch, poplar) and bushes (live fence, thujas) will be removed. The investor shall prepare their stocktaking and obtain relevant official permits (Decision on cutting down of trees) before proceeding with the project implementation.

In exchange the investor plans to compensate for the cutting-down of trees and bushes by planting new ones at a suitable location on the plant area.

Construction of the installation will be of no impact on flora and fauna of the neighbouring areas.

IV.5. Potential occurrence of extraordinary threats

During the implementation of the planned project we do not foresee an occurrence of extraordinary threats. However, such situations may arise in case of a failure.

(***The prognosticated environmental impact in case of a serious industrial failure is described in a separate chapter thereof /V.9/***

Minimisation of extraordinary threats:

In order to prevent the extraordinary threats to the environment it its necessary to:

- the requirements of industrial health and safety as well as parameters assumed for operation of facilities of this type should be absolutely observed,
- for the purpose of fire fighting a sufficient volume of water and other fire fighting media, used in case of a fire, must be supplied,
- the facility should be equipped with the signalling and alarm installation as well as water supply installation with hydrants.
- in view of a potential failure the plant must be provided with the emergency procedure.

V. ENVIRONMENTAL IMPACT OF THE PROJECT – OPERATION STAGE

V.1. Information regarding the city of Bielsko-Biała, location

The Heat and Power Plant is located in the south part of the Silesian Voivodeship in the city of Bielsko-Biała, within Pogórze Śląskie, at the foot of the Beskid Śląski and Beskid Mały, on the River Biała.

The city is located over a few hills. The average altitude above sea level is 310 m.
The ground level of the Heat and Power Plant is 327.5 m above sea level (level + - 0.00 in buildings).

V.1. 1 Characteristics of the natural environment

The city of Bielsko - Biała is situated in the area of the Outer Carpathian Mountains within a macroregion of Pogórze Zachodniokarpackie. Pogórze Zachodniokarpackie is made of Pogórze Śląskie (from the valley of the Olza to Skawa rivers), Pogórze Wielickie (between the Skawa and Raba rivers) and Pogórze Wiślickie (east of the Raba up to the Dunajec river). According to the physical – geographical classification by Kondracki (1978) the city of Bielsko - Biała is located in Pogórze Śląskie, at the foot of the Beskid Śląski and the Beskid Mały mountains.

As regards geomorphology, Pogórze Śląskie is a hilly upland with a number of hummocks criss-crossed by valleys. The hummocks are wide and level, of nearly the same altitude: 350 + 450 m above sea level, rising southwards. The land in question is located within the drainage area of the Vistula, on the Biała river. The Biała river, a right-side tributary of the Vistula, makes a hydrographic axis of the Bielsko area, i.e. it receives both right- and left-side tributaries, drains nearly the entire area within its range and flows into the Vistula river near a place called Żebracze. The watercourses are alimented mainly by atmospheric precipitation and thaw. Varied amount of alimentation results in frequent changes of water level.

Following a climatic classification by Gumiński, the city of Bielsko - Biała is located in a warm temperate belt of the Carpathian climatic valley. The climate characteristics of the city are: ambient temperature, rainfall, cloudiness and insolation, as well as wind direction and velocity.

V.1.2. Meteorological conditions

Ambient air temperature

The average annual temperature in the city is about 8 °C. The average daily temperature of January is -3°C, while that of July is 16°C. The temperature exceeds 25°C for about 25 days in a year. The average number of frosty days with a maximum temperature below 0°C is 45. The average annual and monthly ambient temperatures are higher on hilltops and hillsides than in valleys due to cool hollows in the valleys and frequent temperature inversion. In certain synoptic conditions the area in question demonstrates distinct thermal features in comparison with other regions. In winter the foehn effect results in temperature rise in Bielsko by about + 2.5°C. The synoptic situation is also characterised by considerable temperature changes exceeding 10°C: 30-40 % of cases in winter and 60-80 % of cases in spring.

Air humidity

Relative air humidity is closely connected with other weather elements, such as fog and thermal inversion. The highest values of relative humidity are observed in late autumn and winter while low humidity values – in summer. Air humidity equals about 78 %.

Precipitation

The precipitation in the area is the second highest after the Tatra mountains, often resulting in increase of water level in rivers and streams, sometimes followed by dangerous floods. The annual total precipitation for Bielsko is about 850 mm. Downpours and heavy rains are most frequent during barometric depressions. The total rainfall in July is 1450 mm, while in January it is about 40-50 mm. The average number of snowy days depends on both ambient humidity and thermal condition of the atmosphere. At the lowest height-points within the area of Bielsko the snow-cover remains for 80 days a year. Due to exposure to precipitation-bearing winds the snow-cover disappears earlier in concave formations.

Wind rose

The prevailing wind directions within the area in question are S (about 30%), SW (about 17%) and NW. The highest speed is demonstrated by foehn (“halny”), connected with deep barometric depressions approaching Poland from the west, with Ukraine remaining within a barometric high. Such a situation results in a rapid flow of air from the areas south of the Carpathian Mountains. Having crossed the mountains, the air quickly falls down, is heated and dried at the same time. Thus foehn winds are warm and dry, with velocity reaching 60m/s on mountain slopes and 30 m/s in

valleys. The wind direction largely depends on the course of main valleys decisive for the downflow of air. That is why south and south-west winds prevail in the Carpathian Mountains (about 40% in the winter half-year.)

Average monthly wind velocities in Bielsko-Biała demonstrate seasonal tendencies during the annual course. The highest wind velocities are noted in winter and range from 1.6 m/s do 5.2 m/s. Lower velocities are observed in summer. The average annual velocity is about 3.9 m/s.

Cloudiness and insolation

Cloudiness and insolation depend on physical – geographical location. Insolation of the Pogórze area is relatively low, markedly lower than in the Czech Republic and Slovakia. Only about 4 hours of direct sunshine a day are noted. During the year, the highest insolation in the Bielsko – Biała area is observed in June – with the average values of about 6.5 h/day, and the lowest in December, when days are shortest – about 1.5 h/day. The number of fine days in the area amounts to 55 a year.

V.1.3. Subsoil and water conditions

Following the classification by Kondracki (1998) the area in question is located within the mesoregion of Pogórze Śląskie, on the border of the Beskid Śląski and Beskid Mały. It belongs to a structural unit of Płaszczowina Cieszyńska (Cieszyńska Nappe) which in turn makes a part of a larger unit - Płaszczowina Śląska (Śląska Nappe).

Płaszczowina Śląska in this area has been divided by a dislocation of the Skawa river into two equivalent nappes: the **lower – Cieszyn nappe,** made of Cieszyn beds, and upper – Godula nappe, made of upper Cretaceous beds – Wierzchowice, Lgota and Godula beds as well as Paleogene formations represented by Istebna beds, Ciężkowice sandstone, Hieroglyphic beds and Krosno sandstone. Cretaceous formations – Flysch of the Cieszyn Nappe – are represented by upper Cieszyn shale and locally Cieszyn limestone. Upper Cieszyn shale dominates, in the form of dark-grey marly shale and thin-bedded fine-grained sandstone with inclusions of detritic limestone siderite and their eluvia, which weathering to make rocky residual clay soil, and subsequently cohesive residual soil with rock crumbs. The thickness of upper Cieszyn shale is up to 300m. Its age is determined as lower Cretaceous: Valanginian – Hauterivian.

Below the surface, loam strata are found as well as dust of structure similar to that of clay and loess-like dust.

The formations resemble typical loess in their mineralogical and granulometric composition.

Hillsides and valley-sides are covered with debris of shale and sandstone with admixture of clay or silt.

The major part of the city of Bielsko-Biała belongs to Pogórze Śląskie. The valley of the Biała river divides the city into two parts – Dział Bielski westward of the river and Dział Pisarzowicki eastward. Pogórze Śląskie is a narrow plateau inclined northwards. It slopes from 400-500 m above sea level at the foot of the Beskidy Mountains to 300m above sea level along the border with Kotlina Oświęcimska (Oświęcim valley). Within the city limits, the subsoil of Pogórze Śląskie is made mostly of Cieszyn beds – lower Cretaceous shale and sandstone, Jurassic – Cretaceous limestone with marly shale, and upper Cretaceous shale with limestone insertions. The northern part of Pogórze, where the site in question is located, is covered with Neopleistocene loess. The top layer has been largely converted (anthropogenic soil) by erecting embankments, road substructures as well as industrial and public buildings. The use value of soil is low.

V.1.5. Geological and engineering conditions

The area of the Heat and Power Plant is covered by made ground with clayey and dusty subsoil underneath, locally interbedded with loam.

Geological structure

The surveys demonstrate that the subsoil in the area is made by the Flysch of the Outer Carpathians Mountains, Cretaceous, a part of a large tectonic unit called Płaszczowina Śląska (Śląska Nappe.)
Within the EC1 site it has a form of limestone strata, sometimes sandstone only, with slight interbedding of shale or arenaceous shale.
The Cretaceous beds are covered with Quaternary formations (the Holocene) of fluvial accumulation.
The Holocene beds in the area usually take form of loam, sandy clay, dense loam, dust, humous loam and boulders. In the boulder strata clay is found. The cohesive material, hard plastic, fills the boulder cavities and voids. The entire area is covered by layers of uncontrolled made ground (stone, slag, bricks – mixed with clay).

Water conditions

The borehole survey demonstrated irregular occurrence of ground water – one water level.
The ground water table is mostly perched. However, seeping is sometimes observed, in negligent quantities. The water table remains within the stratum of Quaternary boulders with clay. In view of considerable amount of clay found locally the water table is discontinuous.
The geological composition and hydrogeological conditions result in the area being drained by the Biała river flowing nearby (distance of about 400-500 m). In view of considerable water level differences between the Biała river and the surveyed area, one should not expect the ground water table to fluctuate following directly the changes of the Biała river.

Geotechnical characteristics of subsoil

In view of stratigraphic genetic and lithological diversification of the formations, as well as different physical and mechanical proprieties of subsoil, the following geotechnical strata have been determined within the site in question:

STRATUM I – uncontrolled made ground, of stone, slag, brick, mixed with clay. Loose.

The made ground is found over the entire area under investigation. Depth: 0.5-2.8 m.

STRATUM II – loam and sandy clay interbedded with hard plastic dust. Found in irregular locations over the entire area.

Not very moist, of medium compressibility, loadbearing.

STRATUM III – loam, solid loam, hard plastic. Distribution similar to subsoil of stratum II. Similar degree of moisture, medium compressibility, loadbearing.

STRATUM IV – cohesive loam, plastic. This is an irregular stratum found in some boreholes only. It makes compressible subsoil, of low loadbearing capacity.

STRATUM V – humous loam of determined plasticity degree and medium content of organic particles. Both highly compressible, of varying compressibility, moist and of low bearing capacity. The weakest among the subsoil strata identified within the area.

STRATUM VI – boulders mixed with hard plastic clayey material. A loadbearing stratum of low compressibility. The strength parameters are slightly deteriorated by cohesive formations (sandy clay, loamy sand, loam and dust), hard-plastic, filling cavities and voids between the boulders.

STRATUM VII – highly fissured sandstone.

Conclusions and recommendations

Formations of river accumulation were found in the investigated area . The following subsoil strata were identified:

- * strata of loam, sandy clay and dust, cohesive loam, hard-plastic and plastic
- * a stratum of humous loam
- * a stratum of boulders with clay.

Out of the above subsoil strata the following demonstrate unfavourable geotechnical conditions: stratum no IV – cohesive loam, plastic, and stratum no V – humous loam, plastic.
Should it appear necessary to set foundations within these strata, the subsoil should be removed and replaced by sand or gravel compacted in layers.
The remaining subsoil strata meet the requirements for foundation setting.

The ground water was found among the boulders with clay – a perched water table or small quantity seepage. The boreholes revealed the water table at 321.12 m above sea level to 323 m above sea level, stabilised from 324.59 m to 325.82 m above the sea level (archival data).
The ground water is aggressive towards concrete – leaching, acidic, carbonate and magnesium.
Thus the underground concrete elements need protecting from corrosion.

V.1.5. Fauna and flora

The plant cover of the area includes:

- stinging nettle (Urtica dioica)
- dandelion (Taraxacum officinale)
- plantain (Plantago maior)
- shepherd's purse (Capsulla bursa-pastoralis)
- white clover (Trifolium repens)
- white poplar (Populus alba)
- goat willow (Salix caprea)
- trembling poplar (Populus tremula)
- small-leaved lime (Tilia cordata)

The fauna is represented by species typical for urban areas:

- house sparrow (Paster domesticus)
- jackdaw (Corvus monedula)

V.1.6. Monuments

The most important monuments of the Bielsko-Biała city are:

- Bielski Syjon [the Zion of Bielsko]
- Bielsko-Biała Główna [the Bielsko-Biała Railway Station]
- A funeral house
- "Pod Orłem" Hotel
- "President" Hotel
- Kamienica Pod Żabami [Frog House]
- Katedra św. Mikołaja [Saint Nicholas' Cathedral]
- Kościół Jana Chrzciciela [John the Baptist Church]
- Kościół Marcina Lutra [Martin Luther Church]
- Kościół Opatrzności Bożej [God's Providence Church]
- Kościół Zbawiciela [Christ the Saviour Church]
- The Castle Museum of Bielsko-Biała – Zamek książąt Sułkowskich
- Martin Luther Monument
- The Town Hall
- The Bielsko-Biała Old Town
- The Theatre
- A Dam at Wapienica named after Ignacy Mościcki

V.1.7. Nature, "Natura 2000 Programme"

The nearest areas covered by "Natura 2000" are:

> ***Dolina Górnej Wisły [the Upper Vistula Valley] – A Special Protection Area*** **(SPA)**

Dolina Górnej Wisły is a Special Protection Area (SPA), code number PLB240001, area of 24 767,5 ha.

It covers Zbiornik Goczałkowicki [Goczałkowice Reservoir] and adjacent fish ponds. Zbiornik Goczałkowicki is a drinking water reservoir, excluded from recreation (bathing, water sports). Fishing is permitted only from the bank and in a limited scope. The water level in the reservoir varies and during some years it drops to 2 m below the average of a many years' course. The ponds are used for carp breeding; in autumn the area is used for game. The refuge area is densely inhabited, with buildings scattered among plough land. The forest is mostly deciduous of dry-ground type.

During the breeding season the territory is occupied by at least 1% of the domestic population (C3 and C6) of the following bird species: little bittern (Polish Red List), bittern (Polish Red List), great shrike (Polish Red List), Mediterranean gull, whiskered tern (Polish Red List), tern, black tern, avocet, night heron (Polish Red List), garganey, tufted duck, moorhen, gadwall, redshank, great crested grebe, shoveler, little ringed plover, black-headed gull, black-necked grebe. The following occur in considerable density (C7): white stork, collared fly-catcher, mallard, pochard, coot, little grebe. During migrations at least 1% of the migration route population (C2 and C3) of great crested grebe, great egret and shoveler.

Two Nature Reserves are found in the Upper Vistula Valley:

- Rotuz - area of 21.2 ha,
- Wiślicka Skarpa - area of 24.2 ha.

>- Beskid Śląski SOO (A Special Area of Conservation)

Located in the mountain massif of Beskid Śląski, with small parts within the area of Pogórze Śląskie and Kotlina Żywiecka. The core of the area is made by two mountain ranges: Stożek and Czantoria, as well as Barania Góra range, made mostly of Godula sandstone. A number of picturesque rock forms are found there, such as river bars and waterfalls in stream valleys, klippen forms and various slide forms, over- and underground. The most famous and deepest cave of the Beskid Śląski is Malinowska (Ondraszka) cave, 230.5 m long and 22.7 m deep. In the north-west slope of Barania Góra, at the altitude of 1100 m, the river-head of Czarna Wisełka is found. Forests are mostly artificial and monocultural, with spruce. Only the north-west slopes of the Barania Góra are covered with a natural forest with fir, beech and spruce, aged about 200 years. In the areas situated within Pogórze Śląskie and Kotlina Żywiecka some extremely rare Festuco-brometea grasslands occur. Nearly the entire area falls within the Landscape Park of the Beskid Śląski (38 620 ha; 1998) with eight nature reserves: Barania Góra (383.04 ha; 1953), Czantoria (97.71 ha; 1996), Kuźnie (7.22 ha; 1995), Stok Szyndzielni (57.92 ha; 1953), Wisła (17.61 ha; 1953), Zadni Gaj (5.77 ha; 1959), Dolina Tańskiego Potoku (46.89 ha; 1998), Jaworzyna (40.03 ha; 2003) and two nature and landscape protected areas: Cygański Las (925.53 ha), Eco Park Dolina Wapienicy (1519.02 ha; 2001). The area partly falls within Leśny Kompleks Promocyjny Lasy Beskidu Śląskiego (50 052.1 ha).

Habitat	Coverage [%]
coniferous forest	45 %
mixed forest	24 %
leafy forest	15%
forests undergoing changes	7 %
combined cropland and gardens	6 %
meadows and pastures	1 %
agricultural land with natural elements	1 %
arable land	1 %
open pit mines	0 %
natural grass	0 %
water reservoirs	0 %
scattered housing	0 %

The remaining SPAs (Special Protection Areas) in the Silesian Voivodeship, covered by Natura 2000 are:

- Cieszyńskie Źródła PLH 240001
- Pierściec PLH 240022
- Beskid Mały PLH 240023

The project will be implemented in the vicinity of the area covered by Natura 2000 programme. The nearest NATURA 2000 areas are mentioned above.

V.2. Air pollution

V.2.1. Scope of the study.

ZEC Heat and Power Plant Bielsko-Biała located at ul. Tuwima 2 is a facility producing electric and thermal energy in a process of combusting hard coal and fuel oil or natural gas GZ-50.
The combustion process is the major source of the plant's environmental impact – emission of gaseous and particulate pollution of ambient air. The amount of pollutant emissions depends on the applied combustion technology and primary methods applied to limit their generation.

