



"ENERGOPROJEKT-KATOWICE" SA

Project No.: X – 3580

DCC CODE

**ENVIRONMENTAL IMPACT REPORT FOR THE PROJECT TITLED:
CONSTRUCTION OF THE WASTE-TO-ENERGY PLANT
PROCESSING COMBUSTIBLE FRACTION PRODUCED IN
MUNICIPAL WASTE TREATMENT PROCESS ENSURING ENERGY
RECOVERY AND HEAT SUPPLIES FOR THE CITIZENS OF
OLSZTYN INCLUDING THE ACCOMPANYING INFRASTRUCTURE**

**President of the Management
Board**

Andrzej Kowalski, PhD, Eng.

Katowice, May 2015

BIURO STUDIÓW, PROJEKTÓW I REALIZACJI „ENERGOPROJEKT-KATOWICE” SA

40-159 Katowice, ul. Jesionowa 15, PO. box 315 phone.: 032 208 95 00, 032 208 92 15

fax.: 032 259 88 20, 032 259 95 25, e-mail: epk@epk.com.pl, www.epk.com.pl

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LIST OF REPORT AUTHORS

PROJECT MANAGER

Adam Mertas, M.Sc. Eng.

Air protection issues

Ewa Steuer, M.Sc.

Noise issues

Dominik Piwowarczyk, M.Sc., Eng.

Water and wastewater management issues; environmental protection

Aleksandra Mikołajec, Eng.

Ground surface protection and waste management issues

Dominik Piwowarczyk, M.Sc., Eng.

Radiated electromagnetic issues

Dominik Piwowarczyk, M.Sc., Eng.

Extraordinary environmental hazard issues

Dominik Piwowarczyk, M.Sc., Eng.

Technological issues

Adam Adamek, M.Sc., Eng.

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LIST OF ACRONYMS AND DESIGNATIONS USED IN THE DESCRIPTION

ITPFP - the waste-to-energy plant processing combustible waste fraction produced in municipal waste treatment process ensuring energy recovery and heat supplies for the citizens of Olsztyn, including the accompanying infrastructure

ZGOK - Zakład Gospodarki Odpadami Komunalnymi (Municipal Waste Management Plant)

RIPOK - Regional Municipal Waste Processing Plant

MPEC - Miejskie Przedsiębiorstwo Energetyki Ciepłej (Municipal District Heating Company)

PSG - Polska Spółka Gazownictwa (Polish Gas Distribution Company)

SCR - Plant (module) of Selective Catalytic Reduction of NO_x from flue gas

SNCR - Plant (module) of Selective Non-Catalytic Reduction of NO_x from flue gas

WTP - Water treatment plant

BAT - Best Available Techniques

BREF - Best Available Techniques reference documents

IED - Directive 2010/75/EU of the European Parliament and of the Council of November 24, 2010 on industrial emissions

ECONET-PL - Krajowa Sieć Ekologiczna (Polish National Ecological Network)

NPS - National Power System

HSWB - Homogeneous Surface Water Body (Polish abbr. JCWP)

HUWB - Homogeneous underground water body (Polish abbr. JCWPd)

EU - European Union

EU ETS - European greenhouse gas emissions trading system

GDP - Gross Domestic Product

RES - Renewable Energy Source

FUEL FROM WASTE - Used in the further part hereof includes: waste from ZGOK Olsztyn - alternative fuel with code 19 12 10 - Combustible Waste (alternative fuel); high-energy fraction left over after municipal waste sorting waste from RIPOKs High-energy fraction left over after composting of 20-80 mm waste fraction; waste with parameters similar to those of the above mentioned waste to be used in the plant being the subject of this Report.

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MSC - Municipal District Heating System.

1. SUMMARY OF THE ENVIRONMENTAL IMPACT REPORT FOR THE PROJECT TITLED:

CONSTRUCTION OF THE WASTE-TO-ENERGY PLANT PROCESSING COMBUSTIBLE FRACTION PRODUCED IN MUNICIPAL WASTE TREATMENT PROCESS ENSURING ENERGY RECOVERY AND HEAT SUPPLIES FOR THE CITIZENS OF OLSZTYN INCLUDING THE ACCOMPANYING INFRASTRUCTURE.

Introduction

The subject of this documentation is an assessment of environmental impact of waste -to-energy plant processing combustible fraction produced in municipal waste treatment process (ITPFPOK). The waste-to-energy plant processing combustible fraction, designed to be installed in the area of the city Olsztyn at ul. Lubelska 48, will generate heat for district heating as well as domestic hot water for the city. The new plant will generate electricity as well. Installation of a natural gas-fired or light fuel oil-fired peak load back-up boiler house is also assumed in the facility. The heat to be used by the municipal district heating network will be generated in the boiler house. Miejskie Przedsiębiorstwo Energetyki Ciepłej in Olsztyn submits a request to issue a decision on environmental constraints for the planned Investment Project. The main activity of MPEC is generation of heat and domestic hot water and its supply to the citizens of Olsztyn. MPEC generates the heat by incineration of fossil fuels (pulverized coal, natural gas) and biomass in its systems - which involves emission of air pollution and generation of waste. The enterprise undertakes measures to mitigate emission of air pollution - up to the level required by law. The heat sources operated by MPEC perform:

- high-efficiency combustion processes;
- combustion of pulverized coal with low sulfur content;
- usage, among others, of low-emission fuels (natural gas) and the ones considered "emission-free" (biomass);
- usage of flue gas treatment equipment (dedusting equipment downstream the solid fuel-fired boilers);
- generation of electricity (for the plant auxiliaries) and heat in cogeneration mode - cogeneration module operating based on gas engines.

Whereas in the area of heat transmission and other activity the following is performed:

- reduction of heat transmission losses (good technical condition of the modern district heating networks);
- hydraulic optimization of the heat sources and networks (reduction of energy consumption necessary for pumping);
- optimization of the used plants and systems in scope of electricity consumption.

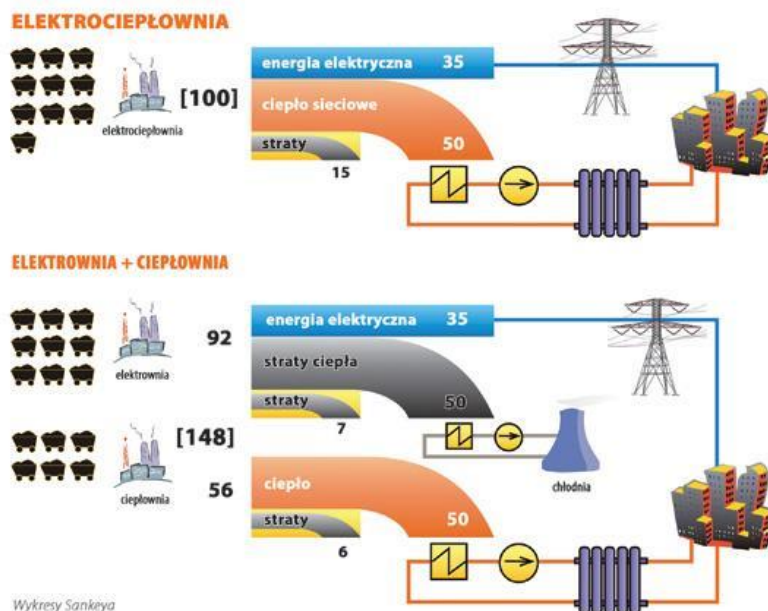
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For the purpose of the new plant construction, Miejskie Przedsiębiorstwo Energetyki Ciepłej purchased a plot and had the provisions of the Local Land Development Plan (MPZP) amended to enable construction of **ITPFP** (the waste-to-energy plant processing combustible waste fraction produced in municipal waste treatment process ensuring energy recovery and heat supplies for the citizens of Olsztyn, including the accompanying infrastructure) on this plot.

For the purposes of the amendment of the plan a Forecast of the Environmental Influence of Effects of the Amendment of MPZP Provisions has been prepared. The Forecast proved that the construction and operation of ITPFP would not have a permanent negative impact on the environment. During the construction local negative impacts will be unavoidable. Application of proper technological solutions enables the operation of the plant without an excessive impact on the environment. Usage of fuel from waste (fuel from waste - used in the further part hereof includes: waste from ZGOK Olsztyn - alternative fuel with code 19 12 10 - Combustible Waste (alternative fuel); high-energy fraction left over after municipal waste sorting in plants for the mechanical and biological treatment including, waste from RIPOKs; high-energy fraction left over after composting of 20-80mm waste fraction; waste with parameters similar to those of the above mentioned waste) enables generation of heat and electricity with simultaneous elimination of the problem of their storage or management. Construction of ITPFP in the city of Olsztyn, based on the municipal waste generated in the area of Warmińsko-Mazurskie voivodeship perfectly suits the strategic goals of the city resulting from the real needs.

Waste in the total amount of 110,000 tons per year is to be used as fuel for ITPFP. Usage of municipal waste as fuel will be advantageous for the broadly understood environment. Heat and electricity cogeneration will result in lower consumption of fuel against separated production of those utilities. Therefore it will result in lower emissions of gaseous and particulate pollutants into the air, lower quantity of waste generation, lower amount of consumed water, lower quantity of generated wastewater and smaller area necessary for the construction of the new plant. The following figure shows comparison of fuel consumption necessary for generation of the same amount of electricity in the facility where electricity and heat are cogenerated with the facilities in which heat and electricity are generated separately. Generation of the same amount of electricity in the facility where electricity and heat are cogenerated related to the facilities where heat and electricity are generated separately requires consumption of one a half times fewer amount of fuel.

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PL	EN
ELEKTROCIEPŁOWNIA	COMBINED HEAT AND POWER PLANT
ELEKTROWNIA + CIEPŁOWNIA	POWER PLANT + HEAT GENERATING PLANT
Wykresy	Charts
Energia elektryczna	Electricity
Ciepło sieciowe	District heat
Straty	Losses
Straty ciepła	Heat losses
ciepło	heat
chłodnia	cooling tower
ciepłownia	heat generating plant

Figure1: Graphic comparison of fuel consumption in cogeneration facility against separated facilities of power plant and heat generating plant (source: http://www.ec.olsztyn.pl/technologia_noweg_zrodla/nowe-zrodlo)

The fuel from waste will be combusted in the grate-fired boiler. The selection of the grate-fired boiler was made based on several advantages of such technological solution. It is a solution commonly used worldwide. It is well known and proven and may be offered by many suppliers. A very important benefit is a fact that a low amount of hazardous furnace waste is generated in grate-fired boilers (compared to other technologies of combustion of fuel from waste, e.g. in fluidized bed boiler). In the grate-fired boiler technology most of the waste generated is slag, a non-hazardous waste recyclable or reusable in industrial processes. Combustion of fuel from waste will contribute to achievement of waste recycling goals in communes and completion of the

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waste management in the region. The application of the specific flue gas treatment methods in ITPFP will ensure meeting the emission standards for all gaseous and particulate pollutant emissions generated in the process of combustion of fuel from waste. ITPFP will be a state of the art plant generating heat and electricity to be output to the National Power System. The generated energy will be partly used for the plant auxiliaries. The operation of the planned Investment Project will involve water intake. Water source for ITPFP will be water supply pipeline of Przedsiębiorstwo Wodociągów i Kanalizacji (PWiK - municipal water supply and sewerage plant) in Olsztyn and the wastewater will be discharged to the sewerage pipeline of PWiK. For the purpose of supply of the peak load back-up boiler house gas from PSG distribution network will be taken. The delivery and collection site for the gaseous fuel will be the high-pressure gas station designed to be located in ITPFP area. ITPFP will be connected to the municipal district heating system by means of the new district heating main.

Location and land development

The planned Investment Project will be located at Lubelska street, on plots numbers: 89-25/1, 89-25/3, 89-25/2, 94-6/1, 94-6/2, 94-6/3, for which Local Land Development Plan has been adopted. This location is advantageous regarding the purpose for which the planned Investment Project is intended, due to bilateral supply of the municipal district heating network and the nearby location of the Municipal Waste Management Plant (ZGOK) in Olsztyn, from which a significant part of fuel from waste will be delivered for ITPFP purposes. The area assumed for the implementation of the planned Investment Project site is limited by the railway tracks from the west, access road to the Logistics Center of Michelin Polska from the east, Logistics Center of Michelin Polska from the south and area intended for Olsztyn bypass from the north. The area is located away from residential buildings and from NATURA 2000 sites which could be directly affected by the Investment Project. The assumed footprint area of ITPFP amounts to approximately 8 hectares. The area is not developed. The flora on site was not transformed by human activity. The soils are not used for agricultural purposes. As a consequence, the area is currently covered by grass vegetation with very high level of weed growth and shows features of fallows. A small part of the area are meadows on swampy areas. At the edges of water ponds there are compact strips of grey willow vegetation.

Purpose and objective of the Investment Project

The purpose of the planned Investment Project is ITPFP - the waste-to-energy plant processing combustible waste fraction produced in municipal waste treatment process ensuring energy recovery and heat supplies for the citizens of Olsztyn, including the accompanying infrastructure. The plant was designed for the purpose of management of combustible fraction of municipal waste with use of the most optimum method, by heat recovery for the purposes of municipal district heating network and electricity to be delivered to the new 110 kV switching station of Olsztyn CHPP. In the area of ITPFP a grate-fired boiler combusting fuel from waste will operate as well as two gas or light fuel oil fired peak load back-up boilers to generate heat. The plant

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operation will run with the lowest possible environmental impact. The solutions resulting from Best Available Techniques (BAT) will be used within the Investment Project.

Main objectives of the planned Investment Project:

- management of the municipal waste fraction that are not recycled,
- completion of the waste management in the area of Warmińsko-Mazurskie voivodeship - performing the role of one of the elements of municipal waste management system based on recovery of materials and management of fraction left over after the processing and treatment of mixed municipal waste, elaborated in order to: "address the problem of waste management in the area of 37 communes of the central part of Warmińsko-Mazurskie voivodeship",
- satisfying the thermal demands of the city of Olsztyn with obtaining the lowest possible heat price;
- reduction of the mass and volume of landfilled waste in the area of Warmińsko-Mazurskie voivodeship,
- increasing of the volume of waste managed in the recovery processes, including the recovery of energy from waste,
- limitation of environmental hazards resulting from waste landfilling,
- limitation of the coal used for heat generation for the purposes of the whole city,
- reduction of the CO₂ and other greenhouse gases emission.

Scope and objective of the Report

The Environmental Impact Report for the planned Investment Project covers with its scope the construction of ITPFP in Olsztyn. The planned Investment Project was classified as the project likely to cause a continuous environmental impact. The scope of this report meets the requirements stipulated in Article 66 of the act on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws No. 2013, item 1235). Furthermore, the scope is compliant with the EU requirements stipulated in the Directive of the Council No. 85/337/EEC of June 27, 1985 on the assessment of effects of certain public and private projects on the environment amended with the Directive of the Council No. 97/11/EC of March 3, 1997.

The aim of the document being the Report is to determine the potential impact of the planned Investment Project on the individual environmental components and the mutual relations between the components. The Report answers the question whether the implementation of the Investment Project in the proposed scope and place taking into account the applied preventive and compensatory methods etc. is possible in view of the environmental protection requirements and standards. The report is also aimed at identification of the most advantageous, from the environmental protection point of view, technological variant planned for the implementation. Based on the Report, the conditions in the scope of the environment protection to be met at the stage of implementation and operation as well as to be taken into account in the building permit design are specified.

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Genesis of the construction of ITPFP in Olsztyn

The decision on the construction of the new generating capacities in the area of the city of Olsztyn was made due to the plans of withdrawal of the heat deliveries of Michelin Combined Heat and Power Plant to the MPEC Olsztyn network by the year 2017. Currently, the municipal district heating system in Olsztyn, operated by Miejskie Przedsiębiorstwo Energetyki Ciepłej Sp. z o.o. in Olsztyn, is supplied from two heat sources: from Kortowo Heat Generating Plant, owned by MPEC Sp. z o.o. in Olsztyn (60-65%) and Michelin Combined Heat and Power Plant (35-40%) owned by Michelin Polska S.A. Due to the value of the installed power in Kortowo Heat Generating Plant and due to the configuration of the district heating system, MPEC is unable to cover the heat requirements of the municipal district heating system based only on generation performed by Kortowo Heat Generating Plant.