The processes of fuel combustion for power generation in heat and power plants fired with hard coal and fuel oil or natural gas result in the following pollutants being discharged into ambient air: sulphur dioxide, nitrogen dioxide, carbon oxide, particulate matter containing heavy metals, hydrogen fluoride, hydrogen chloride, non-methane organic compounds. The content of heavy metals in particulate matter depends on their content in coal, combustion conditions and the applied flue gas dedusting system.

The Ordinance by the Minister of the Environment issued Dec. 20, 2005 on emission standards for plants (Journal of Laws No 260, item 2181), specifies emission standards for three kinds of pollutants: sulphur dioxide, nitrogen dioxide and particulate matter. Standards for the remaining pollutants are not given. According to Art. 224 paragraph 4 of the Environmental Law dated April 27, 2001 (consolidated text JL issue 2008, No 25, item 150 as amended), "when emission standards are determined for a plant, then the permit does not specify other kinds of gas or particulate matter than the ones covered by the standard. Neither does the permit specify permissible levels for pollutants of ambient air concentrations lower than 10% of the reference value".

The present report contains emission calculations for nitrogen dioxide, sulphur dioxide, particulate matter and carbon oxide. Based on art. 224 paragraph 4 of the Act issued April 27, 2001 – Environmental Law (consolidated text JL issue 2008 No 25, item 150) permissible emission levels for the three basic pollutants (nitrogen dioxide, sulphur dioxide and particulate matter) are proposed at the level corresponding with standards specified for the units to operate at the ZEC Heat and Power Plant Bielsko-Biała.

The ambient air pollution resulting from plant operation is influenced by the following factors:

- kind and amount of gas and particulate matter emitted by the facility,
- way of pollutant discharging (kind and height of emitters, flue gas exit velocity and temperature),
- conditions of the pollutant spread in ambient air.

The first two features are determined by the kind of facility, the third one depends on its location, particularly on atmospheric phenomena and topography, decisive for the intensity of air exchange in ambient atmosphere, such as:

wind direction,
wind velocity,
atmospheric diffusion (atmospheric turbulence),
roughness of the area; plant cover and land development,
pollutant absorption at the ground (dry conditions),
pollutant conversion in ambient air,
pollutant rain-out,
high-level temperature inversion (thickness of mixing layer),
wind shift connected with altitude,
10) curvilinear motion of air (due to the Earth rotation),
11) pollutant accumulation in clouds.

The applied calculation methods allow for phenomena described under items 1-^8. They are based on a mathematic description of pollutants' motion in atmosphere, considering test results. The prevailing methods in the world and permitted in Poland include: Pasquille method - (simplified) to calculate gas and particulate matter concentration, Krieb method – to calculate dustfall.

The actual condition of ambient air quality is determined by permissible concentration values of pollutants emitted in a given area and their background indicated by Wojewódzki Inspektorat Ochrony Środowiska (Voivodeship Inspectorate for the Environment Protection.)

The Ordinance of the Minister of the Environment issued March 3, 2008 on certain pollutant levels in ambient air (JL No 47, item 281) specifies: 1. permissible ambient levels for certain pollutants with respect to: human health protection for:

- health resorts and health resort areas as specified by the Act issued July 28, 2005 on spa treatment, health resorts and health resort protection areas and boroughs (JL No 167, item 1399 and issue 2007 No 133, item 921),
- the remaining part of the country,

plant protection;

target levels for certain pollutants in ambient air, from the point of view of human health and plant protection;

long-term target levels for certain pollutants, from the point of view of human health and plant protection;

alert levels for certain pollutants in ambient air, referring to those which may pose a threat to public health even in case of short-term exceedance;

conditions, such as temperature and pressure, to determine pollutant levels;

pollutant code numbers allowing for their identification;

time periods for which measurement results are averaged;

permissible frequency of exceeding permissible and target levels;

9. dates of reaching the levels mentioned under items 1-3, for certain pollutants in ambient air;
10. tolerance margins for certain permissible levels, expressed as a decreasing percentage value related to the permissible pollutant level in ambient air in subsequent years.

The table below presents permissible levels for certain pollutants in ambient air, divided from the point of view of human health and plant protection except health resorts and health resort protection areas; with dates of reaching particular values, pollutant code numbers, time periods for averaging the measurement results, permissible frequency of level exceeding the and tolerance margins, as well as percentiles corresponding to the permissible frequency of level exceeding.

Pollutant (CAS)	Time of averaging measurement results	Permissible ambient level [Ug/m^3]	Permissible exceedance frequency of permissible level in a calendar year		Percentile corresponding to permissible frequency of exceedance	Tolerance margin % *VHglm*			Date of reaching permissible levels
			times	[%]		2008	2009	2010	
Benzene (71-43-2)	calendar year	5	-	-	-	40 2	20 1	0	2010
NO_2 (10102-44-0)	one hour	200	18	18h/8760h=0,002=0,2%	100-0,2=99,8	10 20	5 10	0	2010
	calendar year	40	-	-	-	10 4	5 2	0	2010
Nitrogen	calendar year	30	-	-	-	0	0	0	2003

oxides (10102-44-0, 10102-43-9)									
SO_2 (7446-09-05)	one hour	350	24	24h/8760h=0,003=0,3%	100-0,3=99,7	0	0	0	2005
	24 hours	125	3	3days/365days=0,008=0,8%	100-0,8=99,2	0	0	0	2005
	calendar year and winter time (from Oct. 01 to March 31)	20	-	-	-	0	0	0	2003
Lead (7439-62-1)	calendar year	0,5	-	-	-	0	0	0	2005
Particulate matter PM 10	24 hours	50	35	35days/365days=0,096=9,6 %	100-9,6=90,4	0	0	0	2005
	calendar year	40	-	-	-	0	0	0	2005
CO (630-08-0)	8 hours	10000	-	-	-	0	0	0	2005

The above table indicates that in case of short-term concentration the permissible level cannot be exceeded for the following:

carbon oxide – by the maximum concentration,
nitrogen dioxide – by 99.8 ($S_{99,8}$) percentile
sulphur dioxide and particulate matter PM10 – by the percentile lower than 99.8 ($S_{99,8}$)-

The reference values for pollutants discharged from the plant in question were adopted following the Attachment no 1 to the Ordinance by the Minster of the Environment dated Dec. 5, 2002 on reference values for certain pollutants in ambient air (JL No 1, item 12). An excerpt from the list of pollutants in question, their code numbers, permissible reference values in ambient air and time periods for which the values were averaged for the home territory is presented below.

Sl no	***Pollutant***	***Code number (CAS number)***	***Reference values in jug/m^3 averaged for***	
			1 hour (D_1)	*calendar year (DJ)*
70	Nitrogen dioxide	10102-44-0	200,00	40,0
72	Sulphur dioxide	7446-09-5	350,00	30,0
137	Particulate matter PM 10	-	280,0	10,0
150	Carbon oxide	630-08-0	30000,0	-

The pollutant reference values averaged for 1 hour, specified in Attachment no 1 to the a/m Ordinance are considered to be met when they are not exceeded by more than 0.274% of time during the year for sulphur dioxide and more than 0.2% of time during the year for the remaining pollutants

The dustfall values are given below

Pollutant	*Reference values for dustfall in w g/(m^2*year)*
Particulate matter, total	200

The background for pollutants whose permissible ambient levels are determined, is the actual condition of ambient air quality. The latter is specified by an appropriate Environmental Protection

Inspectorate as a concentration averaged for a year. The Voivodeship Environmental Protection Inspectorate in Katowice, Bielsko-Biała Office specified the average annual concentrations 2007 for Bielsko-Biała:

- nitrogen dioxide (CAS 10102-44-0) – average annual concentration 29 ug/m^3
- suspended particulate matter, total – average annual concentration 40 ug/m^3.

The background for the remaining pollutants, except ozone as a primary pollutant, is considered 10% of a reference value averaged for a year.

Bielsko-Biała is located in the area of the Outer Western Carpathian Mountains in the macroregion of Pogórze Zachodniokarpackie. Pogórze Zachodniokarpackie is made of Pogórze Śląskie (from the valley of the Olza to Skawa rivers), Pogórze Wielickie (between the Skawa and Raba rivers) and Pogórze Wiślickie (east of the Raba up to the Dunajec river). According to the physical-geographical classification by Kondracki (1978) the city of Bielsko-Biała is located in Pogórze Śląskie at the foot of the Beskid Śląski and Beskid Mały. Pogórze Śląskie drops northwards towards Kotlina Oświęcimska with a ledge not very clearly marked.

As regards geomorphology, Pogórze Śląskie is a hilly upland with a number of hummocks criss-crossed by valleys. The hummocks are wide and level, of nearly the same altitude 350-^450m above sea level, rising southwards. Wierzchowina Pogórza (Pogórze hilltop) is a lower Pliocene planation surface. The valleys are drained by low gradient water courses. The courses have wide bottoms and quite steep sides. The area in question is located in the drainage basin of the Vistula, on the Biała river. The Biała river, a right-side tributary of the Vistula, is a hydrographic axis of Bielsko area, i.e. it receives both left- and right-side tributaries and drains nearly the entire area within its reach, flowing into the Vistula river near a place called Żebracze. The watercourses are alimented mainly by precipitation or thaw. Varied amount of alimentation in time results in frequent changes of water level.

Following the climatic classification by Gumiński, the city of Bielsko - Biała is located in a warm temperate belt of the Carpathian climatic valley. The climate characteristics of the city are: ambient temperature, rainfall, cloudiness and insolation, as well as wind direction and velocity.

Ambient temperature

The average annual ambient temperature is about 8°C. The average temperature of January is -3°C, and of July 16°C. The ambient temperature exceeds 25°C for about 25 days in year. The average number of frosty days with maximum temperature below 0°C is 45 days in Bielsko. Average annual and monthly temperatures are higher on hilltops and hillsides than in valleys. The reason is cool hollows in the valleys and frequent temperature inversions.

In certain synoptic conditions the area in question demonstrates distinct thermal features in comparison with other regions. In winter the foehn effect results in temperature rise in Bielsko by about +2.5°C. The synoptic situation is also characterised by considerable temperature changes of over 10°C: 30-40% of cases in winter and 60-80% in spring

Precipitation

Decisive precipitation factors include the area exposure to precipitation-bearing winds, altitude above sea level and plant cover. The precipitation in the area in question is the second highest after the Tatra mountains, often resulting in rapid water level increase in rivers and streams, sometimes followed by dangerous floods. The total annual precipitation in Bielsko is about 850 mm. Downpours and heavy rains are most frequent during barometric depressions. The total rainfall in July is 1450 mm, while the total for January is about 40-50 mm. The average number of snowy days depends on both ambient air humidity and thermal condition. At the lowest height-points within the Bielsko area the snow-cover remains for 80 days a year. Due to exposure to precipitation-bearing winds the snow-cover disappears earlier in concave formations.

Cloudiness and insolation

Cloudiness and insolation of an area are determined by its physical – geographical location. Insolation of the Pogórze area is relatively low, markedly lower than in the Czech Republic and Slovakia. Only about 4 hours of direct sunshine a day are observed. Over the year, the highest insolation is noted in June – about 6.5 h/day on average for the area of Bielsko-Biała, while in December when days are shortest, insolation equals about 1.5 h/day. The number of fine days in the area amounts to 55 a year.

Wind velocity and direction

Out of numerous meteorological factors decisive for the climate in a given area, the wind velocity and direction are of the strongest impact on aerosanitary conditions. Whereas the wind velocity, a resultant of numerous physical factors contributing to the phenomenon of air motion in the atmosphere, is decisive for the rate of the pollutants spread, the wind direction is a meteorological factor responsible for the route of their transport. The wind distribution depends on the layout of land, pressure distribution and temperature. In the area in question the prevailing wind directions are S (about 30%), SW (about 17%) and NW, which is consistent with the direction of air-mass adequation. According to Niedźwiedź (1981), the highest velocity is reached by foehn winds (“halny”), connected with deep barometric depressions approaching Poland from the west, with Ukraine remaining within a barometric high. Such a situation results in a rapid air flow from the south of the Carpathians. Having crossed the mountains, the air quickly falls down, is heated and

dried at the same time. Thus foehn winds are warm and dry, and their velocity reaches up to 60m/s on mountain slopes and 30 m/s in valleys. The direction of winds largely depends on the course of the main valleys decisive for air downflow. That is why south and south-west winds prevail in the Carpathians, mainly in the winter half-year, making about 40% (Starkel 1991). Weather data for Bielsko-Biała including wind statistics and atmosphere balance class for a 12-direction wind rose were supplied by a weather station at Aleksandrowice. The average monthly wind velocities in Bielsko-Biała demonstrate a marked seasonal tendency in the course of a year. The highest wind velocities are noted in winter and range from 1.6 m/s to 5.2 m/s. Lower velocities are observed in summer. The average annual velocity is about 3.9 m/s.

Moreover, the following have been adopted for calculations:

Wind gauge height	-	14.0 m
Average annual temperature	-	7.7 °C

The coefficient of aerodynamic roughness of the area z_0 is determined on the basis of topographic maps. For a single emitter or a group of emitters lower than 50 m a topographic map 1:25.000 is recommended, while for higher emitters – a map 1:100.000.

While determining the highest of maximum concentrations S_{mm} for a single emitter or emitters group, which may be replaced by an equivalent emitter, average values of an aerodynamic roughness coefficient of the area z_0 should be determined for r sectors of wind rose within a radius of 50 h_{max}. For each sector an average z_0 value should be calculated with the formula:

$$z_0 = l/F \; X \; F_t * z_{ot}$$

To calculate the ambient air pollution by a group of emitters an average z_0 value is adopted for the area referred to.

For aerodynamic roughness analysis of the area around ZEC Bielsko-Biała, a situation and altitude map 1 : 100.000 was used. A uniform maximum coefficient of aerodynamic roughness z_0 = 3,0 m was adopted for all wind rose sectors.

Retrofitting of the ZEC Heat and Power Plant Bielsko-Biała will consist in erection of a new heat generation unit and two water heaters. The heat source will be a TG set with a back-pressure turbine, generating steam (parameters matching the current requirements of the municipal heat distribution system) and electric energy in a fully combined cycle. The circulating water will be heated by steam in a heater and further distributed to peak heaters and/or heat distribution units and to the system by means of two district heating mains. Moreover, an additional stand-by / start-up heater will be provided, fed with steam through a reducing cooling by-pass station of the TG set.

The heater will be used for start-up of the unit and in case of disturbances on the TG set or power system side.

The retrofitted source at EC1 will contain the following basic units:

a heating unit with a CFB boiler 157 MW,
peak heaters – two oil and gas fired water boilers 2 x 38 MW, and
a light-up boiler 3.5 MW.

The heating unit (BC-50) will include a steam boiler with a circulating fluidised bed without steam reheating, with thermal power of the furnace (chemical energy of fuel supplied to the furnace chamber) of about 172MW_t. The cross section area of the furnace chamber will equal about 50 m^2 with the grate top level of about + 40 m. The furnace chamber will accommodate an evaporator. The cyclone recirculation will incorporate superheaters. The second pass will incorporate heaters, nitrogen oxide reduction systems and air heater.

Coal of adequate size composition will be supplied to the adjacent coal handling gallery with bunkers from which it will be directed by screw feeders to the fluidised bed, be supplied at the same time with SOx sorbing agent (of powdered limestone).

The air system includes one fan for air supply to the furnace and one for fluidising air, a steam and regeneration air heater, with air ducts. Flue gas from the boiler will be directed through an electrostatic precipitator and one fan to the existing stack of height h = 160 m.

The steam boiler with drum, of 220t/h live steam capacity, will be based on a circulating fluidised bed technology. Due to high rate of fluidisation (>5m/s) the bed material will be lifted up the furnace chamber together with flue gas. Next larger particles will be separated by an adjoining cyclone and recirculated to the furnace chamber. Both the chamber and separator with bed material trap are provided with heat exchange surfaces (evaporator, superheaters). Flue gas with fine particles of the bed (volatile ash) leaving the separator will be directed to the second pass of the boiler and give up the heat to the incorporated convection heating surfaces. Fly ash will be separated from flue gas at the recirculation element at the second pass bottom, and later in the ESP. In order to reduce NOx to the permissible emission level, ammonia will be batched at a well-chosen point of the second pass with precisely determined temperature range.

Fuel in the form of crushed hard coal will be supplied to the furnace by screw feeders. Combustion in the fluidised bed will take place at a temperature of about 870°C at a nominal load.

The bed material is made mostly of ash and sand together with supplied fuel.
In view of a considerable heat load the combustion is stable within a range of 40-100% without a necessity to boost up with additional fuels. High turbulence in the furnace ensures thorough mixing and burning up of the fuel. The peak-load heat sources will be two oil and gas fired boilers, with light fuel oil being the basic fuel and gas – reserve for the peak-load boiler I, and gas – the basic fuel and light fuel oil – reserve for the peak-load boiler II. Both boilers are identical and reserve each other. According to preliminary assumptions, a gas and oil fired steam boiler (capacity about 6t/h and steam parameters: 1.2 MPa, 300°C) will also be provided for start-up purposes (heating air for the fluidised bed boiler, heating feedwater). The basic fuel for the fluidised bed boiler in the new heat generating unit at ZEC Heat and Power Plant Bielsko-Biała will be hard coal from coal mines located in the Vistula river area and in Upper Silesia. It is assumed that coal sized 0-6 mm will be available (appropriate for the fluidised bed boiler). However, it is also planned to provide crushers in the plant (boiler house under coal bunkers) to be used in case fuel of larger particle size is supplied.

The range of coal parameters from particular coal mines is a s follows:

- calorific value: 18 - 20 MJ/kg
- ash content: 20 - 25%
- sulphur content: 0.8 -1.4%

Design fuel for start-up of the fluidised bed boiler:

- natural gas GZ50 of calorific value 33,12 MJ/m^3 or LFO (light fuel oil – compliant with the standard DIN51603 Tl), calorific value 42,8 MJ/kg

Peak-load boilers, fired with oil and gas

- natural gas GZ50 of calorific value 33,12 MJ/m^3 or LFO (light fuel oil – standard DIN51603 Tl) of calorific value 42,8 MJ/kg

Calculations of impact on aerosanitary condition were performed in compliance with the Ordinance of the Minister of the Environment dated Dec. 5, 2002 concerning reference values for certain pollutants in ambient air (JL No 1 item 12). The following assumptions were made:

maximum environmental load (the entire installation operating – the fluidised bed boiler and all the oil and gas fired boilers, with pollutants discharged by all the emitters at the same time);

- maximum coefficient of aerodynamic roughness z_0 = 3,0 m for all sectors;
- coordinate system with axis "0X" pointing eastward and axis "0Y" northward;
- data for calculations.

While determining the scope of calculations it is necessary to specify:

a) maximum averaged emissions for 1 hour - E_g, Ep,

b) average emissions for a calculation period (year, season, or sub-period) - E_g, Ep, Ef.

The maximum emissions are specified for the process phase when the greatest amount of pollutants is emitted in 1 hour. In case of maximum emissions lasting less than 1 h, highest average emission should be calculated with reference to 1 hour.

The calculations of ambient air pollution are performed in:

Reduced scope

when preliminary calculations of:

♋) maximum concentration of gas pollutant S_m averaged for 1 hour in a given weather situation,

♌) maximum concentration of particulate matter S_{mp} averaged for 1 hour,

♍) a single emitter or emitters group meet the dustfall conditions at the same time (dust-fall criterion allows for emissions of all size fractions of particulate matter, including suspended particulate matter,):

[mg/s] (l)

d) the total annual PM emission does not exceed 10.000 Mg,

♏) cadmium emissions do not exceed 0.005 % of the particulate matter emission determined with use of the formula (1) and item d),

♐) lead emission does not exceed 0.05 % of the PM emission value determined with use of the formula (1) and item d).

prove that that the following criteria are met:

a) for a single emitter or emitters group regarded as equivalent emitter:

$$Smm < 0{,}1 * Dl$$

b) for emitters group:

c) dustfall criterion,

then the calculations required for this scope are completed.

If the condition specified under c) is not met, then calculations for particulate matter fall are necessary, considering the statistics of weather conditions in order to find out whether:

$$O_p < D_p - R_p$$

The full scope of air pollution calculations is used when conditions specified for the reduced scope are not met. Then the distribution of maximum pollutant concentration in ambient air, averaged for 1 hour, with provision for weather conditions statistics should be performed in a calculation grid for the entire area. This is necessary to check whether the condition:

$$Smm < Dl$$

is met in every point over the entire area.

If the above calculations demonstrate that the condition:

$$Smm < 0{,}1 * Dl$$

is met for a group of emitters, the calculations are completed.

When the condition is not met for a group of emitters, or the condition S_{mm} ^ Di is not met for a single emitter, it is necessary to calculate the distribution of pollutants concentration in ambient air averaged for a year and to check whether conditions in each point of the area meet the requirement:

$$Sa < D_a - R$$

Further calculations are not required if the dustfall criterion is met, and no buildings higher than one storey are found near the emitters.

If the dustfall condition is not met, calculations of dustfall should be performed considering the statistics of weather conditions in order to check whether:

$$O_p < D_p - R_p$$

If apartment or office buildings more than one-storey high, or nurseries, kindergartens, schools, hospitals or sanatoriums are found at a distance smaller than lOh from a single emitter or any emitter of a group, it should be checked whether they are safe as regards exceeding reference values or permissible values of pollutant concentration in ambient air. To this end, maximum pollutant concentrations in ambient air should be calculated for particular altitudes.

The following cases are recognised:

a) when the total height of the lowest emitter in a group is not less than the level of the topmost floor of building Z, calculations of concentration are performed for Z altitude,

b) when the total height of the lowest emitter in a group is less than the height of the topmost floor of building Z, concentration calculations are performed for altitudes every 1m starting with the total height of the lowest emitter up to:

- Z, if $H_{max} > Z$,

  H_{max}, jeżeli $H_{max} < Z$

H_{max} means the top effective height of emitter in a group of all weather situations calculated.

None of concentration values calculated for buildings located near the emitters may exceed the Di value.

The frequency of exceeding the reference values or permissible pollutant levels in ambient air should be calculated if concentration values calculated for buildings near the emitters exceed the Di value or the condition $S_{mm} < Di$ is not met.

Methods of calculating the ambient pollution for the existing and designed sources specify conditions to be met by emitters or their groups in order to comply with the permissible pollutant concentration values.

When the pollutant concentration due to emission from all emitters of a group exceeds the reference value or a permissible pollutant level in ambient air, the frequency of P(Di) exceeding is calculated.

$$P(Di)=N* 100\%$$

N value is a frequency derived from the wind rose assigned to each of the considered weather situations and each wind direction.

For a spot in question, the calculated of P(Di) frequencies are summed for all weather situations and wind directions. Calculations are repeated for each point of the grid.

99,8 percentile $S_{99,8}$ from ambient pollutant concentration averaged for 1 hour is the concentration value which is not exceeded by 99,8 % of all concentrations averaged for 1 hour during a calendar year. If S99,8 is less than the reference value or a permissible ambient pollutant level Di, then it may be considered that the permissible frequency of Di exceeding, equalling 0.2 % of time during a year, is met.

Emission of pollutants from particular sources and emitters of ZEC Heat and Power Plant Bielsko-Biała is presented below.

Version I

Version I assumes operation of a fluidised bed boiler fired with coal, operation of a light-up boiler fired with gas and both peak-load boilers fired with natural gas.

The calculations assume the following parameters of coal:

- calorific value - 19 MJ/kg
- ash content - 22%
- sulphur content – 1.1%

The table below presents data for a fluidised bed boiler, based on the boiler heating power, and emitter discharging pollutants.

Emitter E - 1	
Height	160.00 m
Outlet diameter	5.87 m
Flue gas exit velocity	4.5 m/s (open)
Flue gas exit temperature	434 K
SOURCE	Fluidised bed boiler
Reducer	Nitrogen dioxide – not less than 65% (ammonia water) Sulphur dioxide – not less than 92.5% (calcium carbonate) Particulate matter – not less than 99.89% (ESP)

EMISSION TIME	4370 hours		
Pollutants	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^J
Nitrogen dioxide	46,018028	201,0988	201,9
Sulphur dioxide	46,100204	201,4579	202,2
Particulate matter PMlO	2,807486	12,2687	12,3
Carbon oxide	164,350102	718,2099	-

In view of the fact that emission standards for nitrogen dioxide and sulphur dioxide with assumptions as above (attachment Z3) are exceeded, the minimum calorific value of coal of 19.5 MJ/kg (attachment Z7) was adopted for the sake of calculations. Thus the pollutant emission adopted for calculations equals:

Emitter E - 1			
Height Outlet diameter Flue gas exit velocity Flue gas exit temperature	160,00 m 5,87 m 4,5 m/s (open) 434 K		
SOURCE	Fluidised bed boiler		
Reducer	Nitrogen dioxide – not less than 65% (ammonia water) Sulphur dioxide – not less than 92,5% (calcium carbonate) Particulate matter – not less than 99.89% (ESP)		
EMISSION TIME	4370 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^J
Nitrogen dioxide	44,838079	195,9424	198,2
Sulphur dioxide	44,918147	196,2923	198,6
Particulate matter PMlO	2,735500	11,9541	12,1
Carbon oxide	160,135997	699,7943	-

The current version assumes natural gas GZ50 of calorific value 33.12 MJ/m^3 as a fuel for the peak-load boilers. Data for each of the boilers, based on their heating power, and emitter

discharging pollutants are given below.

Emitter E - 2 and E - 3			
Height Outlet diameter	40,00 m		
Flue gas exit velocity	1,64 m 9,03 m/s (open)		
Flue gas exit temperature	424 K		
Source	Fuel oil – gas boiler fired with gas		
Reducer	No		
EMISSION TIME	650 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^J
Nitrogen dioxide	33,850754	22,0030	704,3
Sulphur dioxide	0,350408	0,2278	7,5
Particulate matter PMlO	0,052561	0,0342	1,1
Carbon oxide	1,182627	0,7687	-

Since emission standards for nitrogen dioxide are exceeded at the current assumptions (attachment Z4 and Z5), the emission value was reduced in calculations to the one which does not result in exceeding the emission standard (attachment Z8 and Z9).

Thus the pollutant emission adopted in calculations equals:

Emitter E - 2 and E - 3	
Height	40,00 m
Outlet diameter	1,64 m

Flue gas exit velocity Flue gas exit temperature	9.03 m/s (open) 424 K		
SOURCE	Oil and gas boiler, fired with gas		
Reducer	No		
EMISSION TIME	650 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^3
Nitrogen dioxide	6,789156	22,0030	145,6
Sulphur dioxide	0,350408	0,2278	7,5
Particulate matter PMlO	0,052561	0,0342	1,1
Carbon oxide	1,182627	0,7687	-

The current version assumes natural gas GZ50 of 33.12 MJ/m^3 calorific value as a fuel for the light-up boiler. The table below contains data for the boiler based on its heating power and emitter discharging pollutants.

Emitter E - 4			
Height Outlet diameter Flue gas exit velocity Flue gas exit temperature	40,00 m 1,64 m 0,87 m/s (open) 424 K		
SOURCE	Oil and gas boiler fired with gas		
Reducer	No		
EMISSION TIME	50 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^3
Nitrogen dioxide	0,811594	0,0406	180,3
Sulphur dioxide	0,033816	0,0017	7,5
Particulate matter PMlO	0,006129	0,0003	1,4

Carbon oxide	0,114130	0,0057	-

Since the emission standards for nitrogen dioxide are exceeded at the current assumptions (attachment Z6), the calculations adopt an emission value lowered to the one ensuring that the standard is complied with (attachment Z10).

Thus the pollutant emission adopted for calculations is:

Emitter E - 4	
Height	40,00 m
Outlet diameter	1,64 m
Exit velocity of flue gas	0,87 m/s (open)

Flue gas temperature	424 K		
SOURCE	Oil and gas boiler fired with gas		
Reducer	No		
EMISSION TIME	50 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^3
Nitrogen dioxide	0,667874	0,0334	148,4
Sulphur dioxide	0,033816	0,0017	7,5
Particulate matter PMlO	0,006129	0,0003	1,4
Carbon oxide	0,114130	0,0057	-

Data for calculations of pollutants spread in the air are given in attachments Zll ^-Z15. On account of the above assumptions, the scope of calculations for pollutant levels in ambient air is presented below.

One year				
Pollutant	*Pollutant code number (CAS number)*	*^{3} [/ig/m]*	*0,1 *D] [/lg/m]*	*n scope obliczeń*
Nitrogen dioxide	10102-44-0	121,15159	20,0	FULL
Sulphur dioxide	7446-09-5	28,36810	35,0	REDUCED
Particulate matter PM 10	-	1,09227	28,0	REDUCED
Carbon oxide	630-08-0	110,17757	3000,0	REDUCED

As demonstrated by the above, a full scope of calculations is required for nitrogen dioxide levels (10102-44-0) (attachment Z16). For the remaining pollutants, calculations are completed.

Checking the first condition for dustfall for all the emitters.

Emitter	***Height***	***pyłu***	***Condition 0,0667 *h$^{3\,n15}$***	***warunku***
	m	***mg/s***	***mg/s***	***mg/s***
E-l	160,00	759,861	584929,843	Yes
E-2	40,00	14,600	7423,604	Yes
E-3	40,00	14,600	7423,604	Yes
E-4	40,00	1,702	7423,604	Yes

/s< ąo667 l5 =151800jl64mg/j
n ,

Checking the second condition for dustfall.

$\sum E_f$= 12,023Mg/*year* < lOOOOMg/*annum*

Since both dustfall conditions are met, dustfall distribution calculations are not necessary.

For pollutants requiring full range calculations of ambient air level (nitrogen dioxide) calculations were performed for an area covered by a receptor grid of the following coordinates:

X_d = -1600; Y_d = -1600; X_g = 1600; Y_g = 1600

with calculation gauge of lOOm. The maximum values of ambient pollutant concentrations, averaged for 1 hour, are given below, considering the statistics of weather conditions (attachment Z18).

Pollutant	*Pollutant code number (CAS number)*	*Dj*	*S_{mm} l/J-g/m³]*	*Percentile [jdg/m]*	*Point coordinates*
Nitrogen dioxide	10102-44-0	200,0	97,69246	56,08211	x= 100;y = 200;z = 0 x = 300;y= 0; z = 0

The results demonstrate that maximum ambient concentrations, averaged for 1 h, having allowed for weather condition statistics, are not exceeded in the area covered by the adopted receptor grid (attachment Z20). The calculations indicate that it is necessary to calculate average annual concentrations for nitrogen dioxide (attachment Z19).

A calculation of averaged annual concentration distribution was performed for nitrogen dioxide. According to the Ordinance of the Minister of the Environment dated Dec. 5, 2002 concerning reference values for certain pollutants in ambient air (JL No 1, item 12), background of pollutants discharged by emitters of over lOOm is not considered in calculations. However, since only one emitter of the retrofitted ZEC Bielsko-Biała 2 will meet the above condition, while the remaining three will not, the calculations allow for the pollutant background as submitted by the Voivodeship Inspectorate for Environmental Protection, Bielsko-Biała Office (attachment Z2) for nitrogen dioxide. The calculations were performed for an area covered by a receptor grid of coordinates

$X_d = -1600$; $Y_d = -1600$; $X_g = 1600$; $Y_g = 1600$

with calculation gauge of lOOm. The maximum values of average annual concentrations are given below (attachment Z22).

Pollutant	*Pollutant code number (CAS number)*	D_a-*R*	S_a *[jUg/m³]*	*Point coordinates*
Nitrogen dioxide	10102-44-0	11,0	0,62250	x=800;y = 0;z = 0

According to the calculations, the average annual concentration for the pollutant in question is not exceeded (attachment Z24).

The Ordinance by the Minister of the Environment dated Dec. 5, 2002 on reference values for certain substances in the air (JL No 1, item 12) page 54 item „3.2. Full scope " reads:
„If apartment or office buildings, over one storey high, or nurseries, kindergartens, schools, hospitals or sanatoriums are found within a distance smaller than lOh from a single emitter or any emitter of a group, it should be checked whether they are safe as regards exceeding reference values or permissible pollutant levels in ambient air. To this end maximum ambient concentrations of pollutants should be calculated for particular altitudes."

Apartment buildings are found within a distance of less than lOh from the tallest emitter of ZEC Bielsko-Biała at ul. Tuwima 2. Thus calculations of pollutant spread were performed around the nearest buildings (attachments Z26 - Z34).

Calculation results of S_m concentrations and the 99,8 percentile value calculated based on concentrations referred to 1h for the pollutants in question are tabulated below:

Pollutant	*Dj*	*[/ig/m]*	*S99.8 l/ig/m]*	*Point coordinates*
Nitrogen dioxide (10102-44-0)	200,0	160,54689	123,42255	x=100;y = -100;z = 30 x = 200;y= 0; z = 30

According to the results, the maximum pollutant concentrations in ambient air, averaged for 1h and considering statistics of weather conditions, are not exceeded at the nearest buildings.

Version II

Version II assumes operation of a coal-fired fluidised bed boiler, light-up boiler fired with fuel oil and both peak-load boilers fired with fuel oil.

The calculations assume the following coal parameters:

- calorific value - 19 MJ/kg
- ash content - 22%
- sulphur content – 1.1%

The data for a fluidised bed boiler based on its heating power and an emitter discharging pollutants are tabulated below.

Emitter E - 1			
Height Outlet diameter Flue gas exit velocity Flue gas exit temperature	160,00 m 5,87 m 4,5 m/s (open) 434 K		
SOURCE	Fluidised bed boiler		
Reducer	Nitrogen dioxide – not less than 65% (ammonia water) Sulphur dioxide – not less than 92,5% (calcium carbonate) Particulate matter – not less than 99,89% (ESP)		
EMISSION TIME	4370 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^J
Nitrogen dioxide	46,018028	201,0988	201,9
Sulphur dioxide	46,100204	201,4579	202,2
Particulate matter PMlO	2,807486	12,2687	12,3
Carbon oxide	164,350102	718,2099	-

In view of the fact that emission standards for nitrogen dioxide and sulphur dioxide are exceeded at the above assumptions (attachment Z35), the minimum calorific value of coal equal 19.5 MJ/kg (attachment Z39) was adopted for the calculations. Thus pollutant emissions equal:

Emitter E - 1			
Height Outlet diameter Flue gas exit velocity Flue gas exit temperature	160,00 m 5,87 m 4,5 m/s (open) 434 K		
SOURCE	Fluidised bed boiler		
Reducer	Nitrogen dioxide – not less than 65% (ammonia water) Sulphur dioxide – not less than 92,5% (calcium carbonate) Particulate matter – not less than 99,89% (ESP)		
EMISSION TIME	4370 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^J
Nitrogen dioxide	44,838079	195,9424	198,2
Sulphur dioxide	44,918147	196,2923	198,6
Particulate matter PMlO	2,735500	11,9541	12,1
Carbon oxide	160,135997	699,7943	-

For both oil and gas peak-load boilers, fuel oil of calorific value 42,8 MJ/kg was adopted as fuel in the analysed version. Data for each of the boilers based on their heating power and emitter discharging pollutants are given below.