Classification of the Investment Project

Pursuant to the Act of October 3, 2008 on providing information on the environment and its protection, public participation in environmental protection and on environmental impact assessment (Journal of Laws of 2013, item 1235), the planned Investment Project belongs to the category of projects which may have a continuous significant environmental impact, for which the environmental impact assessment and preparing the report on this assessment is required by law.

The classification of the Investment Project is specified in the provision of § 2 clause 1 item 46) of the Ordinance of the Council of Ministers of November 9, 2010 on projects that may significantly impact the environment (Journal of Laws No. 213, item 1397 as amended), quote: 46):

"the plants for recovery and neutralization of non-hazardous waste with use of the processes of waste-to-energy process, cracking process, physical and chemical treatment of waste with capacity not lower than 100 ton per day, excluding the plants combusting waste in the form of biomass under the provisions on standards of emissions from plants".

Description of the predicted effects on the environment in case of the project being not executed

Resignation from the implementation of the planned Investment Project, that is renouncing construction of ITPFP in the area of the city of Olsztyn will result in:

- significant risk in scope of the management abilities for the fraction left over after the processing or treatment of mixed municipal waste — the necessity of storage, further treatment, dependency on external recipients of high-energy fraction (pricing dictate of the producers of alternative fuels and cement plants) and the necessity to cover the fees for waste transport from MBP plant to the external plants and cement plants,

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- the necessity to generate heat for the purpose of the city by another source,
- lack of the optimum and reliable manner of management of combustible fraction of municipal waste, not suitable to be landfilled, within the voivodeship,
- depositing of the collected municipal waste in the existing landfills,
- preventing meeting the objectives specified in Voivodeship Waste Management Plan (WPGO) and Waste Management Plan (PGO) for the city of Olsztyn,
- preventing meeting the objectives specified for Poland by the EU in scope of reduction of the volume of landfilled biodegradable waste.

Furthermore, abandoning the implementation of the planned Investment Project may result in:

- air pollution due to the transport of fossil fuels to the Combined Heat and Power Plant;
- development of unauthorized dumping sites,
- combustion of waste in household hearths, which will contribute to deterioration of the quality of air, surface- and groundwater, destroying forest resources, and in the process of the long-term impact - negative impact on the individual components of environment, including health of people.

Within the predicted effects on the environment in case of renouncing the implementation of the Investment Project the Waste would have to be managed in other way. It would be necessary also to provide the city with the heat generated in other source. Other method of waste management could be their incineration in cement plants. A significant problem of waste incineration in the cement plants is the fact that the ability of waste incineration in the cement plants may become exhausted. The fuel combusted this way must feature a high net calorific value and appropriate parameters. Moreover the waste may constitute only a part of boiler charge and for this reason in order to manage the whole required volume of waste there would be a risk of their delivery to numerous cement plants.

The heat generated for the city would have to be generated in other source, e.g. in a new hard coal grate-fired boiler. In case of combustion of hard coal in such boiler, the gaseous and particulate pollutant emissions into the air would reach higher levels than in the case of combustion of fuel from waste. The fact is due to the value of emission standards resulting from legal conditions. The emission standards for combustion of waste are far more strict than for combustion of hard coal. Meeting the values of emission standards by the plants is necessary, thus as a result during the combustion of fuel from waste lower amounts of gaseous and particulate pollutant emissions would be discharged to the air.

In the scope of the quantity of water intake and wastewater discharge, the technology of hard coal combustion due to its higher calorific value compared to the fuel from municipal waste, would require supplying the lower amount of water and would generate lower amount of industrial wastewater. However, due to the method of execution of the water supply and reception of wastewater, the option proposed for implementation is comparable with the coal variant in scope of the environmental impact of the planned Investment Project. Comparing the hard coal-fired plants with the ones fired with fuel from waste with a comparable thermal power

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in fuel input, it may be expected that the volume of waste generated from fuel from waste will be larger. It applies in particular to furnace ash and slag (code 19 01 12) compared to ash and slag mixtures (10 01 80) and to the mixtures of fly ash and solid waste from lime method for desulfurization of exhaust gases (10 01 82) compared to waste from exhaust gas treatment (10 01 19), constituting non-hazardous waste. The following hazardous waste will also be generated: boiler dust (19 01 15*) and fly ashes (19 01 13*) which would however be subject to stabilization - nonhazardous waste - 19 03 07 or 19 03 05 will be produced from hazardous waste or they will be managed with other method. The heat generation based on combustion of hard coal in the grate-fired boiler compared to the generation based on combustion of fuel from waste may, in view of the above information, be much more harmful for the environment.

Analyzed technological variants

At the stage of pre-project works, the Investor considered various variants to ensure management of waste generated in the area of Warmińsko-Mazurskie voivodeship (e.g. combustion of waste in the cement plants, gasification of waste, pyrolysis or plasma processes or RotoSTERIL technology). The technologies of combustion of fuel from waste were also analyzed (combustion in grate-fired boiler, combustion in fluidized bed boiler). Ultimately, the variant of combustion of fuel from municipal waste in a grate-fired boiler has been selected for the further analysis. The variant consisting in the combustion of fuel from waste in the fluidized bed boiler with the production of heat and electricity was analyzed as a reasonable alternative option.

The comparison of the impact of the above mentioned variants on the environment leads to the following conclusions:

- the impact of the analyzed variants on the quality of the air is comparable. Annual emission values of the six pollutants covered with the emission standards will be the same in case of combustion of fuel from municipal waste in a grate-fired boiler and a fluidized bed one. It results directly from the value of the emission standards. Only the emission of carbon monoxide from the fluidized bed boiler may be higher than the emission from the grate-fired boiler, which results directly from different emission standard for each of the above mentioned type of boilers. Therefore, in both analyzed variants the same concentration values of the individual pollutants (except for CO) in the air will be expected,
- combustion of waste in grate-fired boilers generates lower volume of hazardous furnace waste related to fluidized bed boilers,
- in grate-fired boilers most of the combustion waste generated is slag — usually approximately 75-85%,
- slag is a non-hazardous waste which enables its disposal or industrial usage,
- fly ash with the products of grate-fired boiler flue gas treatment constitutes 20-25% of the whole mass of furnace waste,

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- most of heavy metals and other harmful compounds are raised with the fly ash, which makes the ash a hazardous waste that must be disposed according to the regulations on hazardous waste,
- in fluidized bed boilers the significant part of furnace waste stream is fly ash,
- applying fluidized bed boiler generates additional costs related to the necessity of management of large quantities of hazardous waste,
- the quantity of the product after the performance of waste stabilization is higher in case of fluidized bed boiler than for the grate-fired boiler,
- the larger volume of waste generated in fluidized bed boiler implies greater demand for water necessary for their management.

The environmental impact analysis of the scrutinized variants has shown that the variant proposed by the Investor will constitute the least severe environmental burden, in respect of both the volume of gaseous and particulate emissions into the air and quantity and type of generated waste, as well as the noise and water demand and the volume of generated wastewater.

Analyzed location variants

The selection of location for the planned Investment Project is always a complex process, including a number of local factors (e.g. availability of fuel, water, fuel transport, waste transport, availability of energy consumers, etc.). The optimum location of the waste to energy plant will meet the following conditions:

- consistency with the Local Land Development Plans and other development plans of the city;
- lack of environmentally valuable areas, protected areas, archaeologically and architecturally protected facilities in the vicinity;
- convenient hydrological and geotechnical conditions of subsoil;
- suitable area of the plot, enabling foundation of facilities being a part of the plant and its future extension;
- suitable distance from residential development, guaranteeing minimizing the social disputes;
- lack of necessity of covering the costs of environmental compensations or their minimum amount;
- convenient and effective communication network guaranteeing easy access and lack of disputes in this regard;
- enabling direct access to the power grid and district heating network stations;
- possibility of ensuring demand for the generated heat and electricity.

In the initial phase of the Investment Project consisting in the construction of the Combined Heat and Power Plant in Olsztyn in order to ensure the necessary heat supplies to the municipal district heating system, due to the collapse of the previous arrangement of heat supply, an analysis of the potential locations of the Investment Project was performed.

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The analysis was performed as part of the "Preliminary Feasibility Study for the Construction of the Combined Heat and Power Plant in Olsztyn".

The following locations were considered within this work:

1. "Ash dump" („Hałda popiołów”) - the plot in the area of Kołobrzaska street in the area of Michelin Polska S.A.
2. In the area of Michelin CHPP (the so-called water part of Michelin);
3. The plot between Sprzętowa and Towarowa streets;
4. "Lubelska" - the area of Warmia-Mazury Special Economic Zone (WMSSE) at Lubelska street;
5. "In Track" ("Na Tracku")- the plot No. 18/1 precinct 148 in the area of Trackie lake;
6. Kortowo Heat Generating Plant.

The following locations were rejected in the initial phase of the works:

1. Kortowo Heat Generating Plant - due to the location which is disadvantageous for the new heat source and requires a substantial alteration of the main networks in the center of Olsztyn, requiring significant and currently difficult to establish costs and time for obtaining site approvals.
2. The plot between Sprzętowa and Towarowa streets - due to the lack of possibility of fast acquisition of land. The land is leased by Michelin Polska S.A. from the Municipality of Olsztyn.
3. "The water part" of Michelin CHPP - due to the negative position of Michelin Polska S.A. concerning the possibility to handover or transfer the part of land. Moreover, the construction of the new source is not possible without a significant interference in the Michelin CHPP infrastructure (coal handling systems, buried utilities, above-ground networks).

The comparison of the disadvantages, advantages and availability of the individual locations performed as part of the "Preliminary Feasibility Study for the Construction of the Combined Heat and Power Plant in Olsztyn" led to the conclusion that the most advantageous place for the location of the new Combined Heat and Power Plant is the location at Lubelska street.

The variant most advantageous for the environment - justification for the selection

The solution most advantageous for the environment is the implementation of the Investment Project consisting in construction of the municipal waste-to-energy plant, that will constitute one of the elements of the system of municipal waste management in Olsztyn. The system was elaborated in order to address the waste management problem in the area of 37 communes of the central part of Warmińsko-Mazurskie voivodeship and for the whole voivodeship.

The following arguments support the construction of ITPFP with the grate-fired boiler combusting fuel from waste:

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- lower gaseous and dust emissions of air pollution compared to combustion of coal in the grate-fired boiler,
- generation of heat for the purpose of the municipal district heating network of the city of Olsztyn and electricity with the simultaneous addressing of the problem of municipal waste management in Warmińsko-Mazurskie voivodeship.
- proven, available technology,
- low sensitivity of grate-fired boilers to fuel parameters,
- highly available fuel,
- relatively low volume of generated hazardous waste (mostly slag is generated).

Description of the Investment Project

The main component of the designed ITPFP will be a unit used to process the combustible fraction of municipal waste ensuring the heat generation (heating water) for the purpose of the municipal district heating system of the city of Olsztyn and electricity to be supplied to the new 110 kV switching station of Olsztyn CHPP. The Unit will have technical solutions ensuring high availability and reliability. Within the environmental impact, the Unit and Peak Load Boiler House will meet the requirements of national and European Union Law. The Unit will meet the requirements, rules and standards specified within Best Available Techniques (BAT). The technical concept of the planned Investment Project assumes the construction of the unit combusting fuel from municipal waste from ZGOK and waste from RIPOK plants in total amount of 110,000 t/a, with designed annual average operating time up to 8200 h/a, resulting from the availability of equipment. ITPFP will be equipped with a grate-fired boiler and district heating steam turbine with heating water subcooling system enabling Unit operation with the full load of the boiler in the summer period, with receipt of heat at the minimum level of 18 MW_t. ITPFP will cover the total demand of the city of Olsztyn for heat in the summer period and a part of the demand in the heating season. In the summer period the generation will be performed in the unit only, except for the period of overhaul or unit failure (annual average of approx. 1000 h). It is assumed that in this period the heat will be produced in Kortowo Heat Generating Plant.

The planned Investment Project covers with its scope the construction of the following facilities:

- fuel collection and unloading point,
- waste loading bunker and process feeding fuel,
- boiler house with waste combusting boiler,
- flue gas treatment system,
- stack with flue gas monitoring,
- furnace waste management plant,
- turbine hall,
- external systems,

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- auxiliary systems - auxiliary fuel (light fuel oil), water preparation station, sorbent and ammonia (24% ammonia water) or carbamide management station,
- peak load back-up boiler house

and accompanying systems, communication routes and other necessary auxiliary facilities and elements of land development.

The new plant will be a combined heat and power system, which means that it will generate heat and electricity simultaneously. The energy conversion process will proceed as follows: the fuel from municipal waste will be fed from the bunker to the boiler bunker and then delivered to the combustion chamber of the steam boiler. The combustion will take place on the grate to which air necessary for the combustion process will be supplied. The boiler will be equipped with start up burners used also for maintaining the burning process. The generated flue gas will transfer the heat to water in the preheater system. As a consequence, the water will evaporate in the evaporator and as steam it will be superheated in the superheater. The produced steam will be directed to the steam turbine, where the thermal energy will be converted into mechanical energy and further into electricity in the generator. The turbine will be a back-pressure turbine with heating water subcooling system in the closed cooling circuit with dry mechanical draft cooling tower. The steam will be condensed in the condenser and then in the form of water will be returned to the grate-fired boiler. The low temperature in the combustion chamber enables the reduction of the produced nitrogen oxides. Additionally, the multiple-stage injection of ammonia water or carbamide will ensure compliance with the nitrogen oxide emission standards. The flue gas will be desulfurized in the semi-dry desulfurization reactor. Mixing of flue gas with water sorbent solution in the form of lime or hydrated lime will take place in the reactor. Partial dedusting and removal of heavy metals will also take place here. Dust, a part of the dry product and the unreacted sorbent will be discharged to the ash storage tank. After leaving the desulfurization plant, activated carbon will be entered to the flue gas in order to react with mercury, dioxins and furans. The last stage of flue gas treatment will be a bag filter. Dust will accumulate on the external surface of the bags. Dust removal will be performed periodically by means of compressed air impulses. The dust falling to hoppers will be directed to the dust collection system. Cleaned flue gas will be discharged to the stack. The slag produced in the boiler will be handled to slag removal equipment by means of belt conveyors. The slag will be valorized / seasoned or collected by licensed entities for processing without valorization process. Fly ash and waste from the flue gas treatment plant will be stabilized and then collected by recipients holding relevant permits or collected directly for management by the authorized entities.

Basic materials and raw materials used in ITPFP include:

- primary fuel - fuel from municipal waste from ZGOK and RIPOK plants
- additional fuel - biomass
- auxiliary fuel - natural gas
- back-up fuel - light fuel oil

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- raw water for the production of demineralized and softened domestic water, furnace waste management and for washing purpose.
- reacting substance for the deNO_x plant - 24% ammonia water or carbamide
- sorbent for the flue gas desulfurization plant - quicklime or hydrated lime.

In the area of ITPFP the peak load back-up boiler house equipped with two natural gas-fired or light oil-fired boilers with thermal power input in fuel of approximately 38 MW_t each will also be installed. Their efficiency will be at least 91.5%. Emergency power supply will be provided by Diesel engine fired with diesel oil. Flue gas from the generator will be evacuated to air with an emission source with a height of h=5m and outlet diameter of d = 125mm. The fuel will be delivered to the plant by trucks. A truck weighing station for the measurement of the amount of waste delivered by the supplier will be installed by the delivery station. Fuel will be delivered to the plant from Monday to Friday with ca. 40 trucks. The feed bunker will ensure 5 days of fuel stock, fuel will be transported from the bunker to the boiler tank ensuring fuel deliveries to the boiler for half an hour. Sanitary sewerage, industrial wastewater and rain water drainage system will be in operation in the area of ITPFP. Industrial wastewater will be pre-treated and then directed to a wastewater equalizing tank and then to the PWiK drainage system.

The description of the assumed activities aimed at preventing, limiting or providing environmental compensation for the negative environmental impact

ITPFP will be operated in accordance with the requirements of Polish law and European Union directives issued in scope of environmental protection. The proposed technology will meet the requirements of the Best Available Techniques (BAT). The application of the grate-fired boiler will minimize the volume of the generated hazardous waste. The gaseous and particulate pollutant emissions will be reduced to the lowest possible level by means of application of the flue gas treatment plant enabling to meet the applicable emission standards.

The predicted activities aimed at preventing and limiting the potential negative environmental impact of the planned Investment Project are:

in the scope of gaseous and particulate pollutant emissions into air

- combustion of fuel from waste in the grate-fired boiler with the efficiency of 86%;
- use of flue gas desulfurization plant utilizing semi-dry method with lime or hydrated lime as a reducing agent for sulfur dioxide and other acidic components (HF, HCl) will limit the emission of those pollutants into air to the level required by the national and European Union law;
- use of secondary method of limitation of nitrogen oxide emission in a reduction plant (SCR or SNCR) with 24% solution of ammonia water or carbamide as reducing agent will limit the emission of this pollutant to the level required by the national and European Union law;

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- use of a high-efficiency dedusting device in the form of a bag filter will limit the emission of dust to the level required by the national and European Union law;
- use of bag filter will also limit the emission of heavy metals to the level required by the national and European Union law;
- ensuring sufficiently high temperature in the boiler combustion chamber and its maintaining period not shorter than 2 seconds will cause decomposition of dioxins, furans and their precursors;
- use of activated carbon injection between the reactor and the bag filter will limit the emission of dioxins, furans and mercury into the air to the level required by the Polish and European Union law;
- air intake from bunker building and introduction of air to the boiler will eliminate emission of odors into the air;
- use of hermetic sorbent unloading system, equipped with leakproof pneumatic lime or hydrated lime conveying system, elastic hoses for the connection of compressed air pipeline
- use of leakproof sorbent storage system (tank) equipped with dedusting systems (bag dust separators);
- equipment of sorbent retention tank with a dust removal equipment, enabling keeping the dust emission at the level of 20 mg/m³;
- equipment of ash retention tank with a dust removal equipment, enabling keeping the dust emission at the level of 20 mg/m³;

in scope of noise emission

- the location of ITPFP in the industrial areas of the city of Olsztyn,
- selection of wall and roof structures enabling the proper sound reduction index of space dividers,
- use, if necessary, of the absorbing silencers upstream the inlet window in the mechanical draft cooling tower,
- the requirement established for the equipment suppliers in the proposal stage: the average A noise level on a measuring surface at a distance of 1 m from the new equipment - noise sources, measured during the normal operation, may not, according to Polish standard PN-N-01307, exceed 85 dB/8h for the equipment in the vicinity of which employees are present, during normal standard operation, understood as workplaces or communication routes by which the employees may circulate,

in scope of generation of waste

- implementation of slag seasoning plant enabling its usage as an additive for bitumen production,
- implementation of stabilization plant for fly ash and other flue gas treatment products in order to change their properties in the way enabling their storage in landfills for non-hazardous and neutral waste.

in scope of water intake and water and wastewater management

- sanitary sewage discharge to the network of PWiK in Olsztyn,

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- use of industrial wastewater in the slag quenching process or/and its discharge to the network of PWiK in Olsztyn,
- use of rain water treatment system,
- use of industrial wastewater treatment system,
- discharge of treated rain water to the drainage system of the city of Olsztyn (Struga "Szczesne") or/and to the water or ground in the area of the investor's plot,
- use of rain and thaw water treatment system, including the application of sedimentation tank integrated with the coalescent separator,
- performance of a complete system of collection and treatment of wastewater from ITPFP area, in the areas of possible oil leakage and of high suspended matter content in the wastewater, the industrial wastewater drainage system will be equipped with oil separator and/or separator for preliminary removal of deposits,
- tightness of subsoil in waste collection facilities,
- the leachate from the bunker (the waste storage pit) will be directed via leachate draining and discharge system through internal industrial wastewater drainage system to the industrial wastewater pre-treatment plant,
- pre-treatment of wastewater from washing in the area of oil management, rain water from the above mentioned area prior to their introduction to the associated drainage system,
- preparation of paved storage areas and separation of zones for storing different types of waste, in order to eliminate risks for the groundwater environment;
- protection of the groundwater environment by placement of transfer areas for chemicals, sorbent and waste as well as storage tanks for oil, sorbents and chemicals on tight containment trays or concrete floorings enabling discharge of leakage to the industrial wastewater drainage system.
- for the purpose of protection against the potential impact on underground water and surface water, in the area of ITPFP the vehicles will be allowed to move around only on the designated and paved roads and yards. The equipment operating in the area of ITPFP will be operational and shall ensure lack of contamination with oil derivative substances,

In order to minimize the amount of the used water and discharged wastewater the following solutions will be used:

- The wastewater from the water treatment plant - will be directed to the industrial wastewater pre-treatment plant and then to the slag quenching system or/and PWiK drainage system.

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- Washing wastewater - (unloading hall, combustion building) - will be directed to the industrial wastewater pre-treatment plant, where separation of oil derivative substances and sand will be performed. The water will be pumped to the slag quenching system or/and PWiK drainage system.
- Water added to the reactor being the component of semi-dry flue gas treatment system will vaporize and it will be evacuated to the atmosphere in the form of steam mixed with treated flue gas. Therefore, the planned project will not cause any generation of wastewater from the flue gas treatment system.
- The leachate from the bunker (the waste storage pit) - will be directed via leachate draining and discharge system from the waste stored in bunkers to the internal plant (industrial) wastewater drainage system, the final block of which will be the industrial wastewater pre-treatment plant. Afterwards, upon treatment the water will be used in the slag quenching process or directed to PWiK drainage system.
- Protection against uncontrolled discharge of water from fire-fighting operation carried out in the Combined Heat and Power Plant area into the rain water drainage system by, among others, execution of a leakproof oil pan which can contain at least 125% of the total oil quantity, including also rain water and water from fire-fighting operations.

The above methods of wastewater treatment protects surface waters, underground water and soils against pollution.

Meeting the requirements of the Best Available Techniques (BAT)

According to the definition included in the Environmental Protection Law, the Best Available Technique (BAT) means the most effective and advanced level of development of technology and methods of conducting a particular business activity used as a base for establishing the emission limit values, aimed at elimination of emission or, if it is practically not possible, reducing emission and environmental impact as a whole, provided that the technique refers to both the applied technology and the method applied for engineering, performance, operation and decommissioning of the plant. Identification of the accordance of the technical solutions applied within ITPFP with BAT was conducted by means of comparison of assessment criteria of consistency with the solutions proposed within the planned Investment Project. The analysis performed as part of the Report shows consistency of the solutions proposed for the Investment Project with the requirements of the Best Available Techniques.

Expected emission levels resulting from the functioning of the planned Investment Project

Emissions of gaseous and particulate pollutants to the air

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The following sources of organized gaseous and particulate pollutants emissions into the air will be operated on the premises of ITPFP:

- grate-fired boiler combusting fuel from municipal waste and high-energy fraction remaining after municipal waste sorting and 20-80 mm fraction obtained after waste composting and screening;
- two gas- and oil-fired boilers in the peak load back-up boiler house
- Diesel generator set
- sorbent storage silo for the FGDP
- fly ash storage silo
- activated carbon storage silo
- light fuel oil tank.

In addition, the gaseous and particulate pollutants emissions into the air will cover:

- engines of trucks delivering the individual utilities
- ventilation system of the secondary waste stabilization hall.

The new emission source – grate boiler, fired with fuel from waste, equipped with systems reducing emissions of gaseous and particulate pollutants to the air, will meet the requirements of the following documents:

- Directive 2000/76/EC of December 4, 2000 (OJ EC L 332 of December 28, 2000, p. 91) on the incineration of waste.
- Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control),
- and compliant with the Ordinance of the Minister of the Environment of November 4, 2014 on emissions standards of certain plants, fuel combustion sources and other waste incineration or co-incineration facilities (Journal of Laws, 2014, item 1546);
- BAT (Best Available Techniques) Reference Document.

Flue gas from the grate boiler will be evacuated to the air with an emission source with a height of $h \geq 60$ m and outlet diameter $d \leq 2$ m.

Two gas- and oil-fired boilers will meet the requirements of the Ordinance of the Minister of the Environment of November 4, 2014 on emissions standards of certain plants, fuel combustion sources and other waste incineration or co-incineration facilities (Journal of Laws of 2014, item 1546); Emissions of such pollutants as arsenic, cadmium, mercury, lead, nickel, benzene, dioxins and furans from the natural gas and light fuel oil combustion process will be negligibly small. Flue gas from each from the two gas- and oil-fired boilers will be evacuated to the air via a separate emission source (two flues) with an emission source with a height of $h \geq 25$ m and outlet diameter $d \leq 0.9$ m each.

Keeping emission standards for gaseous and particulate pollutants to the air from a grate-fired boiler and peak load back-up boiler house will be covered by contract guarantees with selected Contractors.



Protection against escape of odors from the bunker hall to the surroundings will be done by proper closing of the hall each time a vehicle delivering municipal waste enters the hall and by use of adequately selected negative pressure causing the air from the area of the unloading hall and the bunker itself to be sucked in. This air will be directed to the process line of waste incineration – combustion chamber. Dust and sorbent tanks will be provided with filters to limit dust emission into the air.

Annual emissions of gaseous and particulate pollutants, resulting from the emission standards from the grate-fired boiler will amount to:

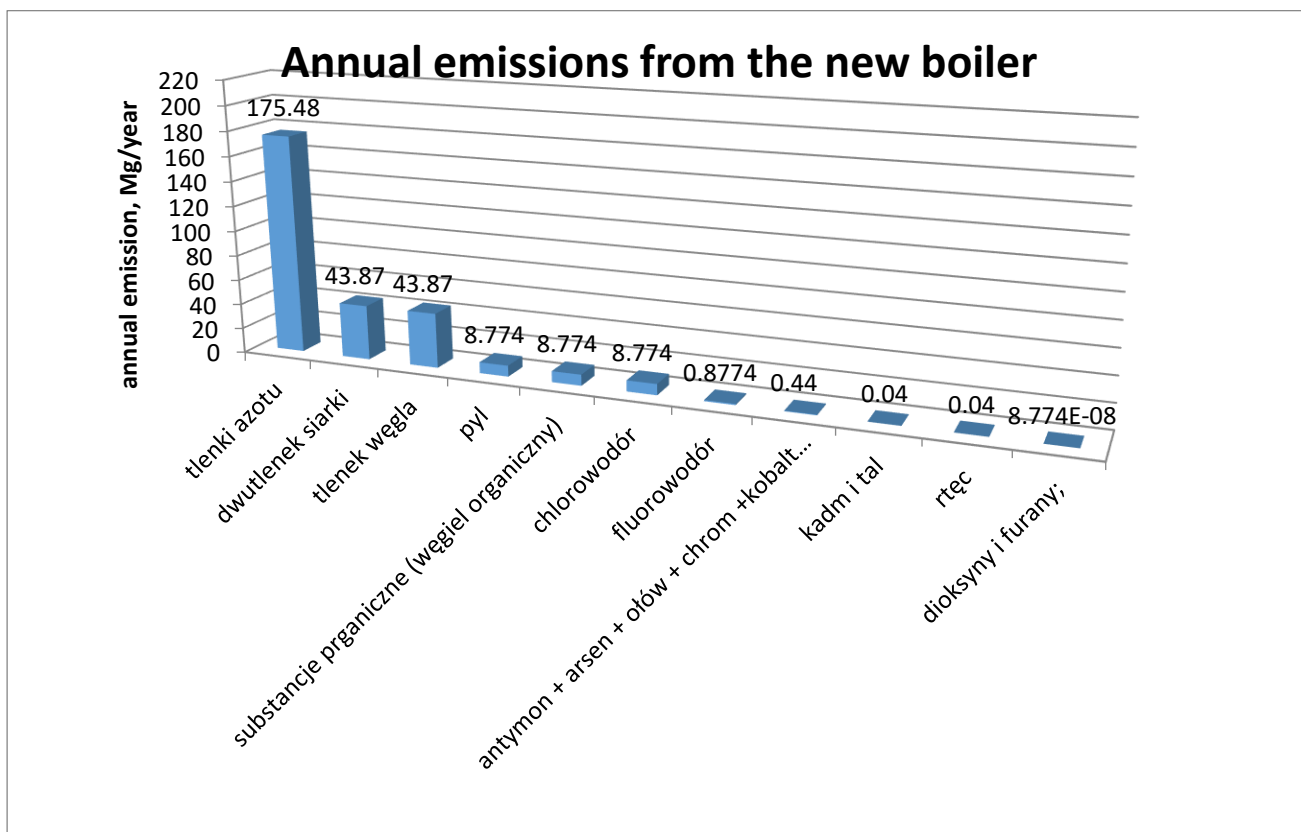


Figure 2: Chart of the expected annual emission from the new boiler

PL	EN
Emisje roczne z nowego kotła	Annual emissions from the new boiler
Emisja roczna, Mg/rok	Annual emission, Mg/year
Tlenki azotu	Nitrogen oxides
Dwutlenek siarki	Sulfur dioxide
Tlenek węgla	Carbon monoxide
Pył	Dust
Substancje prganiczne (węgiel organiczny)	Organic substances (organic coal)

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Chlorowodór	Hydrogen chloride
Fluorowodór	Hydrogen fluoride
Antymon + arsen + ołów + chrom + kobalt...	Antimony + arsenic + lead + chromium + cobalt ...
Kadm i tal	Cadmium and thallium
Rtęć	Mercury
Dioksyny i furany	Dioxins and furans

The calculations of the annual emission of gaseous and particulate pollutants into the air from the grate-fired boiler were performed based on its maximum time of operation per year with the installed capacity – 8200 hours.

Annual gaseous and particulate pollutants emission from the peak load back-up boilers will amount to:

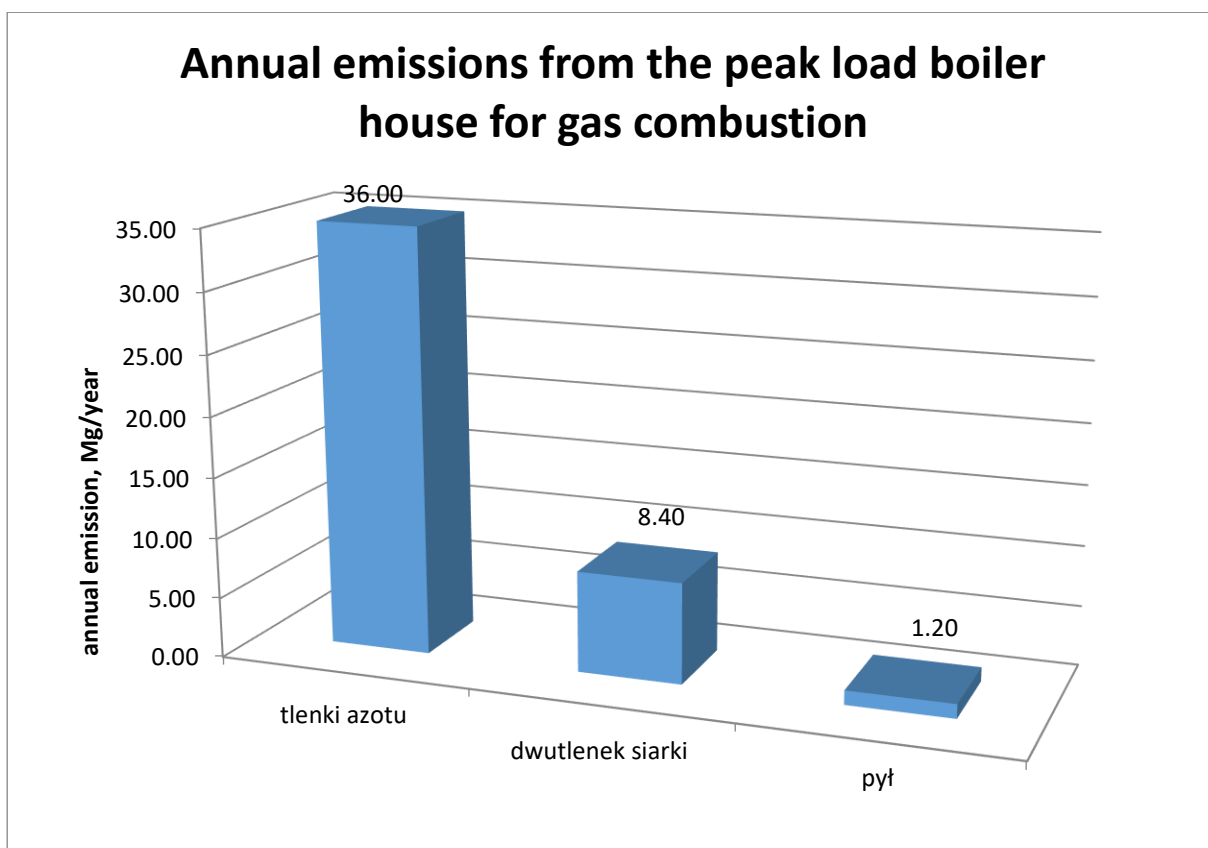


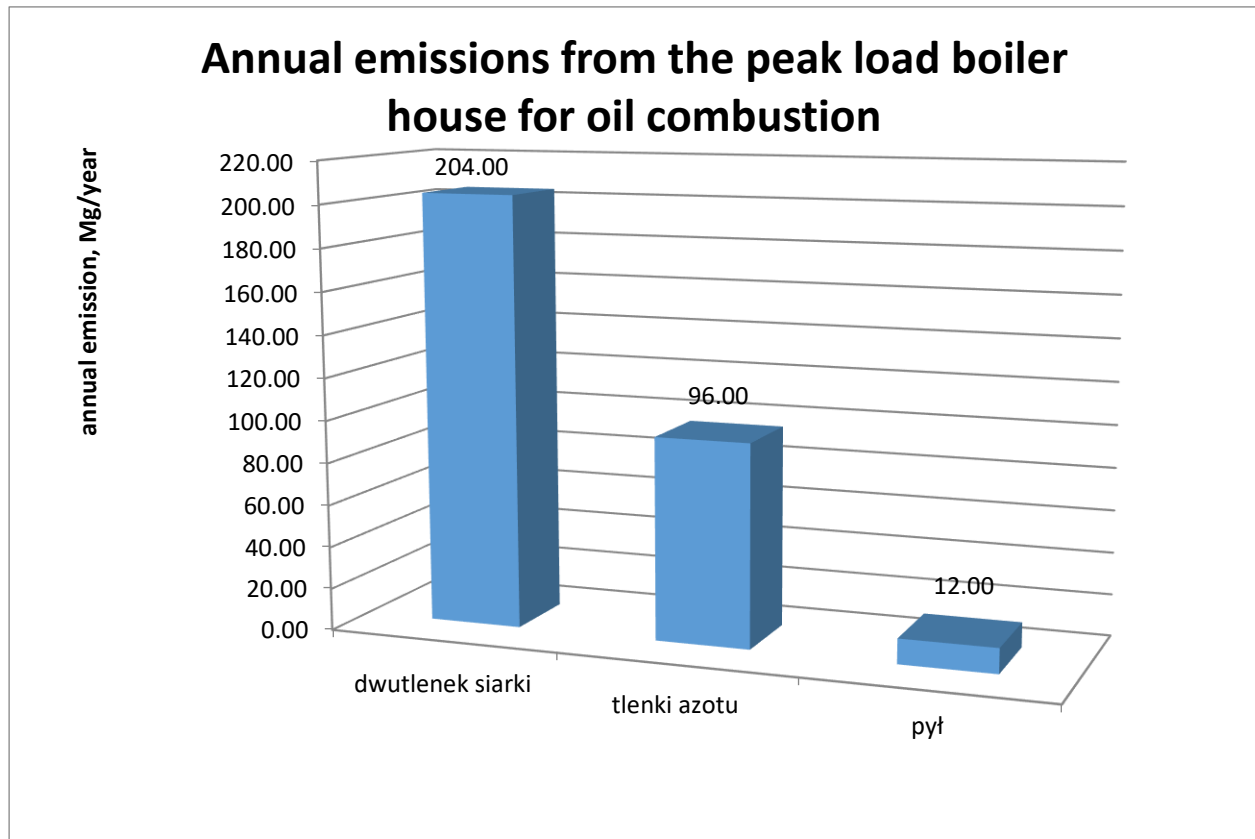
Figure 3: Chart of the expected annual emission from the gas-fired peak load back-up boiler house

PL	EN
Emisje roczne z kotłowni szczytowej przy spalaniu gazu	Annual emissions from the peak load boiler house for gas combustion
Emisja roczna, Mg/rok	Annual emission, Mg/year
Tlenki azotu	Nitrogen oxides
Dwutlenki siarki	Sulfur dioxides



pył

dust

**Figure 4: Chart of the expected annual emission from the oil-fired peak load back-up boiler house**

PL	EN
Emisje roczne z kotłowni szczytowej przy spalaniu oleju	Annual emissions from the peak load boiler house for oil combustion
Emisja roczna, Mg/rok	Annual emission, Mg/year
Dwutlenek siarki	Sulfur dioxide
Tlenki azotu	Nitrogen oxides
pył	dust

Water supply and wastewater drainage

Water for the needs of operation of the planned Investment Project will be taken from the water supply main of PWiK in Olsztyn. It will be used primarily for the following purposes:

- district heating network make-up,
- steam-water cycle make-up,

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- semi-dry Flue Gas Desulphurization Plant.

Table No. 55 of the Report contains the balance of water demand for ITPFP in Olsztyn.

Industrial wastewater after pre-treatment and grey and black water generated on the premises of ITPFP will be drained into the Ø600 mm sanitary sewerage system of PWiK. The rain water may be drained into the irrigation and drainage system of Struga Szczęsne and/or into the ground at the planned Investment Project. ITPFP will have the following complete water supply and sewerage systems:

- sanitary sewerage system, rain water drainage system and industrial wastewater drainage system.

Table No. 40 of the Report presents the balance of the volume of wastewater to be generated in relation to the operation of ITPFP.

The operation of the planned Investment Project, due to the water intake source and the wastewater discharge point as well as the methods of protecting the groundwater environment, will not have a negative effect on the water environment in the entire period of Investment Project operation.

Waste

The management of the waste generated during the operation of ITPFP will conform to the Act of April 27, 2001 – Environmental Protection Law – and the Waste Act of December 14, 2012. The ash and waste from the flue gas treatment plant will be stored together before their potential feeding into the stabilization line. A separate hall will be constructed for the stabilization system. The waste generated in relation to ITPFP operation will be stored in special, suitably marked containers in the designated locations. The storage sites will be protected against unauthorized access, and they will be provided with a concrete surface and sorbents for the neutralization of the potential leaks of that waste. The total time of waste storage will not exceed the periods specified in the detailed regulations in this regard. The waste generated during the operation of ITPFP will be transferred to professional external companies with suitable licenses.

The remains of the Waste-to-Energy process can be used to manufacture construction materials for the construction of structures other than structures designed for permanent human occupancy and for the construction of roads if the detailed requirements specified in the detailed regulations concerning the Waste-to-Energy process are met. This is permitted only for well-developed and accepted technologies, only when the approval procedure is strictly observed and only for products that are precisely tested with respect to composition.

The seasoning/valorization of slag shall be carried out in separated areas, divided with walls of appropriate height and roofed. Protection against secondary dusting shall be provided by an appropriate structure of the seasoning shelter. The shed shall be equipped with a system for discharge and collection of drainage water. After the seasoning process is completed, slag will be transferred to competent bodies for recovery. Post-process waste (waste from flue gas treatment, fly ashes containing hazardous substances, dust from boilers

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containing hazardous substances) will be subject to solidification and chemical stabilization in the post-process waste solidification and stabilization plant located on the premises of ITPFP. That process will produce waste with code 19 03 07 (non-hazardous solidified waste) or 19 03 05 (non-hazardous stabilized waste). If necessary, waste will also be transferred to waste recipients with suitable licenses without processing.

That waste will be sent to hazardous waste landfills or to waste landfills with an area designed for the storage of hazardous waste. The waste may be deposited at the waste landfill in Wysieka that is planned to be extended or used for economic purposes.

Noise

ITPFP will be a plant in constant operation. The noise level emitted to the surrounding environment by the machines and equipment operated during the process of energy generation will be similar in the daytime and nighttime, and it will strictly depend on the quantity of the noise sources operating simultaneously. Differences in the level of emitted noise during twenty four hours may arise, among others, from the road transport which takes place during the daytime only.

Due to the applicable acoustic requirements, the selection of technical solutions for individual facilities and equipment is of great importance for the solutions used for ITPFP. Appropriate selection of civil engineering solutions regarding adequate sound reduction indexes of the space dividers and other protections that will constitute equally significant measures reducing the noise emission to the environment is also important.

The operation of the planned Investment Project will involve the emission of noise from equipment and systems and from the transport of fuel, waste, sorbents or chemicals. The main sources of noise at ITPFP will be the turbine building and the cooling system – subcooling towers or dry condenser. An additional source of noise will be the equipment and systems of the additional heat source – peak load back-up boiler house. A relevant contribution to noise emission will also be the noise from the transport of waste (linear noise sources).

In addition to the equipment and structures listed above, other structures and equipment will also be operated – they will be potential noise sources without such an important impact on the emission of noise into the environment, but their operation may also contribute to an extent to the overall impact of ITPFP on the acoustic climate of the areas adjacent to the plant. For all other equipment (potential noise sources) located at the plant, it is assumed that their noise level (in a free field) will not significantly contribute to the equivalent noise level in the environment. The technical and technological solutions offered for the planned Investment Project will not deteriorate the acoustic climate in the areas subject to noise protection located within the area of the potential impact of ITPFP.

The walls and roofs of the individual structures will be provided with thermal insulation and noise insulation. Defective equipment which may cause an increased level of noise or pollution emissions into the environment should be immediately repaired or replaced during the operation of the plant. Suitable solutions regarding the

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design of the walls and roofs of the individual buildings will be used to minimize the emission of noise from the structures and equipment of ITPFP into the surrounding environment. If the sound pressure of the noise emitted from the inlet windows of the mechanical draft cooling tower (indicated by the specific supplier of the cooling tower) exceeds 80 dBA, solutions will be used to limit the emission to 80 dBA. The specific solutions to be used will be selected by the contractor of the system. The efficiency of the applied solutions (systems) regarding noise emission will be covered by the guarantees of the contract with the selected Contractors.

50 Hz electromagnetic fields generated by electric power equipment are present.

The power output system includes a number of pieces of equipment used for the transmission of energy from the newly designed generator. The power output busducts will be placed inside an insulated and shielded coating. Thus, the impact of the electromagnetic field will be reduced to admissible levels. The 110 kV switching station on the side of the power output into the network will be a closed (fenced-off) structure, which will fulfill the requirements concerning third-party access to areas with field-emitting equipment. The distance of the 110 kV equipment (unit transformer, overhead line) from the boundary of the plot guarantees that the admissible levels of electromagnetic radiation are not exceeded.

Description of the natural environment elements covered by the scope of the expected environmental impact of the Investment Project

A detailed environmental survey has been prepared for the planned Investment Project. The survey revealed the nesting of:

- 23 bird species, and 15 species flew to the site to feed or passed over it.
- 9 bird species outside the area to be used for the location of the planned ITPFP.

In total, during observation the presence of breeding locations of 6 legally protected amphibian taxa were recorded. However, in the area of the Investment Project only 3 amphibian taxa were found: common frog, moor frog and water frog. As regards invertebrates, beetles were observed in three places in the area to be used for the Investment Project. The area of the planned Investment Project is primarily covered with young stands of birch, which are usually not attractive to birds (the detailed environmental survey demonstrated that the bird population in the area was small). The area of the planned Investment Project contains three reservoirs with edges overgrown with willow bushes. Biological diversity in the area is represented mainly by meadow plants and habitats of the waterlogged areas with accompanying fauna. The area of the planned Investment Project and the adjacent areas, due to their development, are not environmentally sensitive habitats.

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Expected environmental impact of the selected variant

Construction phase

During the construction of the planned Investment Project, additional nuisances may occur (not present during operation of the facility) due to emission of pollution that may be generated during welding and painting. The emission will be of a local nature, restricted to the construction site area and so it shall not constitute an additional nuisance for the surrounding environment, and it shall not result in changes of the existing pollution background.

Gaseous pollutants emitted by means of transport shall be limited to the construction site, back-up facilities area and access roads. The primary pollution that may appear during construction will be dust and exhaust gases of cars and trucks. Impacts related to the Investment Project preparation and construction phase will be reversible and will occur in a relatively short period of time. The volume of these negative impacts will not cause permanent consequences for the environment. Noise related to the construction process of the newly designed facility shall cover the construction site, site back-up facilities and access roads. The application of appropriate organizational measures will allow to reduce to minimum the nuisance of this Investment Project implementation phase for local population. Water for the construction of the new unit will be delivered by a pipeline from the existing network. The wastewater generated during the implementation of the Investment Project will be drained into the municipal drainage network, in accordance with the conditions arranged with the utility company. Precautions will be taken during the conducted construction works to prevent pollutants, e.g., oil derivative substances, from penetrating the groundwater environment. Parking areas for equipment and temporary access roads should be paved and slopes will be formed to ensure outflow of rain water and thaw water as well as wastewater from washing to drainage equipment (drainage and water-tight ditches) in a manner that excludes the release of pollutions into the groundwater environment. After pre-treatment and after agreement of discharge conditions, that water will be conveyed into the municipal drainage network. The equipment park to be organized will be provided with portable sanitary facilities for construction personnel. Wastewater from the construction phase should be reclaimed first, and if for process reasons this is impossible or unjustified for ecology or economy reasons, construction waste should be forwarded to be neutralized by storage.

Operation phase

Impact on air quality

Values of the concentrations of the analyzed air pollutants in the air, generated by the operation of ITPFP, were calculated for the standard (resulting from the emission standards) emission values of gases and

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dusts released to the air from emission sources and based on the data of the manufacturers of the dedusting equipment for retention tanks, which will be operated on the premises of the plant. Such approach shows the maximum possible, under the law, impact of the planned Investment Project on the air quality in the area of potential impact of the plant. Twelve pollutants were analyzed to determine if the air quality standards were fulfilled. Only for two of them: nitrogen oxides as NO₂ and arsenic (sum of the following metals: antimony + arsenic + lead + chromium + cobalt + copper + vanadium + manganese + nickel) the calculations were performed in the full scope (for the case where the grate-fired boiler and the peak load boiler house fired with natural gas operate at the same time), which means that the levels of their concentrations do not meet the requirement arising from the calculation methods specified in the Ordinance of the Minister of Environment of January 26, 2010 on the reference values for certain substances present in the air (Journal of Laws No. 16, item 87):

$$S_{mm} \leq 0,1 \times D_1, \text{ where:}$$

S_{mm} – highest concentration of the maximum concentration levels of substances in the air

D_1 – reference value of the substance in the air or admissible level of the substance in the air averaged for one hour, i.e., they are greater than 10% of the reference value or admissible level of the substance in the air, but they do not lead to the exceeding of those values. The concentrations of the other ten pollutants in the air in the area of potential impact of ITPFP, **are lower than 10% of the reference value or admissible level of the substance in the air averaged for one hour.** If the light fuel oil is combusted in the boilers in the peak load back-up boiler house, the concentrations of sulfur dioxide, nitrogen oxides and dust in the air will increase in the area of potential impact of ITPFP. For that case, the performed calculations of pollution propagation in the air indicate that – out of the concentrations of the twelve analyzed pollutants – nine meet the criteria for the shortened calculation scope, which means that they are **lower than 10% of the reference values or admissible level of the substance in the air averaged for one hour.** Concentrations higher than 10% of the reference value will be present with respect to SO₂, NO₂ and arsenic. The results of the calculations show that during the operation of ITPFP the admissible values of pollutant concentration in the air will be met both at the ground level and at a height of 3 m above ground level. The plant will not exceed the reference values applicable in Poland and the concentrations of pollutants in the air that must not be exceeded in order to protect human health and plants as well as the standards and target values applicable in the European Union and the air quality requirements of the World Health Organization (WHO). Additionally, it can be noted that the operating experience for that type of plants indicates that the levels of gaseous and particulate pollutants emission are lower than the emission standards. Consequently, it can be expected that the impact of ITPFP on air quality in the area of potential plant impact will be lower than presented in this Report.