Emitter E - 2 and E - 3			
Height Outlet diameter Flue gas exit velocity Flue gas exit temperature	40,00 m 1,64 m 9,33 m/s (open) 424 K		
SOURCE	Oil and gas boiler fired with fuel oil		
Reducer	No		
EMISSION TIME	650 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^3
Nitrogen dioxide	25,919407	16,8476	587

Sulphur dioxide	68,187979	44,3222	1544,2
Particulate matter PMlO	3,987601	2,5919	90,3
Carbon oxide	1,993801	1,2960	-

In view of the fact that emission standards for nitrogen dioxide, sulphur dioxide and particulate matter are exceeded at the assumptions as mentioned above (attachments Z36 and Z37), a lowered emission value was adopted for the calculations to comply with the emission standards (attachments Z404 and Z41).

Thus the pollutant emissions adopted for the calculations equal:

Emitter E - 2 and E - 3			
Height Outlet diameter Flue gas exit velocity Flue gas exit temperature	40,00 m 1,64 m 9,33 m/s (open) 424 K		
SOURCE	Oil and gas boiler fired with fuel oil		
Reducer	No		
EMISSION TIME	650 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^3
Nitrogen dioxide	17,146685	11,1453	396,4
Sulphur dioxide	36,606178	23,7940	846,4
Particulate matter PMlO	1,993801	1,2960	46,1
Carbon oxide	1,993801	1,2960	-

For the oil and gas fired start-up boiler, fuel oil of calorific value 42,8 MJ/kg was adopted in the present version. The table below presents data for the boiler calculated based on its heating power with pollutant discharging emitter.

Emitter E - 4	
Height Outlet diameter Flue gas exit velocity Flue gas exit temperature	40,00 m 1,64 m 0,90 m/s (open) 424 K

SOURCE	Oil and gas boiler fired with fuel oil		
Reducer	No		
EMISSION TIME	50 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^3
Nitrogen dioxide	1,924134	0,0962	451,5
Sulphur dioxide	6,580539	0,3290	1544,2
Particulate matter PMlO	0,692688	0,0346	162,5
Carbon oxide	0,230896	0,0115	-

In view of the fact that emission standards for nitrogen dioxide, sulphur dioxide and particulate matter are exceeded at the a/m assumptions (attachment Z38), the calculations adopted an emission value lowered to a level which does not result in exceeding the standards (attachment Z42).

Thus the pollutant emission adopted for the calculations equals:

Emitter E - 4			
Height Outlet diameter Flue gas exit velocity Flue gas exit temperature	40,00 m 1,64 m 0,90 m/s (open) 424 K		
SOURCE	Oil and gas boiler fired with fuel oil		
Reducer	No		
EMISSION TIME	50 hours		
Pollutant	Emission		
	[kg/h]	[Mg/annum]	mg/Nm^J
Nitrogen dioxide	1,654755	0,0827	829,0
Sulphur dioxide	3,532710	0,1766	388,3
Particulate matter PMlO	0,192413	0,0096	45,2
Carbon oxide	0,230896	0,0115	-

For thus selected emissions (compliant with emission standards)the preliminary calculations demonstrated exceedance of the permissible values of maximum concentrations and the Sg9,s percentile for nitrogen dioxide as well as Sg9,7 percentile for sulphur dioxide at the height of the nearest buildings. If the height of emitters E-2 and E-3 (peak-load boilers)is increased from 40 m to 49 m at the assumed emission, the Sg9,s percentile for the nitrogen oxide and Sg9,7 percentile for the sulphur dioxide at the height of the nearest buildings will not be exceeded.

On account of the above the height of E-2 and E-3 emitters in calculations is 49 m (attachment Z43). Data for calculating the pollutant spread in ambient air are given in attachments Z43 - Z47. Assuming the above, the scope of calculations for ambient pollutant levels is presented below.

One year				
Pollutant	*Pollutant code number (CAS number)*	*[/ig/m]*	*0,1 *D] [/Ig/m]*	*Scope of calculatio ns*
Nitrogen dioxide	10102-44-0	248,84238	20,0	FULL
Sulphur dioxide	7446-09-5	504,87149	35,0	FULL
Particulate matter PMlO	-	13,82424	28,0	REDUCED
Carbon oxide	630-08-0	110,22057	3000,0	REDUCED

As demonstrated by the above, a full range of calculations for emission levels in ambient air is required for nitrogen dioxide (10102-44-0) and sulphur dioxide (7446-09-5) (attachment Z47). For the remaining pollutants the calculations are completed.

Check of the first condition for dustfall for all the emitters:

Emitter	***Height***	***pylu***	***Condition 0,0667 *h$^{3'15}$***	***Is the condition met***
	m	***mg/s***	***mg/s***	***mg/s***
E-l	160,00	759,861	584929,843	Yes
E-2	49,00	553,833	14068,360	Yes
E-3	49,00	553,833	14068,360	Yes
E-4	40,00	53,448	7423,604	Yes

4&0,244mg/s < ⁰≻^{0667}^h$^{3/5}$ = 155122,500mg/s

e

4&0,244mg/s < ⇒^{0667}^$h^{3}/^{5}$ = 155122,500mg/s

e

Check of the second condition for dustfall.

Y,E_f =14,556Mg/*year* <10000Mg/*year*

f

Since both conditions for dustfall are met, it is not necessary to calculate the dustfall distribution.

For pollutants requiring a full range of level calculations (nitrogen dioxide and sulphur dioxide) calculations were performed for the area covered by a grid of receptors of the following coordinates:

X_d = -1600; Y_d = -1600; X_g = 1600; Y_g = 1600

with calculation gauge of lOOm. The table below specifies maximum concentration values of air pollutants averaged for 1 hour, considering the statistics of meteorological conditions (attachment Z49).

Pollutant	*Pollutant code umber (CAS number)*	**A**	*S_{mm} l/J-g/m^3]*	*Percentile [jdg/m]*	*Point coordinates*
Nitrogen dioxide	10102-44-0	200,0	206,49475	102,01878	x = 0; y = 200; z = 0 x = 400; y = 0; z = 0
Sulphur dioxide	7446-09-5	350,0	440,84225	198,75497	x = 0; y = 200; z = 0 x = 400; y = 0; z = 0

The calculations demonstrate that maximum pollutant concentrations, averaged for 1hour, are not exceeded (considering statistics of meteorological conditions) for the area covered by the receptor grid (attachments Z52 and Z55). It can be seen that calculation of annual average concentrations is required for nitrogen dioxide and sulphur dioxide (attachment Z51 and Z54).

Distribution of averaged annual concentrations was calculated for nitrogen dioxide and sulphur dioxide. The Ordinance of the Minister of the Environment dated Dec. 5, 2002 on reference values for certain pollutants in the ambient atmosphere (JL No 1, item 12) states that calculations of average annual values do not consider the pollutant background for pollutants discharged from emitters higher than lOOm. However, in view of the fact that after the retrofitting of the ZEC Bielsko-Biała only one emitter will meet the above condition, while the remaining three will not, the calculations allow for the pollutant background as submitted by the Voivodeship Inspectorate for Environmental Protection, Bielsko-Biała Office (attachment Z2) for nitrogen dioxide and 10% for sulphur dioxide. The calculations were made for an area covered by a receptor grid of coordinates

$$X_d = -1600;\ Y_d = -1600;\ X_g = 1600;\ Y_g = 1600$$

with a calculation gauge of lOOm. The maximum values of average annual concentrations are given below (attachments Z57 and Z61).

Pollutant	*Pollutant code number (CAS number)*	*D_a-R*	*S_a [jug/m^3]*	*Point coordinates*
Nitrogen dioxide	10102-44-0	11,0	1,08879	x = 400;y = 0;z = 0
Sulphur dioxide	7446-09-5	27,0	2,20202	x = 400;y = 0;z = 0

The calculations prove that the average annual concentration for the pollutant in question is not exceeded (attachments Z59 and Z63).

The Ordinance by the Minister of the Environment dated Dec. 5, 2002 on reference values for certain substances in the air (JL No 1, item 12) page 54 item „3.2. Full scope " reads:
„If apartment or office buildings, over one storey high, or nurseries, kindergartens, schools, hospitals or sanatoriums are found within a distance less than lOh from a single emitter or any emitter of a group, it should be checked whether they are safe as regards exceeding reference values or permissible pollutant levels in ambient air. To this end maximum ambient pollutant concentrations should be calculated for particular altitudes."

Apartment buildings are found within a distance of less than lOh from the tallest emitter of ZEC Bielsko-Biała at ul. Tuwima 2. Thus, calculations of pollutants spread were performed, at the elevation of the nearest buildings (attachments Z65 - Z82).

The results for concentrations S_m and value of 99,8 percentile calculated based n concentrations referred to 1 hour for pollutants in question is presented below:

Pollutant	*Dj*	*[/ig/m]*	*S99.8 l/lg/m]*	*Point coordinates*
Nitrogen dioxide (10102-44-0)	200,0	244,11211	172,30879	x = 200;y= 0; z = 30
Sulphur dioxide (7446-09-5)	350,0	521,15094	349,81500	x = 200;y= 0; z = 30

The calculations demonstrate that the maximum ambient pollutant concentrations averaged for 1 h are not exceeded at the nearest buildings (allowing for meteorological condition statistics.)

Within the radius of 8 km – a distance of 50 times the height of the tallest emitter (equal to 160m) the following are found:

- northward – land up to Czechowice-Dziedzice.
- eastward – land up to Kozy.
- southward – land up to Buczkowice.
- westward – land up to.

An operating plant is obliged by law to perform pollution measurements. This duty arises from art. 147 paragraph 1 of the Environmental Law which states that the plant operator and user are obliged to perform temporary emission measurements. Regarding new plants the a/m article states (paragraphs 4 and 5) that the operator of a new or retrofitted plant, discharging emissions which require a permit, is obliged to perform preliminary measurements of emissions from the plant in question. This duty must be performed not later than 14 days since the end of start-up of the system or starting a facility.

The entire area of the ZEC Bielsko-Biała at ul. Tuwima 2 will be subject to continuous monitoring of all plant processes and technical condition of particular systems. In case of a break-down the process is stopped until the failure is removed and normal operating conditions are restored.

The Ordinance by the Minister of the Environment dated Feb. 27, 2003 on results of measurements carried out in connection with operating plants or facilities and submitted to appropriate environmental agenda as well as the way of presenting them (JL No 59,

item 529) §2 item l reads, „Measurement results for pollutant emissions or energy discharge to the environment, performed for all plants or facilities subject to monitoring obligation, are submitted to respective environmental authorities."

Emissions from the ZEC Heat and Power Plant Bielsko-Biała at ul. Tuwima 2 are not likely to exceed emission standards.

Emitter E - 1	
Fluidised bed boiler	
Pollutant	Emission [mg/Nm]
Nitrogen dioxide	200
Sulphur dioxide	200
Particulate matter PM 10	30

Emitters E-2, E - 3 , E - 4		
Oil and gas fired boilers		
Pollutant	Emission [mg/Nm]	
	Fuel oil	Natural gas GZ-50
Nitrogen dioxide	850	35
Sulphur dioxide	400	150
Particulate matter PM 10	50	5

ZEC Heat and Power Plant Bielsko-Biała, as an plant operator, is obliged to keep records of measurement results and store them for 5 years since the end of the calendar year they refer to.

The emitters at ZEC Heat and Power Plant Bielsko-Biała will be provided with samplers. The measurement cross section is to be located in a straight section of a duct, free from disturbances of flow and with constant hydraulic diameter - D_H (ratio of a quadruple cross section area of the duct to the duct perimeter), as far as possible in a vertical section of length $L > 5D_H$ upstream of the measurement cross section and $L > 2D_H$ downstream. The measuring point location should meet all the industrial safety requirements, an in particular:

- Platform, permanent or provisional, located at the measuring cross section of the duct

should be protected with railings at a height of 1m. The railings should not hamper measuring procedures, and the platform area should be sufficient to service the measuring equipment.

- In order to improve the personnel safety is it recommended to equip the platform with a vertical skirting board 0.5m high.
- Depending on the measuring apparatus used, feeding with all necessary media should be ensured, such as power, water and, if necessary, lighting and protection from rain or snow.

- The calculations comply with the Act dated April 27, 2001 – Environmental Law (consolidated text issued 2008 JL No 25, item 150, as amended) and with the methodology specified in the Ordinance by the Minister of the Environment dated Dec. 5, 2002 on reference values for certain pollutants in ambient air (JL No 1, item 12).

- In case of combusting natural gas GZ-50 in gas-oil boilers, a full scope of calculations was necessary for pollutant level in ambient air for nitrogen dioxide (10102-44-0). Having assumed:
  - NO2 emission of the peak-load boiler 6,789 kg/h
  - $N0_2$ emission of the peak-load boiler II 6,789 kg/h
  - NO2 emission of the light-up boiler 0,669 kg/h

  the permissible level of the pollutant was not exceeded by 99,8 (899,8) percentile over the entire area subject to monitoring by a receptor grid.

- Maximum values of average annual concentration for the pollutant in question are lower than D_a -R. Thus the permissible average annual concentration is not exceeded either.

- The permissible level for nitrogen dioxide (10102-44-0) was not exceeded by 99,8 (899,8) percentile at the nearest buildings.

- In case of gas and oil boilers fired with fuel oil, a full scope of calculations was required to determine the levels for pollutants such as nitrogen dioxide (10102-44-0) and sulphur dioxide (7446-09-5). Having assumed:
  - NO2 emissions from the peak-load boiler 17,147 kg/h
  - $S0_2$ emissions from the peak-load boiler 36,606 kg/h

- $N0_2$ emissions from the peak-load boiler II 17,147 kg/h
- $S0_2$ emissions from the peak-load boiler II 36,606 kg/h
- NO2 emissions from the start-up boiler 1,655 kg/h
- SO2 emissions from the start-up boiler 3,533 kg/h

over the entire area subject to calculations with use of a receptor grid, the permissible level of nitrogen dioxide was not exceeded by 99,8 ($S_9 9_{,8}$) percentile, while that of sulphur dioxide - by 99,7 (899,7) percentile.

- The maximum values of average annual concentration for the pollutants in question are lower than corresponding values assuming D_a - R. Thus the permissible values of average annual concentrations for the pollutants in question are not exceeded.
- In case of nitrogen dioxide (10102-44-0) the permissible level was not exceeded by 99,8 (899,8) percentile at the nearest buildings, while in case of sulphur dioxide (7446-09-5) the percentile is 99,7 (S99/7).

The technical and process analysis and calculations of combustion pollutants spread in ambient air demonstrate that the retrofitted ZEC Heat and Power Plant Bielsko-Biała, ul. Tuwima 2 will comply with the conditions specified in the Ordinance of the Minister of the Environment issued Dec. 5, 2002 on reference values for certain pollutants in ambient air (JL No 1, item 12) as well as Ordinance of the Minister of the Environment issued Dec. 20, 2005 on emission standards from plants (JL No 260, item 2181).

The Ordinance of the Minister of the Environment dated Dec. 20, 2005 on plant emission standards (JL No 260, item 2181) for ZEC Heat and Power Plant Bielsko-Biała specifies emission standards for three pollutants: sulphur dioxide, nitrogen dioxide and particulate matter.

	Emitter E - 1
Height	160,00 m
Outlet diameter	5,87 m

Exit velocity of flue gas	4,5 m/s
Flue gas temperature	434 K
SOURCE	Fluidised bed boiler
Reducer	Nitrogen dioxide – not less than 65% Sulphur dioxide – not less than 92,5% Particulate matter - not less than 99,89%
EMISSION TIME	4370 h/annum
Pollutant	Emission [mg/Nm^3]
Nitrogen dioxide	200
Sulphur dioxide	200
Particulate matter PM 10	30

Emitter E - 2		
Height	49,00 m	40,00 m
	1,64 m	
	9,0 m/s	9,3 m/s
	424 K	
SOURCE	Peak-load boiler	
Reducer	No	
EMISSION TIME	1300 h/annum	
Pollutant	Emission [mg/Nm]	
	Fuel oil	Natural gas GZ-50
Nitrogen dioxide	850	35
Sulphur dioxide	400	150
Particulate matter PM 10	50	5

Emitter E - 3

Height	49,00 m	40,00 m
Outlet diameter	1,64 m	
Flue gas exit velocity	9,0 m/s	9,3 m/s
Flue gas exit temperature	424 K	
SOURCE	Peak-load boiler	
Reducer	No	
EMISSION TIME	1300 h/annum	
Pollutant	Emission [mg/Nm^3]	
	Fuel oil	Natural gas GZ-50
Nitrogen dioxide	850	35
Sulphur dioxide	400	150
Particulate matter PMlO	50	5

Emitter E - 4	
Height	40,00 m
Outlet diameter	1,64 m 0,9
Flue gas exit velocity	m/s
Flue gas exit temperature	424 K
SOURCE	Start-up boiler
Reducer	No
EMISSION TIME	1300 h/annum
Pollutant	Emission [mg/Nm^3]
	Fuel oil / Natural gas GZ-50
Nitrogen dioxide	850 / 35
Sulphur dioxide	400 / 150
Particulate matter PM 10	50 / 5

ATTACHMENTS

Z 1 Plant layout indicating emitters

Z 2 Pollutant background

Z 3 Pollutant emission from coal combustion in the fluidised bed boiler

Z 4 Pollutant emission from natural gas combustion in the peak-load boiler

Z 5 Pollutant emission from natural gas combustion in the peak-load boiler II

Z 6 Pollutant emission from natural gas combustion in the start-up boiler

Z 7 Pollutant emission from coal combustion in the fluidised bed boiler not resulting in exceeding emission standards

Z 8 Pollutant emission from natural gas combustion in the peak-load boiler not resulting in exceeding emission standards

Z 9 Pollutant emission from natural gas combustion in the peak-load boiler II not resulting in exceeding emission standards

Z 10 Pollutant emission from natural gas combustion in the start-up boiler not resulting in exceeding emission standards