Impact on the water environment

The analysis of the potential impact of ITPFP on the water environment presented in the Report indicates that both in the implementation/decommissioning phase and in the operation phase of the Investment Project,

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it will not have a significant impact on surface waters. In the operation phase, there may be insignificant indirect impacts on the local quality of surface waters. That impact will be related to the discharge of the pre-treated industrial wastewater into the drainage system of Przedsiębiorstwo Wodociągów i Kanalizacji in Olsztyn. Due to the distance between ITPFP and the surface waters and the expected method of wastewater management, the planned Investment Project will not have a negative impact on the water environment both during implementation and operation. The analysis of the potential impact of ITPFP on the water environment presented in the Report also indicates that the plant will not pose a real and significant risk of contaminating the groundwater in the construction/decommissioning phase and operation phase. The technical solutions presented in chapter 14.2 of the Report will eliminate the risk of deteriorating the quality of groundwater within the area of the potential impact of ITPFP. It is expected that the planned Investment Project may, in the regional scale, contribute to the reduction of the potential negative impact of municipal waste landfills and unorganized emission of leachate from the landfills into groundwater.

Impact on ground surface

In relation to the construction of ITPFP, the current topography of the site where the plant is to be located will be altered. Owing to significant differences between the existing and planned land development site grading works shall be carried out before proceeding to major civil works. The major civil and erection works for the newly designed facilities, in turn, will be followed by the leveling works involving planting, top-soiling and grass seeding in the particular areas of the land altered during the performance of the works as well as planting of trees and shrubs. The implementation of the planned Investment Project will require occupation of land with an area of approx. 8 ha, which is only a part of the real property. The construction of ITPFP will require excavations for the foundations of buildings, tanks and equipment. In the places for the storage of raw materials and waste, the parking area and oil tanks, the surface will be suitably protected to prevent ground contamination.

During operation, the planned Investment Project will not have an impact on ground surface. The solutions to be applied regarding water and wastewater management and waste management (impermeable bunds protecting tanks with oil and chemicals against leakage, with suitable retention; hard paved and profiled surface; drainage system with pre-treatment equipment, etc.) will effectively protect the groundwater environment against penetration by contaminants.

Impact on the acoustic climate

The current condition of the acoustic environment in the vicinity of the planned Investment Project is shaped by the following:

- Olsztyn motocross circuit,
- “Michelin” tire factory,
- ul. Lubelska.

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The expected impact of the planned Investment Project on the acoustic climate of the areas adjacent to the plant is presented in the table below.

Table 1. Calculated equivalent A-weighted sound level at the specified observation points (daytime) caused by the operation of the designed noise sources of ITPFP

Observation point number	Location of observation points	Calculated equivalent sound level in dBA	Admissible noise level dBA
1.	approx. 270 m to the north-east of the Investment Project boundaries at ul. Lubelska 47b (retail and residential buildings)	45.3	55
2.	approx. 870 m to the west of the Investment Project boundaries at ul. Towarowa 18 (multi-family buildings)	37.1	55
3.	approx. 570 m to the south of the Investment Project boundaries at ul. Al. Marszałka Józefa Piłsudskiego (farmstead building)	39.7	55
4.	approx. 800 m to the east of Investment Project boundaries in the town of Klebark Mały 24a (farmstead building)	38.1	55
5.	approx. 800 m to the north-east of the Investment Project boundaries in the town of Klebark Mały 37a (farmstead building)	37.2	55

Table 2. Calculated equivalent A-weighted sound level at the specified observation points (nighttime) caused by the operation of the designed noise sources of ITPFP

Observation point number	Location of observation points	Calculated equivalent sound level in dBA	Admissible noise level dBA
1.	approx. 270 m to the north-east of the Investment Project boundaries at ul. Lubelska 47b (retail and residential buildings)	44.9	45
2.	approx. 870 m to the west of the Investment Project boundaries at ul. Towarowa 18	37.1	45

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	(multi-family buildings)		
3.	approx. 570 m to the south of the Investment Project boundaries at ul. Al. Marszałka Józefa Piłsudskiego (farmstead building)	39.7	45
4.	approx. 800 m to the east of Investment Project boundaries in the town of Klebark Mały 24a (farmstead building)	38.0	45
5.	approx. 800 m to the north-east of the Investment Project boundaries in the town of Klebark Mały 37a (farmstead building)	37.2	45

The noise level in the vicinity of the planned Investment Project is already fairly high, but it is expected that the emission of noise due to the construction and operation of ITPFP will not increase it.

Impact on the natural elements of the environment in the vicinity of the planned Investment Project

It is expected that there will be no negative impacts on fauna and flora in the operation phase. The methods presented in chapter 14 of the Report will effectively protect the natural environment in the immediate vicinity of the planned Investment Project. The environmental survey conducted for the construction of ITPFP demonstrated that out of the three reservoirs located in the area of the planned Investment Project only one is significant to the amphibian population. In order to protect fauna habitats, the largest reservoir will be left intact. However, if it has to be partially backfilled, those activities will be limited only to the north-western part, where the reservoir is most poorly developed. The large distance between the planned Investment Project and the nearest legally protected areas ensures that it will not have a significant impact on flora and fauna species protected as part of legally protected areas.

Impact on the level of electromagnetic radiation

The sources emitting electromagnetic field operated at ITPFP that could affect the condition of the environment will include equipment with voltage not lower than 110 kV, e.g.:

- 110 kV electric switching station,

110/6.3 kV unit transformer. The electromagnetic field is a physical factor present only in the place where it is generated, it is permanently related to that place and it does not move or propagate. Therefore, the impact of

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electric power equipment is local, and it is limited to the immediate vicinity of the equipment, i.e., it will not exceed the limits of the area to which the Investor holds a legal title.

Impact on human safety and health

It is estimated that ITPFP – since the emission of gaseous and particulate pollutants into the air and the concentrations of pollutants such as sulfur dioxide, nitrogen dioxide or suspended particulate matter will be limited to the levels required by the standards – will not have a negative effect on the health of the citizens of Olsztyn. The planned Investment Project will be provided with a system of solutions and precautions that enables observance of the applicable standards of pollution emission into the environment and environmental quality standards. The admissible concentrations of pollutants in the air that must not be exceeded in order to protect human health will not be exceeded throughout the period of plant operation. The admissible noise levels will not be exceeded throughout the period of ITPFP operation. ITPFP operation will be carried out in accordance with the provisions concerning occupational health and safety as well as with the general and position-related instructions applied in the plant. ITPFP will implement a work safety management system. Therefore, the plant will meet all the requirements specified in the standards and provisions of law. The company will ensure a safe and healthy working environment to the personnel. The planned Investment Project cannot be classified as a plant with a high or increased risk to the environment, and it will not require the preparation of a report on plant safety. In order to mitigate the consequences of industrial failures, the Investor will have a prepared procedure to be followed in the event of an industrial failure, which will contain information concerning the following:

- system for the supply of water, including fire water, complete with hydrant layout,
- description of the places used to store raw materials and maximum quantities of the stored raw materials,
- condition of access roads and internal roads,
- duties and responsibilities of the persons involved in rescue activities,
- alarming in case of hazards,
- performance of a rescue operation,
- failure elimination,
- provision of rescue equipment for the plant.

Decommissioning phase

At the decommissioning phase of the Investment Project it is necessary to adhere to personnel and property safety requirements as well as to respect the environmental protection requirements, particularly in the scope of waste management. During dismantling of process equipment and civil structures, significant amounts of waste will be generated - mainly bricks, scrap metal, elements of insulation, plastic and wood waste which will be used for domestic purposes or neutralized. The process of dismantling particular equipment will require

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special care due to the possibility of soil contamination when dismantling oil management equipment, power output equipment and hazardous waste management equipment. Prior to the disassembly, any equipment and supply networks shall be emptied, with all deposits and waste chemical substance removed outside the plant area and subject to environmentally-safe disposal (chemical neutralization, thermal decomposition). The decommissioning process shall be monitored and documented, since, attributable to the Polish law, the plant operator shall be liable for the effects of the area-wide pollution of the environment, which may be disclosed after decommissioning of the facility. After decommissioning of the facility, the site will be reclaimed by way of leveling, possible replacement of the top soil layer, protection against erosion by sowing grass and planting appropriate vegetation.

Indication of the need to establish a limited use area

In accordance with Article 135 of the Act of April 27, 2001 – Environmental Protection Law (consolidated text, Journal of Laws of 2008, No. 25, item 150, as amended), fuel combustion plants are not subject to the regulations on the establishment of limited use areas. The analysis of the impact of the planned Investment Project during the operation phase carried out in the Report did not demonstrate an excessive impact of the new plant on the environment in any respect. The technical and process solutions planned for ITPFP will ensure that the nuisance related to its operation **will be limited to the boundaries of the site to which the Investor holds legal title**. There will be no need to establish a limited use area and the related consequences in form of limitations in scope of land use, or technical requirements concerning the buildings and their way of use.

Analysis of potential social conflicts

The obligation to protect the legitimate interests of third parties arises from (among other things) the Act of July 7, 1994 – Construction Law. In accordance with Article 5 section 1 point 9 of the above-mentioned act, a civil structure complete with the associated construction equipment shall – with consideration of the expected lifecycle – be designed and constructed in accordance with the regulations, including the building code, and in accordance with good technical practice, without violating the legitimate interests of third parties present in the area of impact of the structure, including the obligation to ensure public road access.

In practice, it has been found that the implementation of every Investment Project may lead to local social conflicts. They may appear particularly in case of violations of interests of third parties residing within the range of potential impacts caused by the functioning of the plant or the works performed at the plant. The conflicts may be caused by the increased emissions of air pollution, noise and undesirable landscape alteration as well as the excessive road traffic associated with the Investment Project.

MPEC S.A. in Olsztyn is already trying to minimize the possibility of social conflicts, also by selecting the suitable location. The area to be used for the implementation of the planned Investment Project is located

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in the area of "Industrial Quarter – East 3 in Olsztyn," which should decisively reduce the possibility of social conflicts both at the implementation stage and during the later operation of ITPFP. The Investment Project was designed so as to ensure that its nuisance does not exceed the boundaries of the site to which the Investor holds a legal title (ITPFP area).

Proposals of monitoring of the impact of the planned project on the environment

The monitoring of the planned Investment Project will be conducted in accordance with the requirements of the secondary legislation to the Act - Environmental Protection Law, the Water Law and the Waste Act. The monitoring will be conducted throughout the operation of ITPFP, and it will include monitoring of the levels of pollutants emitted into the environment (substances and energy) and monitoring of the technical parameters of the unit and the quantity of consumed materials, raw materials and fuels. ITPFP will be equipped with automatic monitoring of the emission of pollutants into the air. Continuous measurements of the following will be performed: dust, HCl, SO₂, CO, C_xH_y, NO_x, HF, organic substances in the form of gases and vapors expressed as total organic carbon. Also, the following parameters of the process must be continuously monitored: O₂ content, pressure, flue gas temperature in the measurement section, absolute moisture content of flue gas or mixing ratio, flue gas flow rate or dynamic flue gas pressure).

The monitoring of waste management shall include keeping records of the types of waste generated, volume of the generated waste of particular types and the manner of waste handling.

In accordance with the conditions specified in the relevant agreement, the amount of the drawn potable water will be determined based on the reading of the water supplier's meter, which will be installed in the monitoring wall at the site of the planned Investment Project or based on the meter on the supply pipeline.

The industrial wastewater generated at ITPFP will be drained into the drainage system of Przedsiębiorstwo Wodociągów i Kanalizacji in Olsztyn, based on a relevant agreement specifying the conditions for the takeover, treatment and monitoring of wastewater and the method of settling payments for the provided service.

If – when the application for an integrated permit is submitted – the local government body finds that an initial report will have to be prepared for the planned Investment Project, it will be necessary to:

- submit the results of soil, ground and groundwater pollution tests,
- perform measurements of substance content in groundwater, including the collection of samples by an accredited laboratory.

It is recommended that the observation holes (piezometers) are located in a manner that enables the performance of tests for the duration of construction and operation. The number of metering points and the frequency and scope of tests will be determined during the preparation of the initial report (if any).

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After the commissioning of ITPFP, the management of environmental protection matters will be handed over to the designated organizational units.

Public involvement in decision-making

Public involvement is also required in accordance with the Polish law, EU law and international law in order to issue the decision on environmental constraints for the planned Investment Project for which it is legally required to conduct an environmental impact assessment and prepare a report. The environmental impact report of the planned Investment Project with a summary in plain language will be made public.

Sources of information

The list of all materials being the basis for the preparation of this Report has been included in chapter 2.6 of the Report.

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2. INTRODUCTION

2.1. IMPLEMENTING INSTITUTIONS

The Investor for the Investment Project titled:

CONSTRUCTION OF THE WASTE-TO-ENERGY PLANT PROCESSING COMBUSTIBLE FRACTION PRODUCED IN MUNICIPAL WASTE TREATMENT PROCESS ENSURING ENERGY RECOVERY AND HEAT SUPPLIES FOR THE CITIZENS OF OLSZTYN, INCLUDING THE ACCOMPANYING INFRASTRUCTURE is **MIEJSKIE PRZEDSIĘBIORSTWO ENERGETYKI CIEPLNEJ IN OLSZTYN (MPEC)**, being the owner of the construction site of the new plant:

Miejskie Przedsiębiorstwo Energetyki Ciepłej Spółka z o.o.

ul. Słoneczna 46

10 – 710 Olsztyn

phone: (+48 89) 524-03-04

fax.: (+48 89) 524-02-01.

2.2. CONTRACTOR

The construction of the planned Investment Project will be performed by a professional company selected by way of a tender.

2.3. APPLIED REGULATIONS AND PROCEDURES

This Report describes the environmental impact assessment process started with the preparation of the application for the Decision on environmental constraints for the planned Investment Project. The Report describes the actions taken by the Investor in the period preceding the filing of the application for the issue of the administrative decision, including the preparation of the technical materials (multi-variant Feasibility Study), specification of the necessary scope of examination of the planned Investment Project's impact on the environment and, consequently, specification of the quality of the environmental domains that will most likely be subject to significant impacts (chapter 13 of the Report), examination of those impacts, selection of measures to avoid, reduce or prevent the risk related to the expected effects of the Investment Project on the environment and the necessary monitoring of those effects during construction and operation. The assessments were conducted based on model studies (noise, air emissions), balance studies (consumption of materials, raw materials, fuels and energy), operating experience with similar facilities and studies performed by other entities in the area of the planned Investment Project. The procedure for environmental impact assessment adopted for

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the preparation of this Investment Project has been prepared with consideration of the requirements of the Polish law:

- Act of October 3, 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws of 2013, item 1235), which implements the requirements arising from the following European Union directives:
- Council Directive 85/337/EEC of June 27, 1985 on the assessment of the effects of certain public and private projects on the environment, amended by Council Directive 97/11/EC of March 3, 1997;
- Directive 92/43/EEC of the Council of May 21, 1992 on the conservation on natural habitats and of wild fauna and flora;
- Directive 2001/42/EC of the European Parliament and of the Council of June 27, 2001 on the assessment of the effects of certain plans and programs on the environment;
- Directive 2003/4/EC of the European Parliament and of the Council of January 28, 2003 on public access to environmental information and repealing Council Directive 90/313/EEC;
- Directive 2003/35/EC of the European Parliament and of the Council of May 26, 2003 providing for public participation in respect of the drawing up of certain plans and programs relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC;
- Directive 2008/1/EC of the European Parliament and of the Council of January 15, 2008 concerning integrated pollution prevention and control.

The process of environmental impact assessment is regulated by Polish law and EC law and by procedural regulations that are not applicable as law but that ensure that the procedure is correctly implemented.

2.4. COMPETENT AUTHORITIES

The authority competent to issue the decision on environmental constraints for the planned Investment Project and conduct the environmental impact assessment procedure, in accordance with Article 75 of the Act on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments, is the President of the City of Olsztyn.

2.5. ASSESSMENT METHODS

The levels of impacts on the environment were determined using the result prediction method based on literature materials and materials included in chapter 2.6 of the Report, documents and other materials held by the Investor and BSPiR Energoprojekt-Katowice S.A. and based on the calculations modeling the phenomena that will take place during the operation of the new plant.

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Air protection

Regarding the impact of the planned investment on air quality, model calculations have been performed regarding pollution propagation in the air around the emission sources for the total emission from all pollution emission sources to be operated on the premises of ITPFP. The Ordinance of the Minister of Environment of January 26, 2010 on the reference values for certain substances in the air specifies the reference method of modeling substance levels in air based on the Pasquill equation. The model calculations of air pollution dispersion were performed using the OPERAT FB computer program developed by PROEKO, which uses the reference modeling model. The methods of calculating the hourly and annual values of the emission of gaseous and particulate pollutants into the air are included in chapter 8.1 of the Report.

Noise protection

Regarding noise protection, model calculations were performed, involving the data about the acoustic power of the sources, noise levels inside buildings, sound reduction index of space dividers, noise screening and attenuation in space, sound wave diffraction at side and top edges of obstacles and sound wave reflection from obstacles surrounding the noise source.

The scope of the calculations included equipment – dominant noise sources arranged in the land development plant for the new plant.

The model calculations were performed with the SoundPlan 7.3 Professional program, using the computational model included in standard No. PN ISO 9613-2:2002, "Acoustics – Attenuation of sound during propagation outdoors. General method of calculation." The program was developed by the international team: Braunstein + Berndt GmbH/SoundPLAN International LLC, and it is one of the most recognized programs related to acoustics worldwide. The program is designed for the calculations of the noise hazard to areas adjacent to industrial noise sources. It enables determination of A-weighted sound levels in the environment in the individual nodes of the computational mesh.

The program operating algorithm is based on the following principles:

- for building-type sources of noise, A sound levels indoors are adopted at a distance of 1 m from the walls and floor slabs,
- for the other sources of noise, acoustic power levels for those sources are adopted.

In accordance with the Ordinance of the Minister of Environment of June 14, 2007 on admissible noise levels in the environment (Journal of Laws No. 120, item 826, as amended), the following ranges of reference time are used for the determination of equivalent sound levels:

- for daytime - 8 least favorable hours of the day,
- for nighttime - 1 least favorable hour of the night.

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The model calculations enabled the assessment of the scale and range of noise propagation in the environment, and the data included in the model were used as the basis to assess the impact and the need to implement measures mitigating noise emission from ITPFP into the surrounding environment.

Water and wastewater management

The prediction of water and wastewater management and its potential impact on the environment was prepared based on the process data described in the Feasibility Study of the Combined Heat and Power Plant in Olsztyn. The prediction was also based on the available materials, including the operating experience at other facilities used to generate heat and electricity. The technical solutions were assessed in terms of their water consumption and the volume of generated wastewater.

Protection against electromagnetic radiation

The assessment of the impact of electromagnetic radiation was based on the similarity of the impact of the newly designed equipment to the respective impacts described in the literature or observed by the institutions studying environmental impact.

Waste management

Waste management issues were described based on the balance data included in the technical materials.

Nature protection

The condition of the environment in the vicinity of the plant is described based on the latest data from environmental monitoring, obtained from (among other sources), the Voivodeship Inspectorate of Environmental Protection (WIOŚ) in Olsztyn. The prediction of the environmental impact of the planned Investment Project was also based on detailed studies, i.e.: "Wildlife inventory of protected animal species in the area of the planned Investment Project involving the construction of a Combined Heat and for the Municipal District Heating System (MSC) in Olsztyn at ul. Lubelska, on plots No.: 89-25/1, 89-25/2, 89-25/3, 94-6/1, 94-6/2 and 94-6/3, and specification of protective and compensating measures," prepared by Krzysztof Lewandowski, M.Sc., March–June 2012, and Tree and vegetation survey on the real property at ul. Lubelska, cadastral district No. 89, plots No.: 25/1, 25/2 and 25/3; precinct No. 94, plots No.: 6/1 and 6/2, designed for the implementation of the Investment Project titled: "Construction of a Combined Heat and Power Plant – heat source for the purpose of the Municipal District Heating System (MSC) in Olsztyn," performed for MPEC in Olsztyn in January 2014.

2.6. INFORMATION SOURCES ON WHICH THE REPORT IS BASED

The Report on the impact of the planned Investment Project on the environment was prepared with the use of the following materials:

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1. Analysis of the potential and availability of alternative fuel from the processing of municipal waste (RDF) in Poland for the Combined Heat and Power Plant in Olsztyn – March 2014,
2. Variant technical and economic concept of the construction of the Combined Heat and Power Plant in Olsztyn – Wrocław, November 2011,
3. Preliminary feasibility study for the construction of the Combined Heat and Power Plant in Olsztyn – Wrocław, April 2012,
4. The feasibility study for the Combined Heat and Power Plant in Olsztyn with consideration of alternative fuel from the processing of municipal waste. VOLUME I, technical part, July 2014,
5. The feasibility study for the Combined Heat and Power Plant in Olsztyn with consideration of alternative fuel from the processing of municipal waste. VOLUME III, recommendations and conclusions, July 2014,
6. Wildlife inventory of protected animal species in the area of the planned Investment Project involving the construction of the Combined Heat and Power Plant for the Municipal District Heating System (MSC) in Olsztyn at ul. Lubelska, on plots No.: 89-25/1, 89-25/2, 89-25/3, 94-6/1, 94-6/2 and 94-6/3, and specification of protective and compensating measures, prepared by Krzysztof Lewandowski, M.Sc., March–June 2012,
7. Tree and vegetation survey on the real property at ul. Lubelska, cadastral district No. 89, plots No.: 25/1, 25/2 and 25/3; cadastral district No. 94, plots No.: 6/1 and 6/2, designed for the implementation of the Investment Project titled: "Construction of the Combined Heat and Power Plant – heat source for the Municipal District Heating System (MSC) in Olsztyn,"

The Report on the environmental impact of the planned Investment Project was prepared based on the following legal acts:

1. Act of October 3, 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws of 2013, item 1235),
2. Act of April 27, 2001 - Environmental Protection Law (consolidated text: Journal of Laws of 2013, item 1232, as amended),
3. Waste Act of December 14, 2012 (consolidated text: Journal of Laws of 2013, item 21, as amended),
4. Act of July 18, 2001 – Water Law (consolidated text: Journal of Laws of 2012, item 145, as amended),
5. Act of July 7, 1994 – Construction Law (consolidated text: Journal of Laws of 2013, item 1409),
6. Nature Conservation Act of April 16, 2004 (consolidated text: Journal of Laws of 2013, item 627),
7. Act of July 23, 2003 on protection and care of historic objects (Journal of Laws No. 162, item 1568, as amended),

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8. Act of April 13, 2007 on protection of environment against damage and its remedying (consolidated text: Journal of Laws of 2014, item 210),
9. Act of March 27, 2003 on spatial planning and development (consolidated text: Journal of Laws of 2012, item 647, as amended),
10. Ordinance of the Minister of Infrastructure of April 12, 2002 on technical conditions to be met by buildings and their location (Journal of Laws No. 75, item 690),
11. Act of August 21, 1997 on real property management (consolidated text: Journal of Laws of 2014, item 518),
12. Ordinance of the Minister of Infrastructure of February 6, 2003 on occupational health and safety during construction works (Journal of Laws No. 47, item 401),
13. Ordinance of the Minister of Labor and Social Policy of September 26, 1997 on general occupational health and safety regulations (consolidated text: Journal of Laws of 2003, No. 169, item 1650, as amended),
14. Ordinance of the Minister of Infrastructure of June 23, 2003 on health and safety information and health and safety plan (Journal of Laws No. 120, item 1126),
15. Ordinance of the Council of Ministers of November 9, 2010 on projects that may have significant environmental impact (Journal of Laws of 2013, item 817, as amended),
16. Ordinance of the Minister of Environment of August 27, 2014, on types of plants that may considerably pollute particular natural elements or environment as a whole (Journal of Laws of 2014, item 1169),
17. Ordinance of the Minister of Interior and Administration of July 24, 2009 on fire water supply and fire roads (Journal of Laws No. 124, item 1030),
18. Ordinance of the Minister of the Environment of January 26, 2010 on the reference values for certain substances present in the air (Journal of Laws No. 16, item 87),
19. Ordinance of the Minister of the Environment of August 24, 2012 on the reference values for certain substances present in the air (Journal of Laws No. 47, item 1031),
20. Ordinance of the Minister of Environment of November 4, 2014 concerning emissions standards of certain plants, fuel combustion sources and other combustion and waste co-firing facilities (Journal of Laws of November 7, 2014, item 1546),
21. Ordinance of the Minister of Environment of October 30, 2014, on requirements for performing measurements of emissions and of water consumption (Journal of Laws of 2014, item 1542),
22. Ordinance of the Minister of the Environment of November 19, 2008 on types of results of the measurements performed regarding the operation of the plant or equipment and of other data as well as time limits and methods of their presentation (Journal of Laws No. 215, item 1366),

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23. Ordinance of the Minister of Environment of June 14, 2007 on admissible noise levels in the environment (consolidated text: Journal of Laws of 2014, item 112),
24. Ordinance of the Minister of the Environment of September 27, 2001 on the waste catalog (Journal of Laws No. 112, item 1206),
25. Ordinance of the Minister of Environment of May 25, 2012 on the levels of reduction of the mass of biodegradable municipal waste deposited at landfills and on the method of calculating the level of reduction of the mass of that waste (Journal of Laws of 2012, item 676),
26. Ordinance of the Minister of the Environment of May 13, 2004 on conditions in which waste is recognized as non-hazardous (Journal of Laws No. 128, item 1347),
27. Ordinance of the Minister of Economy of October 30, 2002 on the type of waste which may be collected in a non-selective way.(Journal of Laws No. 191, item 1595),
28. Ordinance of the Minister of the Environment of April 21, 2006 on the list of waste types, which can be transferred by the owner to natural persons or organization units which are not entrepreneurs and admissible methods of their recovery (Journal of Laws No. 75, item 527),
29. Ordinance of the Minister of Economy and Labor of September 4, 2004 on detailed manner of handling of waste oils (Journal of Laws No. 192, item 1968),
30. Ordinance of the Minister of the Environment of December 8, 2011 on sample documents for the record keeping of waste (Journal of Laws No. 249, item 1673),
31. Ordinance of the Minister of Economy of October 10, 2013 on types and quantities of hazardous substances whose presence at the plant decides on its inclusion to the plant with increased or high risk of the occurrence of serious industrial failure (Journal of Laws No. 2013, item 1479),
32. Ordinance of the Minister of Environment of October 30, 2003 on admissible electromagnetic field levels in the environment and examination methods for maintaining these levels (Journal of Laws No. 192, item 1883),
33. Ordinance of the Minister of Environment of November 18, 2014 on conditions to be fulfilled while discharging sewage to the water or ground, and on substances particularly harmful to water environment (Journal of Laws 2014.1800),
34. Ordinance of the Minister of Environment of November 9, 2011 on classification method of the state of homogeneous surface water bodies and environmental qualitative standards for priority substances (Journal of Laws of No. 257, item 1545),
35. Ordinance of the Minister of Environment of July 23, 2008 on the criteria for the assessment of groundwater quality (Journal of Laws No. 143, item 896),

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36. Ordinance of the Council of Ministers of December 17, 2002, on inland surface waters or parts being public property (Journal of Laws No. 16, item 149),
37. Ordinance of the Minister of Economy of December 21, 2005 on essential requirements for equipment used outside buildings, concerning noise emissions into the environment (Journal of Laws No. 263, item 2202, as amended),
38. Ordinance of the Council of Ministers of June 27, 2006 on the boundaries of river basins and water areas (Journal of Laws No. 126, item 878, as amended),
39. Ordinance of the Minister of Environment of January 12, 2011 on the Special Conservation Areas for Birds (Journal of Laws of 2011 No. 25, item 133, as amended),
40. Ordinance of the Minister of Environment of April 13, 2010 on natural habitats and species of interest to the Community, including the criteria for the selection of areas qualifying to be recognized or established as NATURA 2000 sites (Journal of Laws No. 77, item 510, as amended),
41. Ordinance of the Minister of Economy, Labor and Social Policy of February 12, 2003 on supplies of fuels in power industry companies (Journal of Laws No. 39, item 338, as amended),
42. Directive 2010/75/EU of the European Parliament and of the Council of November 24, 2010 on industrial emissions (integrated pollution prevention and control),
43. Directive 2008/105/EC of the European Parliament and of the Council of December 16, 2008 on environmental quality standards in the field of water policy,
44. Council Directive 96/82/EC of December 9, 1996 on the control of major-failure hazards involving dangerous substances,
45. Directive 2009/147/EC of the European Parliament and of the Council of November 30, 2009 on the conservation of wild birds,
46. Directive 92/43/EEC of the Council of May 21, 1992 on the conservation on natural habitats and of wild fauna and flora,
47. Directive 2008/98/EC of the European Parliament and of the Council of November 19, 2008 on waste and repealing certain Directives,
48. Directive 2004/35/CE of the European Parliament and of the Council of April 21, 2004 on environmental liability with regard to the prevention and remedying of environmental damage,
49. Directive 2008/50/EC of the European Parliament and of the Council of May 21, 2008 on ambient air quality and cleaner air for Europe,

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50. Directive 2011/92/EU of the European Parliament and of the Council of December 13, 2011 on the assessment of the effects of certain public and private projects on the environment,

The Report on the environmental impact of the planned Investment Project was prepared based on the following reference documents (European Commission's Joint Research Centre (JRC), Institute for Prospective Technological Studies, Seville):

1. BREF for waste combustion, August 2006,
2. BREF for emissions from storage, July 2006,
3. BREF for general monitoring principles, July 2003.

2.7. INVESTMENT PROJECT CATEGORY

The Investment Project planned by MPEC in Olsztyn – Waste-to-Energy Plant with a capacity of 110 thousand Mg/year – belongs, within the meaning of the Act of October 3, 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws of 2013, item 1235), to the category of investment projects that may always have a significant impact on the environment, for which the environmental impact assessment and preparing the report on this assessment is required by law.

The classification of the Investment Project is specified in the provision of § 2 section 1 point 46) of the Ordinance of the Council of Ministers of November 9, 2010 on projects that may have significant environmental impact (Journal of Laws No. 213, item 1397, as amended), quote: 46):

"the plants for recovery and neutralization of non-hazardous waste with use of the processes of waste-to-energy process, cracking process, physical and chemical treatment of waste with capacity not lower than 100 ton per day, excluding the plants combusting waste in the form of biomass under the provisions on standards of emissions from plants".

The planned Investment Project within the meaning of Article 5 point 2-a) of the Ordinance of the Minister of Environment of August 27, 2014 on types of plants that may considerably pollute particular natural elements or environment as a whole, is classified as a plant that may considerably pollute particular natural elements or environment as a whole.

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3. BACKGROUND OF THE INVESTMENT PROJECT

3.1. SUBJECT AND OBJECTIVE OF THE INVESTMENT PROJECT

The subject of the planned Investment Project is the construction of ITPFP – the waste-to-energy plant processing combustible waste fraction produced in municipal waste treatment process, ensuring energy recovery and heat supplies for the citizens of Olsztyn, including the accompanying infrastructure, at ul. Lubelska 48 in Olsztyn. The plant was designed for the purpose of management of combustible fraction of municipal waste with use of the most optimum method, by heat recovery for the purposes of municipal district heating network and electricity to be delivered to the new 110 kV switching station of Olsztyn CHPP.

Main objectives of the planned Investment Project:

- satisfying the thermal demands of Olsztyn city with obtaining the lowest possible heat price;
- disposal of at least 50 thousand t/a of the alternative fuel generated by ZGOK Olsztyn,
- serving as one of the components of the municipal waste management system in Olsztyn that was developed in order to solve the waste management problem in 37 communes of the central part of Warmińsko-Mazurskie Voivodeship and other areas of the voivodeship,
- reduction of the mass and volume of landfilled waste in the area of Warmińsko-Mazurskie Voivodeship,
- increasing of the volume of waste managed in the recovery processes, including the recovery of energy from waste,
- limitation of environmental hazards resulting from waste landfilling,
- limitation of the coal used for heat generation for the purposes of the whole city,
- reducing the costs of purchasing the CO₂ emission rights.

Implementation of the project “Municipal waste management system in Olsztyn, construction of the waste neutralization plant,” involving the operation of ITPFP, will affect the condition of the environment by reducing the volume of waste deposited in landfills. Additionally, the project will create 39 new jobs.

The planned Investment Project will contribute to the fulfillment of both Polish and EU requirements for the waste management. Their implementation will allow to achieve the required levels of recovery and the threshold of the waste volume permitted to be landfilled under national and international laws.

The thermal demand of the city of Olsztyn will be secured based on cogeneration, i.e., process involving the simultaneous generation of electricity and useful heat at ITPFP. Owing to the reduced fuel consumption, the use of cogeneration is advantageous for the broadly understood environment, and it produces large economic savings in comparison to separate heat generation at a conventional heat generating plant and electricity generation at a condensing power plant.