Z 11 Reference values

Z 12 Data on emitters

Z 13 Particulate matter size parameters

Z 14 Emissions variants per emitter

Z 15 Load for particular pollutants

Z 16 Calculations for emission variants – calculation scope

Z 17 Calculations for emission variants – emitters

Z 18 Maximum ground level concentrations for nitrogen dioxide, maximum concentration value and 99,8 percentile for maximum concentrations – results

Z 19 Points with maximum nitrogen dioxide concentration values on the ground

Z 20 Points where permissible standards of nitrogen dioxide concentration on the ground are exceeded

Z 21 Distribution of nitrogen dioxide maximum concentrations

Z 22 Average annual nitrogen dioxide concentrations on the ground – results

Z 23 Average annual nitrogen dioxide concentrations on the ground, points of maximum average annual concentration

Z 24 Points of average annual concentrations exceeding standards for nitrogen dioxide

Z 25 Distribution of average annual concentrations for nitrogen dioxide

Z 26 Results for nitrogen dioxide concentrations at buildings over 6 m, 9 m and 12 m high, maximum concentrations and 99,8 percentile for maximum concentrations

Z 27 Points of maximum concentration at buildings over 6 m, 9 m and 12 m high for nitrogen dioxide, maximum concentration values and 99,8 percentile for maximum concentrations

Z 28 Points where permissible standards for nitrogen dioxide are exceeded at buildings over 6 m, 9 m and 12 m high

Z 29 Results for nitrogen dioxide concentrations at buildings 15m, 18m and 21m high, maximum concentration value and 99,8 percentile for maximum concentrations

Z 30 Points of maximum nitrogen dioxide concentrations at buildings over 15 m, 18 m and 21 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 31 Points where permissible standards for nitrogen dioxide concentrations are exceeded at buildings over 15 m, 18m and 21m

Z 32 Results for nitrogen dioxide concentrations at buildings 24 m, 27 m and 30 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 33 Points of maximum concentrations at buildings over 24 m, 27 m and 30 m high for nitrogen dioxide, maximum concentration values and 99,8 percentile for maximum concentrations

Z 34 Points where permissible standards for nitrogen dioxide concentrations are exceeded at buildings over 24 m, 27 m and 30 m high

Z 35 Pollutant emissions from coal combustion in the fluidised bed boiler

Z 36 Pollutant emissions from fuel oil combustion in the peak-load boiler

Z 37 Pollutant emission from fuel oil combustion in the peak-load boiler II

Z 38 Pollutant emissions from fuel oil combustion in the start-up boiler

Z 39 Pollutant emissions from coal combustion in the fluidised bed boiler not resulting in exceeding emission standards

Z 40 Pollutant emissions from fuel oil combustion in the peak-load boiler not resulting in exceeding emission standards

Z 41 Pollutant emissions from fuel oil combustion in the peak-load boiler II not resulting in exceeding emission standards

Z 42 Pollutant emissions from fuel oil combustion in the start-up boiler not resulting in exceeding emission standards

Z 43 Data on emitters

Z 44 Particulate matter size parameters

Z 45 Emissions variants per emitter

Z 46 Load for particular pollutants

Z 47 Calculations for emission variants – calculation scope

Z 48 Calculations for emission variants – emitters

Z 49 Maximum ground level concentrations for nitrogen dioxide, maximum concentration value and 99,8 percentile for maximum concentrations – results

Z 50 Points with maximum nitrogen dioxide concentration values on the ground

Z 51 Points where permissible standards of nitrogen dioxide concentration on the ground are exceeded

Z 52 Distribution of maximum nitrogen dioxide concentrations

Z 53 Maximum ground level concentrations of sulphur dioxide, maximum concentration value and 99,8 percentile for maximum concentrations – results

Z 54 Points of maximum ground level concentrations of sulphur dioxide

Z 55 Points where permissible standards for ground level concentrations of sulphur dioxide are exceeded

Z 56 Distribution of maximum sulphur dioxide concentrations

Z 57 Average annual ground level concentrations of nitrogen dioxide – results

Z 58 Average annual ground level concentrations of nitrogen dioxide, points of

maximum average annual concentrations

Z 59 Points of average annual nitrogen dioxide concentrations exceeding standards

Z 60 Distribution of average annual concentrations for nitrogen dioxide

Z 61 Average annual ground level concentrations of sulphur dioxide – results

Z 62 Average annual ground level concentrations of sulphur dioxide, points of maximum average annual concentrations

Z 63 Points of average annual concentration values exceeding standards for sulphur dioxide

Z 64 Distribution of average annual concentrations for sulphur dioxide

Z 65 Results of nitrogen dioxide concentration at buildings over 6 m, 9 m and 12 m high, maximum concentration value and 99,8 percentile for maximum concentrations

Z 66 Points of maximum nitrogen dioxide concentration at buildings over 6 m, 9 m and 12 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 67 Points where permissible standards for nitrogen dioxide are exceeded at buildings over 6 m, 9 m and 12 m high

Z 68 Results for nitrogen dioxide concentration at buildings 15 m, 18m and 21m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 69 Points of maximum nitrogen dioxide concentration at buildings over 15 m, 18 m and 21 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 70 Points where permissible nitrogen dioxide concentration standards are exceeded at buildings over 15 m, 18m and 21m high

Z 71 Results for nitrogen dioxide concentration at buildings 24 m, 27 m and 30 m high, maximum concentration values and 99,8 percentile for the maximum concentrations

Z 72 Points of maximum nitrogen dioxide concentrations at buildings over 24 m, 27 m and 30 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 73 Points where permissible concentration standards for nitrogen dioxide are exceeded

at buildings over 24 m, 27 m and 30 m high

Z 74 Results for sulphur dioxide concentration at buildings over 6 m, 9 m and 12 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 75 Points of maximum sulphur dioxide concentration at buildings over 6 m, 9 m and 12m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 76 Points where permissible concentration standards for sulphur dioxide are exceeded at buildings over 6 m, 9 m and 12 m high

Z 77 Results for sulphur dioxide concentration at buildings over 15 m, 18m and 21m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 78 Points of maximum sulphur dioxide concentration on buildings over 15 m, 18 m and 21 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 79 Points where permissible sulphur dioxide concentration standards are exceeded at buildings over 15 m, 18m and 21m

Z 80 Results for sulphur dioxide concentrations at buildings over 24 m, 27 m and 30 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 81 Maximum sulphur dioxide concentration points at buildings over 24 m, 27 m and 30 m high, maximum concentration values and 99,8 percentile for maximum concentrations

Z 82 Points where permissible concentration standards for sulphur dioxide are exceeded at buildings over 24 m, 27 m and 30 m high

Z 83 Land within a radius of ten times the height of the tallest emitter around the EC1 at Bielsko-Biała, ul. Tuwima 2

V.3.1. Subject of the study

The study is an assessment of design solutions regarding the propagation range of sound generated by all sources located in the area of the retrofitted Heat and Power Plant Bielsko-Biała EC1 – construction of a new thermal unit and two water boilers in Bielsko-Biała, ul. Tuwima 2.

3.1.2 Purpose and scope of the study.

The purpose of the study is to assess the acoustic environmental impact of the retrofitted EC1 at Bielsko-Biała, ul. Tuwima 2 in post-retrofitting condition and to assess its impact on the sound climate near the property boundary and the nearest residential areas.

The scope of the study includes:

- characteristics of the area in the vicinity of the planned investment with assessment of its current sound climate;
- determining permissible values of sound level A in the area adjoining the EC1 in Bielsko-Biała at Tuwima St.;
- characteristics of technical / process solutions of the facility from the point of view of noise emission;
- noise sources stock-taking;
- determining the main noise sources and preliminary assessment of acoustic environmental impact of the plant;
- calculating the noise level emitted by the plant and its propagation;
- conclusions and recommendations.

3.1.3. Basis of the study. Acts of law, standards, guidelines.

The study was prepared on the basis of the following materials, legal acts, guidelines and instructions:

- Technical and process data of the plant.
- Theoretical calculations performed with use of sound field modelling methods.
- Ordinance of the Minister of the Environment dated June 14, 2007 on permissible ambient noise levels (JL no 120, item 826).
- ITB guidelines no 338. "Metodyka określania emisji i imisji hałasu przemysłowego w środowisku wraz z programem komputerowym" [Methodology of determining industrial noise emission and ambient concentration, with computer programme]. Issue: Warszawa 1996.
- ITB guidelines no 308. "Metoda określenia uciążliwości i zasięgu hałasów przemysłowych wraz z programem komputerowym" [Method of determining industrial noise nuisance and range, with computer programme]. Issue: Warszawa 1991.

- ITB guidelines no 311. "Metoda prognozowania hałasu emitowanego z obszarów dużych źródeł powierzchniowych"[Method of predicting noise emissions from large surface sources]. Issue: Warszawa 1991.
- Obliczeniowe metody klimatu akustycznego w środowisku. [Calculation methods for ambient sound climate]. Issue: Instytut Ochrony Środowiska [Environmental Institute] Warszawa 1988r.
- "Wytyczne dla służb ochrony środowiska w zakresie ochrony środowiska w zakresie ochrony przed hałasem" [Noise protection guidelines for environmental services]; MOŚZNiL , Warszawa 1988.
- J.Sadowski - "Podstawy akustyki urbanistycznej"; [Acoustics for town planning] Warszawa 1982.
- PN - 61/B - 02513 "Akustyka budowlana. Nazwy i określenia".
- PN-70/B-02151 -"Akustyka budowlana. Ochrona przeciwdźwiękowa pomieszczeń".
- PN-84/N - 01330 - "Hałas. Techniczna metoda określenia poziomu mocy akustycznej hałasu maszyn w swobodnym polu akustycznym nad powierzchnią odbijającą dźwięk".

3.1.4 Noise nuisance range.

The range and volume of noise emitted by industrial plants depend on both the sound level produced by particular sources and the following factors:

- means of noise abatement (noise screens, silencers etc.),
- development of land surrounding the noisy equipment,
- time characteristics of noise sources,
- topographic features and development of land subject to noise effect.

The boundary of noise impact zone of the plant is determined by an equal loudness contour of value permissible for a given area. The area where the sound level exceeds the permissible value is referred to as a sound nuisance zone. Within its boundaries no protected facilities or areas may be situated.

Depending on the kind of industrial plant (newly designed, existing), a method based on measurements or calculations is used to determine the plant’s sound impact range.

CALCULATION METHOD.

The method refers mainly to newly designed industrial plants, as well as expanded and retrofitted ones. In such cases, data on both internal and external noise sources, as well as development of the plant site and its neighbourhood, allow to determine the range of noise exceeding the permissible level for the surrounding area.

The method is based on a dependence between sound emissions, characterised by an equivalent and maximum sound level A of particular sources and ambient noise in the area in question, characterised by equivalent and maximum sound level A .

MEASUREMENT METHOD

The measurement method is applied only for existing industrial plants when determining the sound emission level is necessary, as well as it propagation into the neighbouring areas, considering their spatial development.

3.1.5. Permissible ambient sound intensity.

The permissible values of sound intensity for different areas are given in the table below – according to the attachment to the Ordinance of the Minister of the Environment dated June 14, 2007 on permissible ambient noise levels (JL No 178, item 1841).

TABLE 1.

Item 1.1	**Land use (zoning)**	**Permissible noise level expressed by means of equivalent sound level A in dB**			
		Roads or railways		**Installations and other objects and groups of noise sources**	
2 3		**Hour – during the day – reference time interval equal to 16 hours**	**Hour – during the night – reference time interval equal to 8 hours**	**Hour – during the day – reference time interval equal to 8 least favourable successive hours during the day**	**Hour – during the night – reference time interval equal to 1 least favourable hour during the night**
	2	3	4	5	6
	a. Protective area „A" health resorts b. Areas of hospitals out of urban areas	50	45	45	40
	a. Areas of single family residential houses b. Areas of houses associated with permanent or prolonged occupation of children and youth c. Areas of social care institutions d. Areas of hospitals within urban areas	55	50	50	40
	a. Areas of multi -family residential houses and collective residential houses	60	50	55	45

4	b. Areas of farmsteads c. Recreation and rest areas d. Residential and service areas				
	a. Areas situated in the central zone of towns with more than 100 thousand inhabitants	65	55	55	45

3.2. Localization of Elektrociepłownia Bielsko-Biała EC1 and characteristics of the area in its direct vicinity.

Elektrociepłownia EC1 is situated almost in the centre of Bielsko-Biała town. From their west side, EC premises are delimited by Bielsko – Żywiec railway line and by Żywiecka Street constituting a fragment of the national road No 69 from east side. J. Tuwima Street is the northern boundary and J. Chodkiewicza Street is the southern boundary of the premises.

The local area development plan for Bielsko-Biała town established in the form of resolution on 26th May 1994 expired on 1st January 2003.

In accordance with this plan, the following functions have been assumed for the areas situated north, south and east of Elektrociepłownia EC1 in Bielsko-Biała town, 2 Tuwima Street: "R – zoned area (encompassing single and multi-family houses)".

From its east side, the premises of EC1 adjoins to the railway and industrial areas.

Pursuant to the Study of land use conditions and directions for Bielsko-Biała gmina approved in the form of resolution No XXQ/252/99 adopted by City Council on 21st December 1999, the following functions are performed by the area around Elektrociepłownia EC1 in Bielsko-Biała: single and multi-family houses as well as preferred small service and handicraft shops.

3.3 Characteristics of Elektrociepłownia EC1.

The modernization of ZEC Bielsko-Biała consists in the erection of a new thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt including partial liquidation of existing objects.

The primary goal of the investment is to reconstruct the thermal and electric capacity of Elektrociepłownia EC1. The erection of basic generation facilities will be accompanied by the construction of auxiliary systems i.e.: fuels management, water supply and sewage disposal management, furnace waste management.

3.4 Characteristics of noise sources.

The acoustic arduousness problem from the premises of Elektrociepłownia EC1 can be associated with the impact of indirect sources (indoor noise – inside the investment objects) and with the impact of direct sources (outdoor noise – out of the investment objects) including point and linear sources. Due to the kind of use of the objects complex under analysis, potentially unfavourable acoustic impact is possible at night and day hours.

Linear (communication) sources.

The traffic of delivery vans supplying the materials, raw materials etc. will be carried out along inner roads. Their number will be equal about 50 vans/ month. Therefore the impact of delivery vans (as the sources emitting noise into the environment was ignored) in further calculations.

Point sources.

These sources have been classified as the sources situated out of the objects or in their vicinity as well as equivalent sources:

ZŁ1-ZŁ4 - dumping and loading machine – sound power level - 82 dB(A)

WCS - flue gases draught fan – sound power level - 85 dB(A)

TR - generator transformer– sound power level - 85 dB(A)

TR - auxiliary transformer – sound power level - 85 dB(A)

Indirect (surface) sources).

Noise will be generated in the buildings and will penetrate into the environment through the enclosure elements.

ZRW - Coal unloading bunker – Slot bunker – noise level - 82 dB(A
MI - Coal supply tunnel from slot bunker – bridge M1 – noise level - 82 dB(A
BPRZ - rehandling building – noise level - 82 dB(A
M2 - inclined coal supply bridge – M2 – noise level - 82 dB(A
WPRZ - coal supply transfer tower – Bunker room – noise level - 82 dB(A
CHW - Mechanical draught wet cooling tower – noise level - 85 dB(A
BKOT - Building incorporating the boiler station – fluidised bed steam boiler – noise level - 85 dB(A
BKSZ - Building incorporating peak – hours boiler station – 2 gas/ oil fired boilers – noise level - 85 dB(A)
MASZ - Building incorporating the turbine hall – noise level - 85 dB(A
ELF - Electrofilter – noise level - 84 dB(A
SPR - Air compressing station – noise level - 85 dB(A
BGO - Oil management building – noise level - 81 dB(A
SKPG - Gas control and measuring station – noise level - 80 dB(A
POMP - Building incorporating the water pumping station – noise level - 84 dB(A

Owing to the fact that the noise will penetrate from the objects into the environment through the enclosures/ partitions, the following average insulating powers have been assumed for the enclosures/ partitions: R= 5 dB(A) up to R = 20 dB(A) – pursuant to ITB - 308 and ITB-338.

3.5. Acceptable values of noise intensity around EC1

Pursuant to mandatory documents:

Appendix attached to the Decree issued by the Minister of Environment on 14 June 2007 regarding the permissible noise levels in environment (Journal of Laws 178; Item 1841)

and considering the type of areas surrounding EC1, the following acceptable levels of noise emissions to the residential buildings areas have been proposed in the report on undertaking impact on the environment:

- 55 dB(A) – equivalent sound level between 6^{oo} and 22 °°
- 45 dB(A) - equivalent sound level between 22 ^{oo} and 6°°

3.6. The computation of level of sound intensity which will be emitted into the environment to be modernized and sound propagation.

The computation of level of sound intensity which will be emitted into the environment from the premises of Elektrociepłownia EC1 in Bielsko – Biała and of sound propagation has been carried out by means of "HPZ95ITB" software.

Noise emission by surface sound sources.

ITB-338 Instruction has been established as the basic instruction for the description and computation of noise emission by the surface and outdoor sound sources. The surface sound sources are classified as the walls and roof of the buildings incorporating the noise sources.

The total equivalent sound level (A) at the imission location, for the noise originating from all elementary sound sources, is calculated by means of equations used by the software. As a result of relevant program options, the printout of the results obtained for observation points is possible in the form of table of graphical representation.

The computation of level of sound intensity which will be emitted into the environment from the premises of Elektrociepłownia EC1 in Bielsko – Biała and of sound propagation has been carried out by means of "HPZ95ITB" software.