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3.2. SCOPE AND OBJECTIVE OF THE REPORT

The scope of the Environmental Impact Report of the planned Investment Project includes the construction of ITPFP with the unit with gross available capacity of 11.3 MW at ul. Lubelska 48 in Olsztyn. Heat and electricity will be generated in ITPFP from the combustion of fuel from municipal waste in a grate-fired boiler. A peak load back-up boiler house fired with natural gas or light fuel oil will be erected at the plant. The planned Investment Project was classified as the project which may always have a significant impact on the environment. The scope of this Report meets the requirements stipulated in Article 66 of the Act on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws No. 2013, item 1235). Furthermore, the scope is compliant with the EU requirements stipulated in the Directive 85/337/EEC of the Council of June 27, 1985 on the assessment of the effects of certain public and private projects on the environment amended by Directive 97/11/EC of the Council of March 3, 1997.

The objective of the document that is the Report is to determine the potential impact of the planned Investment Project on the individual environmental components and the mutual relations between the components. The Report answers the question whether the implementation of the Investment Project in the proposed scope and place including the applied preventive and compensatory methods, etc. is possible in view of the environmental protection requirements and standards.

The Report is also aimed at identification of the technological variant planned for implementation most advantageous for the environment protection. Based on the Report the conditions in scope of the environment protection to be met at the stage of implementation and operation as well as to be taken into account in the building permit design are specified.

This Report will be the basis for the issue of the decision on environmental constraints. The decision on environmental constraints is an administrative decision issued in accordance with the Act on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments. In the investment process, that decision is the document that should be obtained before filing the application for the building permit and before preparing the building permit design, and also before the commencement of the procedure required to obtain the decision on the determination of public project location. The decision is appended to the application for the building permit. The decision on environmental constraints specifies, among other things, the conditions to be considered at the Investment Project implementation and operation stages and in the building permit design. The decision on environmental constraints does not grant rights to the site, and it is not a permit for the implementation of the Investment Project.

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3.3. GENESIS OF ITPFP CONSTRUCTION IN THE CITY OF OLSZTYN

The decision on construction of the new generating capacities in the city of Olsztyn was made due to the plans of withdrawal of the heat supplies from Michelin Combined Heat and Power Plant to MPEC Olsztyn network by year 2017. Currently, the municipal district heating system in Olsztyn, operated by Miejskie Przedsiębiorstwo Energetyki Ciepłej Sp. z o.o. in Olsztyn, is supplied from two heat sources: from Kortowo Heat Generating Plant, owned by MPEC Sp. z o.o. in Olsztyn (60-65%) and Michelin Combined Heat and Power Plant (35-40%) owned by Michelin Polska S.A. Due to the value of the power installed in Kortowo Heat Generating Plant and due to the configuration of the district heating system, MPEC is unable to cover the heat requirements of the municipal district heating system based only on generation of Kortowo Heat Generating Plant.

In general, the need to construct ITPFP at the own site of MPEC in Olsztyn is due to the following reasons:

- withdrawal of Michelin Combined Heat and Power Plant from the supply of heat into the network of MPEC Olsztyn in 2017,
- need to secure the heat demand of the city of Olsztyn and dispose of at least 50 thousand t/a of alternative fuel generated by ZGOK Olsztyn by constructing a new heat source covering a considerable portion of the city's heat demand, using fuel from municipal waste to generate energy; and
- construction of Regional Municipal Waste Processing Systems, so-called RIPOKs, in Warmińsko-Mazurskie Voivodeship that are going to process mixed municipal waste collected from the citizens;
- implementation of a regional waste management system in the city, including 37 communes located in 8 districts of Warmińsko-Mazurskie Voivodeship;
- RIPOK and ZGOK plants will generate fuel from municipal waste, high-energy fraction left over after municipal waste sorting and 20–80 mm fraction left over after composting and screening – those fractions will be used as fuel for ITPFP in Olsztyn;
- ITPFP in Olsztyn is not included in the Voivodeship Waste Management Plan (WPGO), but the WPGO contains the following provision: “One of the fundamental courses of action is the intensive increase of the use of biological and thermal methods to process mixed municipal waste;”
- position of the Government of Warmińsko-Mazurskie Voivodeship regarding the inclusion in the Waste Management Plan for Warmińsko-Mazurskie Voivodeship, strongly supporting the efforts of MPEC Sp. z o.o. in Olsztyn to include the planned incineration plant for waste with codes 19 12 10 and 19 12 12 generated at plants for the mechanical and biological processing of municipal waste in the Waste Management Plan for Warmińsko-Mazurskie Voivodeship and in the investment plan to be appended to the WPGO (Appendix No. 16 to the Report).

The planned Investment Project inscribes into the objectives set out in the Voivodeship Waste Management Plan for Warmińsko-Mazurskie Voivodeship, and, thus, it is in line with the objectives specified in National Waste

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Management Plan 2014 and with the implementation of Directive 2008/98/EC of the European Parliament and of the Council of November 19, 2008 on waste and repealing certain Directives, as well as the Waste Act of April 27, 2001, and the Act of September 13, 1996 on keeping order and cleanliness in communes.

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4. CONFORMITY OF THE INVESTMENT PROJECT TO STRATEGIC AND PLANNING DOCUMENTS

This Report on the environmental impact of the planned Investment Project has been prepared with consideration of the regulations applicable in Poland and the European Union Directives implemented by the Polish law with respect to waste management and environmental protection, and it refers to the applicable and prepared documents concerning waste management in the city of Olsztyn and in Warmińsko-Mazurskie Voivodeship. The Report was prepared with consideration of the findings of documents prepared at the national and voivodeship level and accepted by the City Council and by the Government of the City of Olsztyn, which contain provisions concerning waste management issues. An important document is the **Local Land Development Plan of the City of Olsztyn**.

Study of Conditions and Directions of Spatial Development for the City of Olsztyn

RESOLUTION No. XXIV/434/12 of the City Council of Olsztyn of June 27, 2012 regarding the commencement and preparation of the amendment to the Study of Conditions and Directions of Spatial Development of the City of Olsztyn amended the provisions of the study in the area to be used for the planned Investment Project. The area affected by the amendment is depicted in the drawing below:

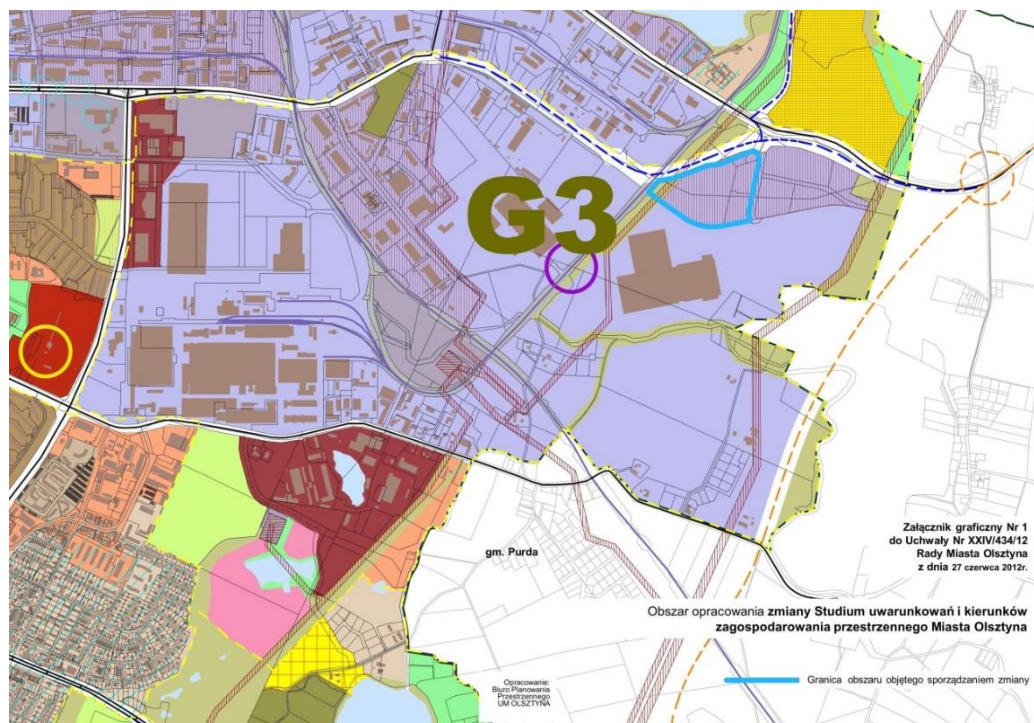


Figure 5. Graphic Appendix No. 1 to Resolution No. XXIV/434/12 of June 27, 2012

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Załącznik graficzny Nr 1 do Uchwały Nr XXIV/434/12 Rady Miasta Olsztyna z dnia 27 czerwca 2012 r.	Graphic Appendix No. 1 to Resolution No. XXIV/434/12 of the City Council of Olsztyn of June 27, 2012
Obszar opracowania zmiany Studium uwarunkowań i kierunków zagospodarowania przestrzennego Miasta Olsztyna	Area affected by the amendment to the Study of Conditions and Directions of Spatial Development for the City of Olsztyn
Granica obszaru objętego sporządzaniem zmiany	Boundary of the area affected by the prepared amendment

The Study of Conditions and Directions of Spatial Development for the City of Olsztyn is an act of the spatial policy implemented in the given commune, and it is not an act of local law. Its provisions are the basis for the preparation of the local land development plan of the commune, where they become legally enforceable and are actually implemented. The local land development plan is an act of local law. The amendment of the Study was the basis for the preparation and passing of the amendment of the "Local Land Development Plan named Industrial Quarter – East 3 in Olsztyn."

Local Land Development Plan

The location of the planned Investment Project was covered by the Local Land Development Plan passed with Resolution No. LVII/763/06 of the City Council of Olsztyn of February 22, 2006. Major part of the area is intended for industrial, storage and service development (2PS in the Local Land Development Plan), while the north part, at the boundary of the plot - for technical infrastructure areas.

The Graphic Appendix to the Local Land Development Plan presents the following:

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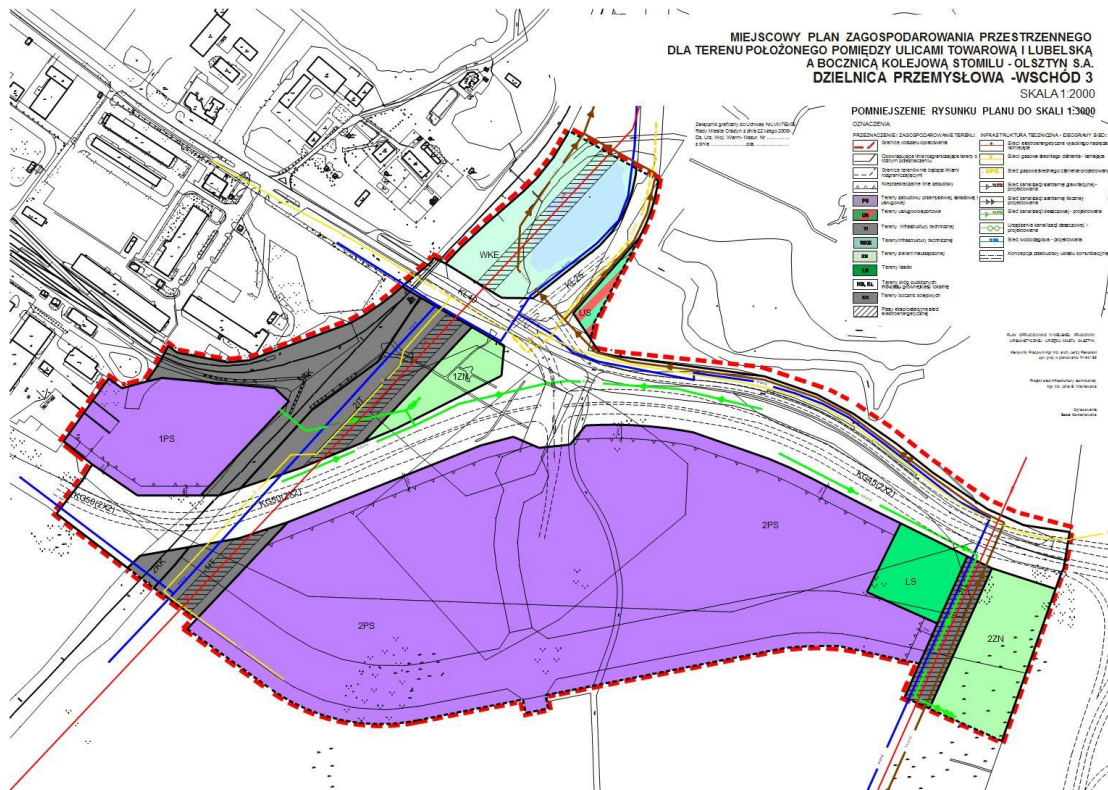


Figure 6. Graphic Appendix to the applicable Local Land Development Plan

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Miejscowy plan zagospodarowania przestrzennego dla terenu położonego pomiędzy ulicami Towarowa i Lubelska a bocznica kolejową Stomilu-Olsztyn S.A. Dzielnic przemysłowa – wschód	Local land development plan for the area located between ul. Towarowa and ul. Lubelska and the railway siding of Stomil-Olsztyn S.A. Industrial Quarter – East
Skala	Scale
Pomniejszenie rysunku planu do skali	Plan drawing reduced to the following scale:

Resolution No. LIII/866/14 of the City Council of May 28, 2014, titled: Local land development plan for the area located between the railway siding, ul. Lubelska and the boundary of the City of Olsztyn referred to as “Industrial Quarter – East 4” introduces the site referred to as 1CEO, with an area of 7.74 ha, to be used for the **heat generating plant or combined heat and power plant generating thermal energy for the municipal district heating system, with the possibility of electricity cogeneration, complete with the necessary technical infrastructure equipment and networks**. Maximum construction height for this area - 55m. The height of more than 55 m is permitted for:

- process equipment of the fuel combustion or waste incineration plants,
- civil structures other than buildings, necessary for operation of the plant, specified in the plan,
- and related technical infrastructure elements.

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The Graphic Appendix to the draft amendment to the Local Land Development Plan presents the following:

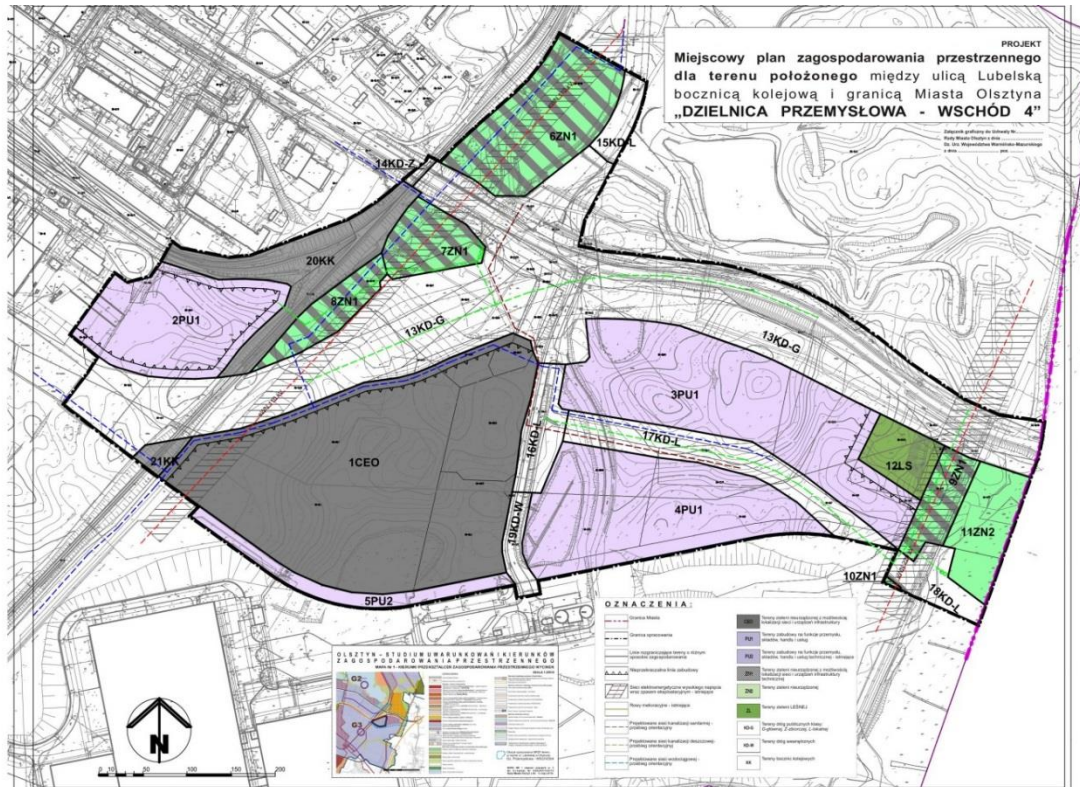


Figure 7. Graphic Appendix to the draft amendment to the Local Land Development Plan

PL	EN
Miejscowy plan zagospodarowania przestrzennego dla terenu położonego między ulicą Lubelską bocznica kolejową i granicą Miasta Olsztyna „DZIELNICA PRZEMYSŁOWA – WSCHÓD 4”	Local Land Development Plan for the area located between ul. Lubelska, the railway siding and the boundary of the City of Olsztyn "INDUSTRIAL DISTRICT - EAST 4"
OZNACZENIA	DESIGNATIONS

In accordance with Article 17 section 1 point 1) b) - the area assumed for location of the planned Investment Project is intended for:

"the waste incineration or co-incineration plant with energy recovery, for the needs of the municipal district heating system, with a possibility of electricity cogeneration"

Pursuant to point 3:

"b) for the permitted purpose, i.e. for the waste incineration or co-incineration plant, it is **ordered to use alternative fuel from the processing of municipal waste** in accordance with arrangements of the Voivodeship Waste Management Plan,

c) for the purpose referred to in letter B, it is allowed to incinerate flammable waste other than municipal and other than hazardous and co-combustion of other fuels, including coal".