This software makes it possible to compute and to illustrate the noise emission range for an industrial facility, to determine the sources contributing to resulting noise and to determine this contribution as well as determine how to reduce this noise in an optimal manner. In the framework of said software, the noise sources are subdivided into the indoor and outdoor sources. In case of indoor sources, “secondary” noise sources are created i.e. in the form of the walls and roof of the building.

The purpose of the data determining the mathematical and acoustic model is to describe the geometrical location, size of model elements (e.g. sources, screens) and their acoustic features (equivalent and maximum corrected level of acoustic power (A), sound level (A) indoor at each external wall, insulating power of external walls). All data associated with sizes and coordinates are specified in meters and describing acoustic properties in dB.

Data prepared for a/m program have been presented in the appendix.

The following noise sources have been specified:

Point sources:

ZŁ1-ZŁ4 - dumping and loading machine – sound power level - 82 dB(A)

WCS - flue gases draught fan – sound power level - 85 dB(A)

TR - generator transformer– sound power level - 85 dB(A)

TR - auxiliary transformer – sound power level - 85 dB(A)

Indirect (surface) sources):

ZRW - Coal unloading bunker – Slot bunker – noise level - 82 dB(A
Ml - Coal supply tunnel from slot bunker – bridge M1 – noise level - 82 dB(A
BPRZ - rehandling building – noise level - 82 dB(A
M2 - inclined coal supply bridge – M2 – noise level - 82 dB(A
WPRZ - coal supply transfer tower – Bunker room – noise level - 82 dB(A
CHW - Mechanical draught wet cooling tower – noise level - 85 dB(A
BKOT - Building incorporating the boiler station – fluidised bed steam boiler – noise level - 85 dB(A
BKSZ - Building incorporating peak – hours boiler station – 2 gas/ oil fired boilers – noise level - 85 dB(A
MASZ - Building incorporating the turbine hall – noise level - 85 dB(A

ELF - Electrofilter – noise level - 84 dB(A

SPR - Air compressing station – noise level - 85 dB(A

BGO - Oil management building – noise level - 81 dB(A

SKPG - Gas control and measuring station – noise level - 80 dB(A

POMP - Building incorporating the water pumping station – noise level - 84 dB(A

Average insulating power R = 5 dB up to = 20 dB has been assumed in calculations (the insulating power for enclosures / partitions conforms with Instructions ITB-338 and 308).

In case of any rigid obstacle e.g. building, earth embankment or compact green belt situated between a noise source and observer, the value of sound level at the observation point depends on the reduction of sound level vs. distance from the source and on effectiveness of screening by an enclosure / partition under consideration.

Indirect screening elements have been selected for the object under consideration and provided with symbols between E-l and E-17:

BA – Administration Building

SLUW - Water Pretreatment Station

NAS - Incorporating the control room

ROZD – Switchyard Building

MKOT - Building incorporating turbine hall and old boiler station

BŁ – Link Building

SUW - Water Treatment Station

BSPR - Building incorporating air compressors

BGS - Building incorporating the garages for bulldozers

MAG1 -MAG3 - Warehouses

BW - Building incorporating workshop

BBS – Office and Social Building

BWB - Building incorporating construction workshop

BSU – Social and Service Building

BM – Residential Building

Aforesaid data are presented in appendices attached to the present study.

A computational method has been used in course of determination of the impact range for the noise emitted from the premises of Elektrociepłownia EC1 in Bielsko –Biała.

"HPZ95ITB" software has been created by Zakład Akustyki ITB Warszawa on the basis of the Instruction 338 ITB issued in 1996.

The data on sources and screens have been entered by means of a/m software, in accordance with the appendix.

In order to determine the impact range for the noise around the object under consideration, the Cartesian co-ordinate system has been plotted on the plan illustrating the facility with adhering area.

OX axis has been oriented in east – west direction; OY axis has been oriented in north - south direction. Grid nodes have been assumed every 30 m.

In the framework of this program, the intensity of sound emitted by the sources has been calculated for each node of the grid with consideration of screening.

Therefore it was possible to draw noise isolines (the lines with equal sound level) in the areas adhering to the premises of Elektrociepłownia EC1 in Bielsko –Biała. These isolines determine maximum impact range for the noise with equal sound intensity level.

3.7. Final conclusions and recommendation

On the basis of performed **acoustic evaluation** it has been demonstrated that the existing acoustic climate will be not affected by the operation of modernized Elektrociepłownia EC1 in Bielsko-Biała, 2 Tuwima Street i.e. any permissible sound intensity standards i.e. 55 dB(A) during the day and 45 dB(A) during the night will be not exceeded in the areas encompassed with acoustic protection (multifamily residential houses in south area).

Remark:

Impacts on environment in the phase of modernization of Elektrociepłownia EC1 will be temporary impacts with significant intensity. Significant disturbance of acoustic climate are possible during modernization as a result of noise emitted by the machines and facilities performing construction and transport works.

APPENDICES

V.4. Water and sewage management

V.4.1. Purpose of the study

The purpose of the present part of the study is to determine the impact of contemplated project consisting in *modernization of* ***Bielsko-Biała EC1*** on the condition of surface and ground waters.

V.4.2. Water supply

Water drawing conditions

EC1 is in possession of an integrated permit granted for fuels incineration system and valid up to 8th June 2015.

permitting to **draw water from Biała river for process purposes in amount of Q=0,014 m^3/s maintaining the undisturbed flow Q_{NN}=0,050 m^3/s.**

The maximum consumption of water from water supply network up to 10 000m^3/24h (416 m^3/h) is allowed under existing contract concluded by Elektrociepłownia Bielsko-Biała with the Enterprise AQUA S.A.

Pursuant to the Contract 1075/96 on water supply concluded on 01.01.1996 between Przedsiębiorstwo Komunalne „AQUA" S.A. in Bielsko – Biała and „ZE Elektrociepłownia Bielsko-Biała" S.A. in Bielsko – Biała, the recipient shall obtain the consent of the Supplier for change of water supply technical parameters in the scope of water supply increase exceeding the contractual volume by 10%. The recipient shall also obtain the consent of the Supplier for each water supply from hydrant (or from similar water intake points) incorporated on the water supply network of the Supplier. **It is assumed that the water for the new power unit will be drawn from Biała river in amount not exceeding its permitted consumption (1209,6 m3/d).**

It is not anticipated to use the water from water supply network for process purposes.

Water for process purposes

Water for process purposes will be subjected to treatment in the Water Treatment Station.

It is anticipated that the following water quality requirements will be met for individual principal process cycles:

- **Make up water for cooling cycle:**

pH	7,2-9,5,
carbonate hardness	lower than 2 mval/dm^3,
content of chlorides	lower than 100mg/dm^3,
content of sulphates	lower than 75 mg/ dm^3
total iron,	lower than 0,2 mg/ dm^3;

Make up water for heat district cycle:

- pH at temperature.<25°C lower than 9

electric conductivity lower than 10 u S/cm

total basicity after pH correction total hardness lower than 0,3 mval/dm^3

content of O_2 lower than 0,02 mval/dm^3

content of SiO_2

content of Cu lower than 0,02 mval/dm lower than 1,0 mg/dm^3

total iron content lower than 0,05 mg/dm

COD as oxygen consumption lower than 0,05 mg/dm^3 OWO

Boiler water:

content of SiO_2 lower than 0,2

mg/dm^3 lower than 0,2 u S/cm

- electric conductivity lower than 10,5 do 12
- pH at temperature <2 5 ° C

The following net water demands are anticipated for process cycles making up:

-* make up water for heat district cycle: nom. /max 10 m^3 /h /30 m^3 /h

-* make up water for steam and condensate circuit and cooling service water: nom./max 4 m^3 /h/7,5

Total estimated maximum water consumption for the process will be equal to about 44,7 m^3 /h i.e. 1072,8 m^3 /d after the erection of the new power unit in EC1

Total annual maximum water consumption for the process will be equal to about 44,7 m^3 /h i.e. 1072,8 m^3 /d after the erection of the new power unit in EC1.

Water demand for social and domestic purposes

Water for social and domestic purposes as well for washing will be supplied from the district water supply network.

Water volume required for fire fighting purposes determined in accordance with requirement included in the Decree issued by the Minister for Inner Affairs on 16.06.2003 concerning fire water supply and fire roads will be equal to 80 dm^3/s.

-* water demand for washing purposes up to 7,2 m^3 /h

-* Water demand for social and domestic purposes 8,3 m^3/d

In connection with the reconstructive modernization of Elektrociepłownia Bielsko-Biała EC1, the reduced consumption of water is anticipated. The value of water demand for compensation of losses in cooling circuit constitutes about 15% of its actual consumption.

V.4.3. Waste water discharge

Waste water discharge conditions

Existing waste water discharge conditions are determined in the contract No 125/96 concluded on 09.09.1996 between Przedsiębiorstwo Komunalne „AQUA" S.A. in Bielsko Biała and „Zespół Elektrociepłowni Bielsko-Biała" S.A. in Bielsko Biała concerning discharge of waste water and storm water drainage into municipal sewer systems in Bielsko Biała town being the property of „AQUA" S.A.

Pursuant to the contract , the following waste water streams are allowed:

♋◑ domestic and household waste water - 350 m^3/ 24h, - 1000 m^3/ 24h,

♌◑ industrial and process waste water - 1000 m^3/ 24h,

♍◑ industrial waste water – post-cooling waters and condensates - 500 m^3/ 24h,

d) storm water drainage discharged into combined sewer systems - from runoff surface of 63 500 m^2

The permissible pollution indices in industrial waste water discharged into sewer systems are determined in the Decree issued by the Minister of Building Sector on 14.07.2006 concerning the method of the performance of their duties by the suppliers of industrial waste water and conditions to be met when discharging waste water into sewer systems (Journal of Laws 2006.136.964

Permissible pollution indices in industrial waste water discharged into sewer systems

Item:	Pollution index	Unit	Permissible concentration	
			Contract with„AQUA"	Decree (Annex No 2)
1.	BOD_5	mg0_2/l	<700	values determined in the contract
2.	COD	mg02/l	<1000	values determined in the contract
3.	Chlorides	mgCI/1	<600[n]	1 000
4.	Sulphates	mg$S0_4$l/l	< 300[2])	500
5.	Dissolved substances	mg/l	<1500	
6.	Total suspended solids	mg/l	<330	values determined in the contract
7.	Substances extracted with petroleum ether	mg/l	<50	100
8.	Oil derivatives	mq/l	<15	15
9.	Total nitrogen	mg N/l	<20	values determined in the contract
10.	Ammonia nitrogen	mgNHJI	<15	200

11.	Total iron	mgFe/1	<10	values determined in the contract
12.	Total phosphorus	mgP/1	<3	values determined in the contract
13.	Rhodanates	mgCNS/1	<5	30
14	Cyanides excluding bound cyanides	mgCNS/l	≤ 1	0,5
15	Phenols	mg/l	≤ 0,05	15
16	Anionic surfactants (detergents)	mg/l	≤ 5	15
17.	Nonionic surfactants (detergents)	mg/l	≤ 10	20
18.	Lead	mgPb/l	≤ 0,5	1
19.	Mercury	mgHg/l	≤ 0,01	
20.	Copper	mgCu/l	≤ 0,5	1
21.	Zinc	mgZn/l	≤ 1	5
22.	Cadmium	mgCd/l	≤ 0,1	
23.	Chromium 6+	mgCr^{+6}/l	≤ 0,1	0,2
24.	Chromium 3+	mgCr^{+3}/l	≤ 0,5	
25.	Nickel	mgNi/l	≤ 1,0	1
26.	Boron	mgB/l	≤ 1,0	10
27.	Arsenic	mgAs/l	≤ 1,0	0,5
28.	Free chlorine	mgCl_2/l	≤ 1,0	1
29.	Sulphides	mgS/l	≤ 0,2	
30.	Trichloroethylene (TRI)	mg/l	0	
31.	Carbide	mgCaC_2/l	0	

Pursuant to a/m Decree, the temperature of industrial waste water discharged into sewer systems should not be higher than 35ºC, pH value should be included between 6,5 and 9,5.

Designed facility sanitary and industrial sewage system as well as storm water drainage system will be integrated with the municipal sewer network to be used as the receiving body for waste water from the objects associated with designed undertaking..The following stream will be discharged

into sanitary and industrial sewage system:

- waste water from cooling system
- waste water from the water treatment station
- waste water from the unloading station after pretreatment
- waste water originating from floor washing
- social and domestic waste water.

It is assumed that water treatment technology will be based upon reverse osmosis process.

Description of water treatment technology

In the framework of designing of water treatment station the following technology has been assumed:

- Preliminary water treatment – flocculation aided ultrafiltration (UF), nominal process output of 2x20=40m^3/h
- Water deionisation – reverse osmosis I stage (RO), nominal process output of 2x10=20m^3/h.,
- Final demineralisation – member of ionite demineralisation – cationite and anionite process; rated output of 2x7,5=15m3/h.

Water pretreatment and ultrafiltration

The execution of the pretreatment process (disinfection, flocculation) and filtration on the basis of membrane ultrafiltration technology has been assumed for newly designed system. The construction of two (2) UF units is assumed with capacity of 50% of total demand each.

Water deionisation

It has been assumed that newly designed system will be based upon deionisation process in the form of reverse osmosis technology. Assumed quality of treated water – conductivity <10μS/cm. The installation of two (2) RO units with individual throughput of 75% of total demand; the both RO units will be connected in parallel configuration and their operation will be independent.

Final water demineralisation

The final demineralisation system will consist of two sequence of multi-chamber (cationite / anion-ite/ cationite) columns, each one with individual capacity of 100% of the total demand

Waste water from UF, RO and demineralisation system will be directed to industrial sewage system. Waste water from ion exchange demineralisation system will be dosed to a/m waste water system in order to enable pH correction.

The neutralization of sewage is anticipated in order to ensure the parameters included in Table No 4 and enabling sewage discharging into sewage facilities.

It is anticipated that the connections discharging washing waste water from the compressor station building, from the oil management building, from garage building will be provided with the preatreatment facilities eliminating oil crude derivatives.

>- **Waste water discharged from process systems**

Balance of waste water discharged from process systems into sewer system

	Waste water to industrial sewage system	medium	Max. m^3/h
1	**Steam – water system of the unit**		
	1 Overflow from contaminated condensate tank	demi water	2
	2 Overflow from discharges and overflows tank	demi water	0
	3 Equipment dewaterings; about 10 points	demi water	15
	4 Pipelines dewaterings; about 30 points	demi water	2
2	**Heating water system**		0
	Pipelines dewaterings; about 10 points	soft water	1
	Overflow from discharges and overflows tank	soft water	0
	accumulator overflow basin dewatering	soft water	
3	**Service (cooling) water system**)		100
	1 Cooling tower cells drainage	demi water	20
	2 Overflow from discharges and overflows tank	demi water	30
	3 Pipelines dewaterings; about 10 points	demi water	
			2
			0
			1
			0
			1
			0

Annual volumes of waste water discharged from process system will be equal to about 1 500 m^3 / year

>- **Waste water from the Water Treatment Station >**

As a result of the proposed technological system of the Water Treatment Station the following streams of waste water will be produced:

System	Volume [m^3/h]	Suspended solids [mg/ dm^3]	Chlorides [mg/ dm^3]
UF Pre-treatment	2-5	500-1000	like in raw water
Sludge dewatering system		precipitation in form of sludge in amount of 0,15 m^3/ 24h:	
Deionisation ROI	3-5,3	1	<800
Final demineralisation ion exchange columns	0,1-0,2	1	10.000

Annual volume of waste water discharged from the Water Treatment Station will be equal to about 8 400 m^3 / year.

Waste water from UF, RO and demineralisation system will be directed to industrial sewage system. Waste water from ion exchange demineralisation system will be dosed to a/m waste water system in order to enable pH correction. The waste water discharged in aforesaid system will be characterized by the following parameters:

- suspended solids < 3 5mg/ dm^3;
- content of salts < 1000 mg Cl/ dm^3)

Owing to a/m parameters, the waste water can be discharged into external receiving bodies

-* **Waste water with oil content**

Waste water occurred as a result of leakages or operating personnel errors from the unloading station and the channels will be drained to oil separator.

Waste water generated in the pumping station building will be removed by means of submersible pump with float control, installed in order to enable the pumping of any potential oil contaminated sewage to the oil separator.

■* **Waste water from floors washing**

Discharge of waste water originating from floor washing in the newly designed objects of boiler station and turbine hall is anticipated in the amount of 14,4 m^3/d.

■* **Social and domestic waste water**

Social and domestic waste water from the newly designed objects will be discharged into industrial and sanitary sewage system in amount of about 8,3 m^3/d.

-» **Storm water sewage**

Facility storm water drainage system will be used as the receiving body for precipitation waters from dewatering of roofs, dewatering of roads associated with the undertaking being implemented, drainage water from coal storage yard dewatering, precipitation waters from dewatering of sealed sumps of oil transformers, precipitation waters from dewatering of sorbent unloading trays, ammonia water, precipitation waters from dewatering of the tray on ash transfer station.

The installation of local pre-treatment equipment is anticipated in order to eliminate crude oil derivatives and the sludge settling tanks will be installed in the area of coal storage yard and ash unloading station.

It is assumed that precipitation and thaw waters from paved surfaces and from the roofs of designed objects will be discharged into the storm water drainage system and into combined sever system thereafter..

Assuming the design storm intensity, precipitation waters will be discharged in amount of 250 dm^3/s. Average discharge of rain waters will be equal to 7500 m^3/year.

V.4.5. Conclusions

The water supply and sewage discharge management will be carried out in a manner ensuring maximum protection of the environment against pollution. The contemplated project will not contribute to change of water conditions in the investment area nor in adjacent areas and will not contribute to the deterioration of surface and ground waters quality.

V.5. Waste management

V.5.1. Purpose and scope of the study

The purpose of the present part of the study is to determine the impact of waste produced as a result of the operation of newly implemented project i.e. the **erection of the thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt**.

V.5.2. Types and volumes of anticipated waste

Waste management

The waste generated in EC1 premises in framework of designed undertaking will be produced in connection with:

construction works

fuels incineration process

- auxiliary activity encompassing the current and periodical repairs / overhauls as well as workshop, erection and assembling works
- processes associated with water and sewage treatment.

Any generated waste will be stored in a selective manner, taken over by authorized business units acting as the holders of relevant permits pursuant to the requirements included in the Act of 27th April 2001 – Act on waste (unified text Journal of Laws 2007, No 39 Item 251 including further amendments) and handed over to the recycling or neutralization facilities thereafter.
The principle to be applied consists in the reduction of waste volumes and their negative impact on environment as a result of the following organizational activities:

- arrangement of personnel training in the scope of proper waste handling procedure;
- control of waste volumes being produced as a result of the keeping of their qualitative and qualitative records;,
- implementation of rational management in the scope of means used by the personnel,
- implementation of selective waste collection and their storage in specialized containers,

• waste handing over to specialized companies in order to perform recycling or neutralization process

• handing over to recycling in case of waste kinds with properties enabling their utilization in actual state of technology and organization, particularly in case of waste which can be used as an alternative raw material instead of raw materials and materials originating from natural resources or as a complete equivalent of a raw material or fuel previously used in a manufacturing process or which can be used in order to improve the quality or manufacturing process performance or safety level, or which can be used in order to reduce negative impact of manufacturing process on environment, constitute the source of recoverable raw materials, constitute the usable articles after the regeneration or processing, or which can be used in building purposes immediately or after processing.

V.5.3. Characteristics of anticipated waste, waste generation sources

Furnace waste being a by – product generated in coal incineration process will be produced in connection with electric energy production and will constitute 99% of the whole waste volume generated in EC.

Specification of types and volumes of anticipated production waste

Waste other than dangerous

CODE	Groups, subgroups and types of waste
The waste will be generated in connection with operation of thermal and electric energy production in the premises of EC1 after modernization.	
10	Waste from thermal processes
10 01	*Waste from power plants and other fuels incinerating facilities in power sector*
10 01 24	Sands from fluidised beds (bottom ash from fluidised bed boiler)
10 01 82	Mixtures of fly ashes and solid wastes as a result of flue gases desulphurization by means of lime methods (incineration in fluidised bed)

Item		Type of waste	VOL [t/a]
1.	100124	Sands from fluidised beds (bottom ash from fluidised bed boiler)	47000
2.	100182	Mixtures of fly ashes and solid wastes as a result of flue gases desulphurisation by means of lime methods (incineration in fluidised bed)	32000

In the scope of management of waste produced in connection with basic activity / EC1 after modernization/ and consisting mainly of furnace waste, EC1 is engaged in actions intended to use the hard coal with good quality parameters in manufacturing process and to utilize furnace waste. Zespół Elektrociepłowni Bielsko-Biała has concluded the contracts with an enterprise engaged in furnace waste recovery i.e. using this waste as filling material in mines.

The management methods for individual waste types have been determined in accordance with the appendix No 5 and 6 attached to the Act on Waste.

a) **recovery of waste -** shall mean any operations which do not endanger human life and health or the environment, consisting in the use of waste in whole or in part, or leading to extraction and use of substances, materials or energy

b) **treatment of waste -** shall mean the submission of waste to the processes of biological, physical or chemical treatment as result of which the nature of waste does not pose risks to human life and health or the environment.

The waste types which are typical for functioning of each industrial object will be generated except of furnace waste in the premises of EC 1 after modernization:
Dangerous waste*

Code	Type of waste
130205*	Mineral engine, gearbox and lube oils free of halogen organic compounds
130307*	Mineral oils and liquids used as electric insulators and heat carriers free of halogen organic compounds
150202*	Oil soaked cleaning materials
160213*	Scrapped equipment containing dangerous materials other than those specified in 16 02 09 through 16 02 12 (e.g.: fluorescent lamps, thermometers, screens)
160601*	Batteries and lead batteries
170204*	Wood waste contaminated with dangerous substances (e.g. sleepers)

Waste other than dangerous

Code	Type of waste
07 02 80	Rubber waste from worn belt conveyors
15 02 03	Sorbents, filtration materials, textiles for wiping and protective clothes not contaminated with dangerous substances
16 02 14	Scrapped electric and electric equipment not containing any dangerous substances
1602 16	Elements removed from scrapped equipment other than those specified in 160215
170101	Concrete waste and concrete rubbish from demolition and overhauls
1817 01 02	Crushed brick
17 03 80	Paper roof waste
17 04 01	Copper, bronze, brass
17 04 02	Aluminium
17 04 05	Iron and steel
17 04 07	Mixtures of metals
17 04 11	Cables not containing crude oil, tar and other dangerous substances
17 05 08	Crushed stone
17 06 04	Insulation materials other than those specified in 17 06 01 and 17 06 03

V.5.4. Waste generation sources, storage locations and conditions for anticipated furnace waste and their further handling

Waste other than dangerous – furnace waste

Code	*Type of waste*	*Method of collection, transport, recovery and neutralization*
10 01 24	**Sands from fluidised beds (bottom ash from fluidised bed boiler)**	**Bottom ash** from fluidised bed boiler will be discharged from the hoppers of bottom ash silo. Pneumatic conveying pumps will be incorporated under each hopper.

Code	*Type of waste*	*Method of collection, transport, recovery and neutralization*
		Transport pipelines will be laid on the installation bridge and will lead to the ash storage silos area. It has been assumed that bottom ash will be located in newly designed ash silo V=1000m^3. Collection and transportation by means of trucks or railway to the recovery facilities by an entrepreneur having relevant permits in that scope. The use (recycling) as filling material in mining sector, for building materials production (R5), as the material for earth works and land reclamation (R10). Any waste not handed over for recovery are disposed at waste dump (D5).
10 01 82	**Mixtures of fly ashes and solid wastes as a result of flue gases desulphurization by means of lime methods (incineration in fluidised bed)**	**Fly ash from fluidised bed boiler** will be discharged from the hoppers of water economizer (ECO), rotary water heater (LUVO) and electrofilter hoppers (ESP). Material will be supplied to pneumatic conveying pumps incorporated under each hopper.

Code	*Type of waste*	*Method of collection, transport, recovery and neutralization*
		Part of pumps will feed the common transport collector. Estimated storage reserve of ash storage silos amounts about 6.5 day. Collection and transportation by means of trucks or railway to the recovery facilities by an entrepreneur having relevant permits in that scope. The use (recycling) as filling material in mining sector, for building materials production (R5), as the material for earth works and land reclamation (R10). Any waste not handed over for recovery are disposed at furnace waste dump (D5) in Kaniowo.

The waste types which are typical for functioning of each industrial object will be generated except of furnace waste in the premises of EC 1 after modernization:
Dangerous waste*

Code	*Type of waste*	*Permissible Waste volume annually [Mg/a]*	*Waste source and methods of its storage and management.*
130205*	Mineral engine, gearbox and lube oils, free of halogen organic compounds	20,0	Created in connection with the operation of oil management systems and with overhaul works on the equipment

130307*	Mineral oils and liquids used as electric insulators and heat carriers free of halogen organic compounds	20,0
150202*	Oil soaked cleaning materials	2,5
160213 *	Scrapped equipment containing dangerous materials other than those specified in 16 02 09 through 16 02 12 (e.g.: fluorescent lamps,	0,5

Stored in sealed lockable drums, in the oil management room.	Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management Created in connection with the operation of oil management systems and with overhaul works on the equipment.
Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management Created in connection with the operation of oil management systems and with overhaul works on the equipment.	Stored in lockable drums, in storage room.
Stored in sealed lockable drums, in the oil management room.	Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – overhaul and workshop works on the equipment.

	thermometers, screens)		Stored in specialized containers protecting against damage in separate room in the store. Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – overhaul and workshop works on the equipment and transport means..
160601 *	Batteries and lead batteries	**0,5**	
170204*	Wood waste contaminated with dangerous substances (e.g. sleepers)	**5,0**	Stored in an acid resistant containers separated locked room in the store. Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – overhaul and dismantling works in building objects Bulk storage in arranged manner at the Storage Yard. Collection and transportation by trucks by recipient being in

possession of relevant permit in the scope
of waste management.

Waste other than dangerous

Code	*Permissible waste volume annually* [Mg/a]	***Waste source and methods of its storage and management.***
07 02 80	Rubber waste from worn belt conveyors 1,0	Created in connection with auxiliary activity – overhauls of belt conveyors Waste stored in containers in the store. Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management.
150203	Sorbents, filtration materials, textiles for wiping and protective clothes not contaminated with dangerous substances 2,0	Created in connection with auxiliary activity – overhaul and workshop works Waste stored in sealed drums in the store Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management.
160214	Scrapped electric and electric equipment not containing any dangerous substances 0.5	Created in connection with auxiliary activity – electric equipment maintenance Waste stored in storage room in the IT and Telecommunication Department. Transportation using inner transport means to the storage place Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management.

16 0216 0,5	Elements removed from scrapped equipment other than those specified in 160215		Created in connection with auxiliary activity – electric equipment maintenance. Waste stored in storage room in the IT and Telecommunication Department Transportation using inner transport means to the storage place. Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management.
1701 01	Concrete waste and concrete rubbish from demolition and overhauls	150,0	Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works. Bulk storage in arranged manner in designated area at the coal Storage Yard. Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management.
170102	Crushed bricks	20,0	Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works. Bulk storage in arranged manner in designated area at the coal Storage Yard.

			Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management.
1703 80	Paper roof waste	50,0	Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works.
			Bulk storage in arranged manner in designated area at the coal Storage Yard.
			Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management.
170401	Copper, bronze, brass	5,0	Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works.
			Selective storage in containers.
			Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works.
			Selective storage in containers.
170402	Aluminium	5,0	

170405	Iron and steel	150,0	Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works. Selective storage in containers.
170407	Mixtures of metals	**5,0**	Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works. Selective storage in containers.
170411	Cables not containing crude oil, tar and other dangerous substances	0,6	Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works.. Selective storage in containers.

17 05 08	Crushed stone	100,0	Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works.. Bulk storage in arranged manner in designated area at the coal Storage Yard
170604	Insulation materials other than those specified in 17 06 01 and 06 03		Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management. Created in connection with auxiliary activity – construction, overhaul and dismantling works on building objects as well as overhaul and workshop works. Bulk storage in arranged manner in designated area at the coal Storage Yard. Collection and transportation by trucks by recipient being in possession of relevant permit in the scope of waste management.

Storage locations have been illustrated on a map attached to the report.

V.5.6. Waste transport

All anticipated types of waste will be transported by external companies.

V.5.7. Waste collection

No waste collection is anticipated

V.5.8. Waste recovery and neutralization

No waste recovery and neutralization is anticipated

V.5.9. Conclusions

Furnace waste being a by – product generated in coal incineration process will be produced in connection with electric energy production and will constitute 99% of the whole waste volume generated in Elektrociepłownia Bielsko-Biała EC 1.

In the scope of furnace waste management, EC1 is engaged in the activities intended to handover the whole volume of furnace waste for recovery.

The method of waste disposal has been evaluated as conforming with applicable regulations in the scope of environment protection. Therefore the natural environment in the investment area as well as in adjacent areas will be not negatively affected by the waste created in connection with intended investment.

V.6. Impact on soil

V.6.1. Purpose and scope of the study

The purpose of the present chapter is to determine water and soil conditions existing in the subsoil in the area of contemplated project and to determine the properties of soils including the specification of geotechnical layers with their specific parameters found by means of A and B methods pursuant to PN-81/B-03020 standard.

The chapter contains the influence on the soil and aquatic environment created as a result operation of the system - **new thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt**.

V.6.2. Characteristics of the area

In accordance with the subdivision of Kondracki (1998), the area being discussed is situated in Silesian Upland mesoregion, on boundary between Beskid Śląski and Mały Mountains.

The area is situated within a structural unit – Cieszyńska Nappe constituting the link within a larger unit – Silesian Nappe.

Silesian Nappe in this area has been divided by Skawa river dislocation into two equivalent parts i.e. **lower - Cieszyńska Nappe** consisting of Cieszyńskie layers and upper i.e. Godula Nappe consisting of upper Cretaceous links – wierzchowickie, ligockie and Godula Beds as well as Paleogene formations represented by Istebna Beds, Ciężkowice sandstones, Hieroglyphic Beds and Krosno sandstones. The Cretaceous formations in the form of flysch deposits of Cieszyńska Nappe are represented by upper cieszyńskie slates and locally by cieszyńskie limestones. Prevailing form are upper cieszyńskie slates in the form of dark grey marly slates and thin layered fine sandstones with the inclusions of detritus limestone, siderite and their residual deposits, forming residual deposits consisting of stones with clay content in course of weathering process and cohesive residual deposits containing stone chips thereafter.

The thickness of upper cieszyńskie slates amounts up to 300m. They are determined as Lower Cretaceous formations – originating from Valanginian – Hauterivian period.

The layers of dusty clays and dusts with structure similar to clays as well as loess-like dusts are deposited at the ground surface. The mineral and granulometric composition of these formations is identical to composition of typical loess deposits.

The formations of debris consisting of slates and sandstones with clays or silts content are deposited on the slopes of hills or valleys.

V.6.3. Geological structure and water conditions

Lithology and stratigraphy

The area of Biała river valley (being the location area of Elektrociepłownia Bielsko - Biała EC1) is situated in the central part of Silesian Nappe consisting of the deposits created between Upper Jurassic and Upper Cretaceous period. The whole structure is covered by Quaternary deposits with diversified thickness and lithology. Upper Cretaceous formation occur in the form of intensively fractured slates and marls with inclusions of limestones. Higher formations have been created as the boundary deposits between Lower Cretaceous and Upper Jurassic period and consist of limestones with interbeddings of marly slates. The Lower and Upper Cretaceous formations are represented by slates and sandstones with diversified grain size and with interbeddings of slates and mudstones.
The thickness of Quaternary deposits amounts up to 30 - 40 m in the valleys of rivers and between 0 up to 5 - 8 m on the slopes and uplands.

The Quaternary deposits are represented as gravels and sands with interbeddings of Carpathian clays. The strips of gravels and sands with cobbles as well as alluvial soils and river silts occur on the boundaries of rive valleys.

Tectonics

The tectonics of described area is complicated and demonstrated by significant variety of individual rock sequences and rich network of fractures.

Hydrogeology

The aquifer level in sand and gravel Quaternary deposits is situated on the depth from 3 - 5 m, depending on morphological diversity of Biała river valley. The aquifer levels in Quaternary deposits are associated with fractured and tectonically disturbed Upper Cretaceous sandstones layers (Godula sandstones).

V.6.5. Geotechnical characteristics of soils

The clay and sandy soils with local embeddings of dusty clay are deposited under the layer of construction embankments in EC premises.

V.6.6. Impact on soils

The quality of soils in adjacent areas can be affected by waste, sewage and airborne emissions generated as a result of and associated with the operation of the system - **new thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt**.

As a result of handling of anticipated

>- waste

>- domestic and household waste water, process waste water

and storm water drainage conforming with applicable environment protection regulation, the soil and aquatic environment will be provided with maximum protection against their unfavourable influence.

The permissible concentrations will be not exceeded by airborne emissions. Therefore it is concluded that the existing condition of the soil and aquatic environment will be not affected.

V.6.3. Conclusions

The operation of **designed system which is associated with the modernization of Elektrociepłownia Bielsko-Biała EC1** will not result in the pollution of the area lawfully owned by the investor and of adjacent areas.

V.7. Impact on flora and fauna

V.7.1. Purpose and scope of the study

The purpose of the present part of the study is to determine the impact of **designed system which is associated with the modernization of Elektrociepłownia Bielsko-Biała EC1** on flora and fauna in operation phase.

V.7.2. Impact on flora and fauna, including the area of NATURA 2000

The area of the investment is situated in the territory not classified as the areas to be protected pursuant to the Act of April 2004. Act on environment protection (Journal of Laws 2004 No 92 item 880, including further amendments).

The project will be implemented in the area situated out of the Natura 2000 sites but located in its vicinity. The closest site NATURA 2000 is the **Area of Special Protection PLB240001 – Uppe Vistula Valley** as well as further Areas of Special Protection (OSO): Beskid Śląski PLH 240005, Pierściec PLH 240022, Cieszyńskie Źródła PLH 240001, Beskid Mały PLH 240023.

The flora and fauna in adjacent areas can be affected by waste, sewage and airborne emissions generated as a result of and associated with the operation of the system:

As a result of handling of anticipated

>- waste

>- domestic and household waste water, process waste water and storm water drainage conforming with applicable environment protection regulation, the soil and aquatic environment will be provided with maximum protection against their unfavourable influence.

The permissible concentrations will be not exceeded by airborne emissions.

It can be concluded that flora and fauna in adjacent environment will be not affected by the substances contained in waste, domestic and household waste water, process waste water, storm water drainage and airborne emissions.

Therefore it can be concluded that there will be no impact of contemplated project on the closest NATURA 2000 areas.

V.7.3. Conclusion

The operation of designed system which is associated with the modernization of Elektrociepłownia Bielsko-Biała EC1 consisting in the erection of a new thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt. will not affect flora and fauna in adjacent areas. Therefore there will be no impact on NATURA 2000 area.

V.8. Impacts on historical monuments as well as objects and areas existing in vicinity or in direct impact range of the system, to be protected pursuant to the regulations included in the Environment Protection Act, act on Forests, Water Act and Act on health resorts and Act on Medical Care in health resorts.

There are the objects and areas existing in vicinity or in direct impact range of designed system associated with the modernization of Elektrociepłownia Bielsko-Biała EC1; to be protected pursuant to the following acts:

>- Act of 23rd July 2003 on the protection of historical monuments and extending care over them (Journal of Laws 98 No 162 item 1568);

>- Nature Protection Act issued on 16th April 2004 (Journal of Laws 2004, No 92, Item 880 including further amendments)

>~ Act of 28th September 1991 on forests (Journal of Laws 2005, No 45, Item 435),

>~ Act of 18th July 2001. Water act (unified text Journal of Laws 2005, No 239 Item 2019 including further amendments)

>- Act issued on 28th July 2005 on health resorts and Act on Medical Care in health resorts and areas of health resort protection and on health resort gminas (Journal of Laws 2005, No l67, Item 1399).

Therefore it should be concluded that there will be no impact of contemplated project on a/m objects and areas.

V.9. Anticipated impact on environment in case of occurrence of serious industrial accident.

A serious industrial accident is defined as an event (occurring in the facility), particularly emission, fire or explosion occurred in course of industrial process, storage or transportation with accompanying one or more hazardous substances leading to immediately created danger for human life or health or for environment or to delayed creation of such danger.

The facility creating the danger of occurrence of a serious industrial incident, depending on the type, category and amount of hazardous substance existing in facility, is classified as the facility with increased risk or the facility with high risk of occurrence of a serious industrial incident.

The following provisions have been included in the Decree issued by the Minister of Economy on 9th April 2002 concerning the types and amounts of hazardous substances the presence

of which in the facility is decisive for its classification in increased risk category or as the facility with high risk of occurrence of a serious industrial incident (Journal of Laws No 58 Item 535):

>- names and amounts of hazardous substances which decisive for the classification of the facility in increased or high risk category;

>- numerical marking of substances enabling their precise identification;

>- substances qualification criteria in the following categories:

- highly toxic,
- toxic,
- oxidizing,
- explosives,
- flammable,
- highly flammable,
- extremely,
- hazardous, particularly for inhabitants and environment;

and their amounts in the facility which are decisive for its classification in increased risk category or as the facility with high risk of occurrence of a serious industrial incident.

A/m Decree has been amended by the Decree issued on 31st January 2006 (Journal of Laws No 30 Item 208).

The procedures of continuous monitoring for all technological processes and for technical condition of individual systems will be implemented in the premises of ZEC Bielsko-Biała, 2 Tuwima Street.

In case of system failure, the process is interrupted until the failure is eliminated and normal working conditions are restored.

The obligations of the manager of the facility creating the danger of the occurrence of a serious industrial incident are precisely determined in the Act of 27th April 2001. Act on environment protection (Journal of Laws 2006 No 129 item 902) in title IV, Chapter 2. Pursuant to guidelines the manager of the facility with increased risk of the occurrence of a serious industrial incident is obliged:

>- to ensure the designing, construction, operation and liquidation of this facility in a manner preventing the occurrence of industrial incidents and limiting their consequences for

the inhabitants and environment;

>- to notify competent authority of State Fire Department of the facility;

>- to notify the competent authority of State Fire Department of each change of the amount or type of hazardous substance or its physical and chemical features, fire and toxic properties, change of technology or production profile as well in case of any change which could results in serious consequences associated with the risk of failure, in relation to data contained in a/m notification;

>- to notify the competent authority of State Fire Department of the date of the end of the system operation or closure of the facility

>- to prepare the program of prevention of serious industrial incidents and to submit this program to the competent authority of State Fire Department; this program contains the presentation of security system ensuring the protection for inhabitants and environment,

>- to perform the analysis of said program and to introduce its revisions, if required, before introduction of changes into facility operation, which could contribute to the occurrence of the danger of industrial incident;

>- to submit the revisions of the program of prevention of industrial incidents to the commander of State Fire Department on poviat level and to inform the Voivodship Inpector of Environment Protection about said changes.

In case of occurrence of the industrial incident, the manager of the facility with increased risk of the occurrence of a serious industrial incident is obliged:

>- to notify the competent authority of State Fire Department and the Voivodship Inpector of Environment Protection of this fact immediately,

>- to inform immediately aforesaid authorities about:

- circumstances of incident
- about hazardous situations associated with the incident;
- enabling the evaluation of incident consequences for inhabitants and environment,
- about initiated rescue operations as well as activities intended to reduce the consequences of incident and to prevent its re-occurrence.

Minimization of extraordinary hazards:

In order to prevent any extraordinary hazards for environment, proceed as follows:

>- unconditionally comply with requirements in the scope of occupational hygiene

and safety as well with operation parameters assumed for this type of objects

>- in order to ensure fire protection, water supply as well as other fire extinguishing media should be provided in sufficient amount to be used in case of fire.

>- object should be provided with signalling and alarm system, fire extinguishing system and water supply system with hydrants.

>- owing to potential occurrence of emergency situation, the facility should be provided with emergency operations manual.

VI. IMPACT OF UNDERTAKING ON ENVIRONMENT – LIQUIDATION PHASE

VI.1. Purpose of the Study

The purpose of the present part of the study is to analyse the impact of the undertaking consisting in the liquidation of designed system associated with the modernization of Elektrociepłownia C 1 – consisting in the erection of the thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt, on environment

VI.2. Impact on Environment

The liquidation of Elektrociepłownia EC1 is not anticipated in perspective of next years, particularly in case of its modernization in the framework of contemplated project.

However in case of such necessity, two variants of liquidation of a/m object are possible:

- partial liquidation,
- complete liquidation.

Partial liquidation will consist in discontinuation of the activity associated with thermal energy generation for heating purposes for Bielsko – Biała Town, but without execution of any demolition works. Installed facilities and machinery as well as other equipment will be sold. The buildings and similar objects will be maintained in existing condition in order to enable their adaptation for other purposes.

Partial liquidation process will be not associated with the occurrence of environmental collisions and will not contribute to the deterioration of environment condition nor to the deterioration of its individual components.

Complete liquidation will consist in discontinuation of the activity associated with thermal energy generation for heating purposes and in the demolition of the objects associated with actual activity. Installed facilities and machinery as well as other equipment will be sold. Existing objects will be dismantled and demolished.

The acoustic climate of surrounding areas will be disturbed as a result of dismantling and demolishing works and associated operation of heavy machinery as well as intensified motor vehicles traffic. The operation of heavy construction machinery (noise source with maximum level exceeding 85dB) will be the most arduous in respect of noise emission. The transport vehicles will generate the noise on the level of 65 - 85 dB(A). The level of noise emission into the environment in the investment phase will be variable in a dynamic manner; within more than 20-30 dB.

The demolishing works will be accompanied by dust emission into the atmosphere.

The following types of waste are anticipated:

- concrete waste and concrete rubbish from demolition and overhauls - code 17 01 01,
- crushed brick - code 17 01 02,
- waste of ceramic materials and equipment elements - code 17 01 03,
- mixed concrete waste, crushed bricks and waste of ceramic materials and equipment elements other than those specified in 17 01 06 - code 17 01 07,
- waste from roads overhauls and reconstruction - code 17 01 81,
- wood – code 17 02 01,
- glass - code 17 02 02,
- plastics - code 17 02 03,
- mixtures of metals – code 17 04 07,
- power supply cables (cables other than those specified in 17 04 10) - code 17 04 11,
- other waste from construction, overhauls and dismantling (including mixed waste) containing dangerous waste ,
- mixed waste from construction, overhauls and dismantling other than those specified in 17 09 01, 17 09 02 and 17 09 03 - code 17 09 04,
- domestic waste - code 20 03 01.

Pursuant to Article 3 paragraph 3 subparagraph 3 included in the Act of 27th April 2001 – Act on waste (unified text Journal of Laws 2001, No 62 Item 628 including further amendments), the waste is generated among others by the subject rendering the service in the scope of construction, demolition and overhauls of objects. Therefore a/m waste will be generated by the company rendering the service in the scope of demolition of building objects and will be responsible for its correct management.

The removal of existing foundations will be associated with intervention into soil. The area will be levelled after completion of works.

However the changes of acoustic climate, emission into the atmosphere as well as intervention into the upper layers of soil will be temporary and limited to the local area and – up to the completion of the works without contributing to permanent change of existing condition of environment.

V1.3. Conclusions

The analysis presented above indicates that the undertaking consisting in (partial or complete) liquidation of designed system which is associated with the modernization of Elektrociepłownia Bielsko-Biała EC1 consisting in the erection of a new thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt. will not contribute to permanent change of existing condition of environment.

IX. IMPACT OF UNDERTAKING ON ENVIRONMENT

DESCRIPTION OF POTENTIALLY SIGNIFICANT IMPACTS OF CONTEMPLATED PROJECT

IX.l. Impact on environment

Pursuant to the Decree issued by the Council of Ministers of 9th November 2004 regarding the determination of the types of undertakings which may significantly influence on the environment as well as detailed conditions associated with the qualification of undertakings for the preparation of Environment Impact Report (Journal of Laws 2004; No 257 Item 2573 including further amendments), the intended investment belongs to the undertakings which may significantly influence on the environment - **(§ 3 subparagraph 1 item 4).**

Like in case of any other investment, individual components of the environment are less or more affected. This impact depends on the following factors:

> localization of the investment,

>- method of the previous land use,

>- means protecting and minimizing the impact of the investment on environment.

Individual types of impacts associated with assumed solutions have been evaluated and found acceptable.

>- **impact on humans** – no dangers will be created in case of correct operation and permanent inspection of technical condition,

>- **impact on air** – air pollution level in adjacent areas will be not affected significantly by the investment,

>- **impacts on acoustic climate** – acoustic climate in the area under analysis will be not affected significantly by noise emission,

>- **impacts on water** – surface and ground waters flow will be stabilized after the investment completion,

>- **impacts on soil** - operation of designed installation will be not associated with any negative influence on soils condition,

>- **impacts on fauna and flora** – fauna and flora in adjacent areas will be not affected by the installation,

>- **impacts on climate** – climate condition will be not affected by the scale of installation,

> **impacts on material interest, cultural goods and landscape** – investment will not result in any disturbances of spatial order.

On the basis of the scale of intended investment and its associated operation, it can be found that the character of any possible direct and indirect impacts on the environment will be balanced in any possible type. No secondary impacts will occur.

1X2. Cumulative impacts

IX.2.1. Short term impacts

Short term impacts are defined as the impacts on environment, occurring as a result of the project impact without causing any permanent consequences in the form of environment degradation. The following conclusions has been made in this scope:

>- The substances emitted into the air during project implementation phase will not result in any exceedance of acceptable standards. Therefore it can be concluded that their introduction into air will not lead to their excessive accumulation.

>- The noise associated with continued construction works and with increased traffic of transport vehicles serving the construction site during project implementation phase will be temporary only – up to the completion of work.

>- Domestic waste produced during project implementation phase will be accumulated in closed containers and handed over to waste dump. Soil excavated from trenches will be used for levelling of investment area (otherwise handed over to storage place). Plastics, wood, concrete waste, packaging material, iron and steel as well as mixtures of metal will be handed over for recovery.

>- The upper layers of soil will be disturbed in course of the construction works in connection with:

- excavations to be prepared for the foundations;
- removal of some existing foundations;
- modernization of roads (increase of width and replacement of pavement);
- construction of new connections in the facility water supply and sewage network as well as modernization of existing connections;

However such disturbance will be limited to local area within the boundaries the of the area

lawfully owned by the Investor.

The runoff of precipitation waters and the ground waters flow will be disturbed as a result of construction works. It will be caused by the excavations to be prepared for the foundations and other construction works. However such disturbance will be limited to local area within the boundaries the of the area lawfully owned by the Investor.

IX.2.2. Long term impacts

On the basis of assumed program in the scope of environment use it has been found that long term accumulations of the project impact on environment will not result in accumulation of factors which may contribute to the environment deterioration.

1X3. Compensation of impacts on environment

IX.3.1. In relation to air

In case of application of designed technological and technical solutions limiting the emissions into the air, the present environment condition in the project localization area will be not significantly affected by the operation of contemplated project. The compensation of potential impacts will consist in maintaining of high efficiency of the emission reducing equipment in the form of their inspection in accordance with prepared schedule and immediate repair or replacement in case of any irregularity.

IX.3.2. In relation to acoustic impacts

The compensation of potential impacts occurring in the operation phase of designed system will consist in planting of high vegetation. In case of detection of deteriorated acoustic climate deterioration in adjacent areas, acoustic baffles will be incorporated in order to neutralize the noise sources.

IX.3.3. In relation to water supply and sewage management

The compensation of potential impacts on environment occurring in the operation phase of designed system, in relation to water supply and sewage management, will consist in maintaining of high efficiency of facility sewage system.

IX.3.4. In relation to waste management

The impact of generated waste on environment will be wholly compensated as a result of compliance with the requirements included in the Act on Waste, accompanying acts as well as relevant implementation provisions.

IX.3.5. In relation to soil

The compensation of potential impacts on environment occurring in the operation phase of designed system, in relation to soil, will consist in maintaining of high efficiency of facility sewage system.

IX.3.6. In relation to flora and fauna

The compensation of potential impacts on environment occurring in the operation phase of designed system, in relation to flora and fauna, will consist in planting of vegetation in proper location in the premises and in the environment use without creating any danger for the vegetation existing in adhering areas. Furthermore the maintenance of proper order and cleanness in the area used by the facility will be continuously supervised by the investor.

IX.3.7. In relation to impact on landscape

The compensation of potential impacts on environment, in the scope of landscape, will consists in maintenance of order and aesthetical appearance of the area surrounding designed system.

IX.4. Measures protecting and minimizing the impact of the project on environment

The contemplated project will not constitute the source of extraordinary danger for the environment. However emergency situation endangering the natural environment may occur in course of operation in the form of various events caused by emergency condition of facilities and system or by their improper operation.

In order to minimize the impact of the project on the natural environment, the investor

intends to:

>- unconditionally comply with requirements in the scope of occupational health and and safety as well with operation parameters assumed for this type of objects,

>- pay particular attention to potential emergency situations and immediately initiate their elimination in case of their occurrence. Furthermore the recommendations included in individual chapters of the present study should be considered in order to adapt the functioning of the investment to actually applicable regulations in the scope of environment protection.

IX.5. Establishing of the area of limited use

Pursuant to Article 135 included in the Act of 27th April 2001. Act on environment protection (Journal of Laws 2006 No 129 item 902), the introduction of the area of limited use is not justified.

IX.6. Analysis of possible social conflicts

Any occurrence of social conflicts is not anticipated.

IX.7. Potential effects of transborder impacts

Owing to character of actual activity and significant distance from the state border (about 35km), it can be concluded than any transborder impacts will not occur as a result of contemplated project.

IX.8. Proposed monitoring of impacts of contemplated project

The scope of monitoring i.e. analytic and concept method of environment condition control as well as the scope of forecasting of its directions and phases of its transformations in case of the implementation of described investment, is closely associated with the type and scale of impacts of the object on natural environment. Any mandatory environment monitoring is not anticipated in construction phase. Individual construction cycles will be subject to partial acceptance under the control exercised by the Site Supervision Inspector which seems to be sufficient.

The operation of designed system associated with the modernization of Elektrociepłownia C

1 – consisting in the erection of the thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt, will be not associated with negative impact on environment in case of compliance with the requirements in the scope of occupational health and safety as well as in the scope of fire protection and environment protection, therefore any mandatory environment monitoring is not anticipated.

IX.9. Problems encountered in course of report elaboration

Owing to used methods consisting in descriptions and calculations, there were no problems affecting the quality of the documentation. The technical and technological data as well as data available in literature were used as the basis for the elaboration of the documentation describing the initial and target impacts of the object on environment in a complete manner.

X. CONCLUSIONS AND RECOMMENDATIONS

The purpose of the present study was the analysis of the impact of the designed system– consisting in the erection of the thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt including partial liquidation of existing objects **in phase of its construction, operation and potential liquidation**, on environment

From the analysis it appears that:

>- contemplated project will not constitute the source of extraordinary danger for natural environment.

>- technical solutions will be used in the framework of the project in order to ensure the airborne emissions to maximum extent possible

>- the operation of designed system will not affect the acoustic climate existing in adjacent areas;

>- contemplated project will not contribute to the change of water conditions in the investment areas and in adjacent areas and will not contribute to the deterioration

of surface and ground waters quality;

>- no danger for environment will occur in case of handling of anticipated waste in accordance with the recommendations included in the present report;

>- the operation of designed system will be not associated with any negative impact on soils condition;

>- the operation of designed system will be not associated with any negative impact on flora and fauna;

>- the operation of designed system will be not associated with any impact on NATURA 2000 area;

>- the operation of designed system will be not associated with any impact on environment on macro-regional level.

Therefore in consideration of the foregoing, it can be concluded that the present investment consisting in the modernization of Bielsko-Biała EC1 – erection of the thermal power station unit with electric power output of up to 50 MWe and thermal power output of up to 110 MWt as well as two water boilers with total power output up to 80 MWt including partial liquidation of existing objects, after the application of proper solutions and protections, with simultaneous consideration of recommendations presented in individual chapters of the present study, will be not associated with any negative impact on the condition of natural environment as well as on life and health of local inhabitants.

Therefore in consideration of the foregoing it is requested to issue the decision on environmental conditions for project implementation permit

XL APPENDICES

1 KRS

- Letter from Municipality in Bielsko – Biała dated 19.10.2007 informing about intended use of indicated land around Elektrociepłownia in accordance with Study of land use conditions and directions for Bielsko-Biała gmina;
- Letter from Municipality in Bielsko – Biała dated 14.10.2008 concerning the areas adhering to EC1 and to be encompassed with acoustic protection + map

- Letter informing about intended buyout of the plot situated at 1 Czechowa Street by PKE S.A.

5. Outline planning permission dated 20.11.2007
6. Standard copy from mortgage register
7. Decision issued by the Mayor concerning the necessity to prepare the report on impact on environment
8. Sanitary expertise concerning the lack of obligation to prepare the report on impact on environment
9. Topographic map
10. General plan / scale 1:1000/
11. Map with indicated waste storage locations.