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The planned Investment Project will be a plant burning fuel from municipal waste and generating heat in cogeneration with electricity. The Combined Heat and Power Plant may be supplied with the alternative fuel generated at ZGOK, high-energy fraction left over after municipal waste sorting, which is generated at the RIPOKs in the voivodeship or outside the voivodeship as well as other waste, including, for instance, waste left over after composting and screening of the biodegradable fraction and unprocessed municipal waste.

The areas adjacent to MPEC plot cover mainly the areas intended for functions such as industry, storage, trade and services as well as public roads.

4.1. PLACE AND ROLE OF THE WASTE-TO-ENERGY PLANT BURNING MUNICIPAL WASTE IN THE WASTE MANAGEMENT SYSTEM

The current waste management systems, based primarily on waste landfills, are becoming more expensive, are ineffective (recycled materials are wasted) and do not conform to the law of the European Union and Poland.

In accordance with Article 5.2 of Directive 99/31/EC and Article 16a section 4 of the amended Waste Act, that reduction should be performed in three stages, defined as follows:

- by December 31, 2020 – the volume of municipal waste sent to landfills should not exceed 35% (by weight) of the overall mass of biodegradable municipal waste in relation to the mass of that waste generated in 1995.

In accordance with the Ordinance of the Minister of Economy and Labor of September 7, 2005 on the criteria and procedure for the acceptance of waste to be deposited in landfills of the given type (Journal of Laws No. 186, item 1553, as amended), as of January 1, 2013, it became prohibited to deposit municipal waste with thresholds exceeding the following:

- total organic carbon TOC > 5%
- calcination losses > 8%
- gross calorific value > 6 MJ/kg

Following the analysis of the potential for the development of the municipal waste management system in the region, ZGOK and the Waste-to-Energy Plant were proposed as an integral part of the new system. The purpose of ITPFP construction is to achieve a level of biodegradable waste recovery conforming to the requirements of the European Union and fulfill the conditions of modern waste management.

Waste-to-Energy Plants are an indispensable element of modern (conforming to EU and Polish law) systems for the comprehensive management of municipal waste, which are widely used in EU cities (in 15 of them) and which are still rare in the new EU member states. Waste-to-Energy Plants for municipal waste are necessary, particularly in the waste management systems of large Polish cities, so that the individual communes, and, thus, Poland, can fulfill the accepted accession obligations and the statutory requirements regarding, among other things, reduction of biodegradable waste. In order to fulfill the accession obligations and statutory requirements,

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the requirements for projects financed from the Cohesion Fund should be met as soon as possible so that the funds for the construction of waste-to-energy plants for municipal waste in Poland (the so-called Indicative List of the Ministry of Regional Development for large projects) can be used.

In the light of the above, the waste management system should ensure the following hierarchy of waste handling:

- prevention,
- preparation for reuse,
- recycling,
- other recovery methods, e.g., energy recovery,
- neutralization.

Considering the hierarchy of the waste handling methods, it was decided to adopt the following solution for the waste management system of the city of Olsztyn:

1. prevention of waste generation – through ecologic education of the citizens;
2. development of the selective collection of selected types and fractions of waste, including the following:
 - recovery and recycling:
 - material waste, i.e., paper, plastics, metals and glass, will be sent for recovery in waste sorting plants and then for recycling;
 - large waste – to be dismantled and then sent for recovery and/or recycling;
 - green waste and biodegradable waste collected selectively – sent for biological waste processing;
 - hazardous waste – sent to special plants for the treatment of such waste;
 - post-overhaul waste – sent for recovery.
 - waste-to-energy process – only waste left over after selective collection, i.e., selection of the most valuable waste, with the greatest material value, or the so-called problem waste, i.e., for instance, large waste and hazardous waste of the municipal waste stream, will be subject to the waste-to-energy process. That is why it is referred to as the “residual fraction.” Owing to selective collection, the residual fraction of municipal waste will primarily consist of waste with energy value > 6 MJ/kg.

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5. DESCRIPTION OF ANALYZED VARIANTS

At the stage of pre-project activities performed by MPEC in Olsztyn, the Investor considered different variants of the construction of the new plant. These included both technological variants regarding the combustion of fuel from municipal waste (combustion in a grate-fired boiler, combustion in a fluidized bed boiler) and fuel variants (coal, gas, biomass) with respect to the generation of heat for the district heating network of the city. In the end, in relation to the implementation of the objectives set out in the Voivodeship Waste Management Plan, the variant involving the combustion of fuel from municipal waste in grate-fired boiler was selected for further analyses.

The variant requested by the Investor, involving the construction of a new heat source in Olsztyn using the grate technology and equipped with systems reducing gaseous and particulate emission into the air is, at the same time, the most environmentally friendly variant out of the ones analyzed in this Report. That assertion is supported by the following (among other things):

- lower emission of pollution into the air (including CO₂ and landfill gas),
- lower volume of wastewater discharged into external receiving water bodies,
- lower volume of municipal waste deposited on landfills,
- lower volume of hazardous waste deposited on landfills.

The impact of the selected variant on the individual components of the environment will be lower both in comparison to the zero variant and in comparison to the reasonable alternative variant.

Additionally, the following arguments supported the use of a grate-fired boiler burning fuel from waste:

- proven, available technology,
- low sensitivity of grate-fired boilers to fuel parameters,
- lower quantity of hazardous waste, which is difficult to manage, than in the case of fluidized bed boilers.

The impact of the technological variant proposed by the Investor on the environment is described in detail in chapter 13 of the Report.

5.1. VARIANT WITHOUT THE IMPLEMENTATION OF THE INVESTMENT PROJECT

Presently, there are rules in Poland (which are also adopted in European Union states) that define the admissible volume of biodegradable municipal waste that can be deposited on landfills. In accordance with the Ordinance of the Minister of Environment of May 25, 2012 on the levels of reduction of the mass of biodegradable municipal waste handed over to landfills and on the method of calculating the level of reduction of the mass of that waste (Journal of Laws of 2012, item 676), the levels of reduction of the mass of biodegradable municipal waste handed over to landfills in relation to the mass of that waste generated in 1995 are as follows:

- in 2015 – up to 50% of the overall mass of biodegradable waste,

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- in 2017 – up to 45% of the overall mass of biodegradable waste,
- by July 16, 2020 – 35% of the overall mass of biodegradable waste.

Also, the Ordinance of the Minister of Economy of September 7, 2005 on the criteria and procedure for the acceptance of waste to be deposited on landfills of the given type (Journal of Laws of 2005, No. 186, item 1553), has been effective since January 1, 2013. The ordinance limits the possibility of depositing processed and unprocessed municipal waste on landfills.

The purpose of the planned Investment Project is to burn fuel from waste and use it to generate heat for district heating and domestic hot water and to supply the citizens with those utilities. If the planned Investment Project is not implemented in the city, the primary method of handling waste will still be its deposition on landfills, and the deficit of heat in the city system will have to be covered by, for instance, combustion of coal in another source.

Therefore, if the planned Investment Project is not implemented, it will have the following consequences:

- significant risk in scope of the management abilities for the fraction left over after the processing or treatment of mixed municipal waste — the necessity of storage, further treatment, dependency on external recipients of high-energy fraction (pricing dictate of the producers of alternative fuels and cement plants) and the necessity to cover the fees for waste transport from MBP plant to the external plants and cement plants,
- the necessity to generate heat for the purpose of the city by another source,
- lack of the optimum and reliable manner of management of combustible fraction of municipal waste, not suitable to be landfilled, within the voivodeship,
- preventing meeting the objectives specified in Voivodeship Waste Management Plan (WPGO) and Waste Management Plan (PGO) for the city of Olsztyn,
- preventing meeting the objectives specified for Poland by the EU in scope of reduction of the volume of landfilled biodegradable waste.

Presently, there is a network of Regional Municipal Waste Processing Systems (the so-called RIPOKs) in Warmińsko-Mazurskie Voivodeship:

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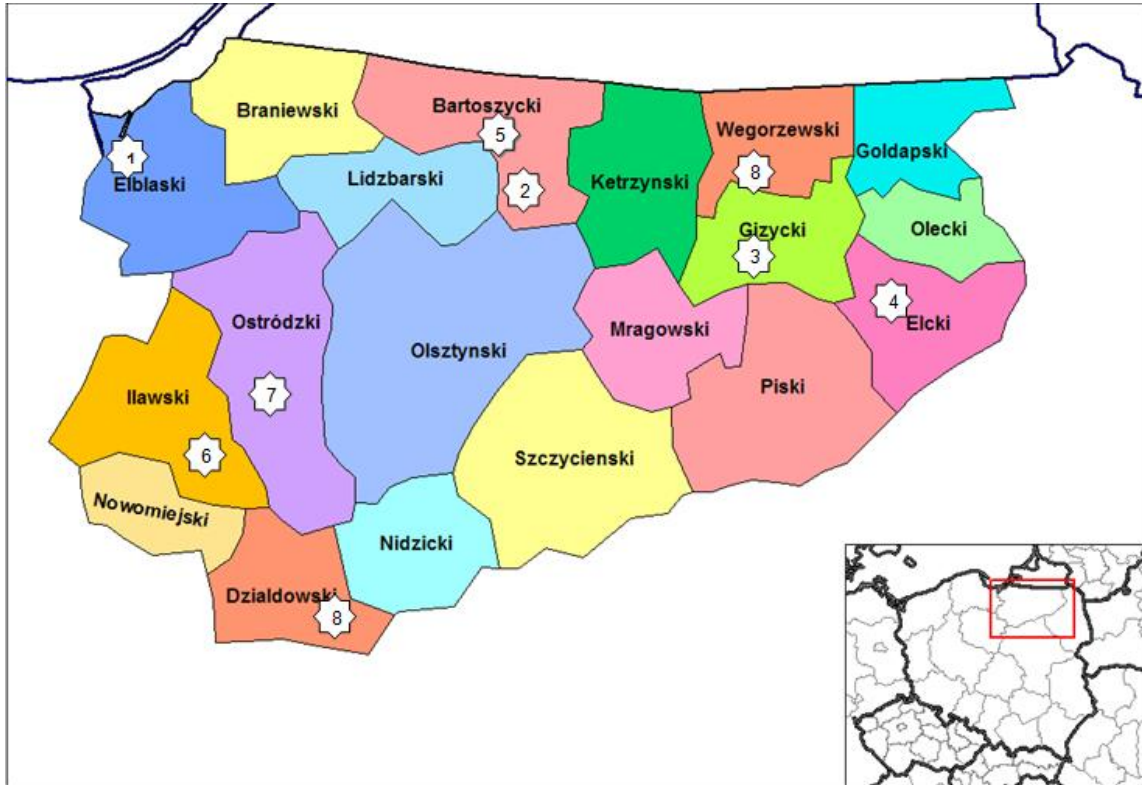


Figure 8. Map of Regional Municipal Waste Processing Systems (the so-called RIPOKs) in Warmińsko-Mazurskie Voivodeship.

1. Northern Region – Zakład Utylizacji Odpadów Sp. z o.o. in Elbląg

- Plant for the mechanical and biological processing of mixed municipal waste (MBP).
- Plant for the storage of waste generated during the mechanical and biological processing of mixed municipal waste and remains left over after sorting of municipal waste – landfill.

2. North-Eastern Region – Międzygminny Zakład Kompleksowego Przerobu Odpadów Komunalnych Sp. z o.o. Sękity

- Plant for the mechanical and biological processing of mixed municipal waste (MBP).

3. North-Eastern Region – Zakład Usług Komunalnych Sp. z o.o. in Giżycko

- Plant for the mechanical and biological processing of mixed municipal waste (MBP).
- Plant for the storage of waste generated during the mechanical and biological processing of mixed municipal waste and remains left over after sorting of municipal waste – landfill.

4. Eastern Region – Przedsiębiorstwo Gospodarki Odpadami “Eko-Mazury” in Elk

- Plant for the mechanical and biological processing of mixed municipal waste (MBP).
- Plant for the storage of waste generated during the mechanical and biological processing of mixed municipal waste and remains left over after sorting of municipal waste – landfill.

5. Central Region – ZGO Sp. z o.o. in Bartoszyce

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- Plant for the storage of waste generated during the mechanical and biological processing of mixed municipal waste and remains left over after sorting of municipal waste – landfill.

6. Western Region – ZUK “USKOM” Sp. z o.o. in Mława

- Plant for the storage of waste generated during the mechanical and biological processing of mixed municipal waste and remains left over after sorting of municipal waste – landfill.

7. Western Region – Związek Gmin Regionu Ostródzko-Iławskiego “Czyste Środowisko” in Ostróda

- Plant for the mechanical and biological processing of mixed municipal waste (MBP).
- Plant for the storage of waste generated during the mechanical and biological processing of mixed municipal waste and remains left over after sorting of municipal waste – landfill.

8. Western Region – EZG Działdowszczyzna in Działdowo

- Plant for the mechanical and biological processing of mixed municipal waste (MBP).

The primary purpose of the RIPOKs is to:

- achieve high levels of recycling of certain fractions of the generated waste;
- recirculation of biowaste deposited on landfills by professional waste processing.

In Warmińsko-Mazurskie Voivodeship, there are 6 operating plants for the mechanical and biological processing of municipal waste (MBPs). The MBP process consists of the following: mechanical and biological processes combined into a single, integrated technological process of the processing of mixed waste in order to prepare the waste for recovery, including recycling, energy recovery, waste-to-energy process or storage. Municipal waste transported to RIPOKs is subjected to mechanical processing in accordance with the requirements specified in paragraph 3 of the Ordinance of the Minister of Environment of September 11, 2012 (Journal of Laws of 2012, item 1052) on mechanical and biological processing of mixed municipal waste. After separation of fractions suitable for use as materials and of fraction requiring further biological processing, the fraction suitable for energy generation is left. The product thus created is the fuel from municipal waste. If ITPFP is not constructed in Olsztyn, there will be a problem with the management of approx. 50 thousand tons of fuel from municipal waste per year due to the prohibition of the deposition of such waste effective as of 2016. Also, a plant for the biological processing of waste will be constructed at ZGOK in Olsztyn. The plant will use the processes of the biological drying of municipal waste. The technology applied shall be compliant with the requirements of paragraph 4, section 4 of the Ordinance of the Minister of Environment of September 11, 2012 (Journal of Laws of 2012, item 1052) concerning mechanical and biological processing of mixed municipal waste. The waste generated in the process of biological drying shall subsequently undergo further mechanical processing in accordance with paragraph 5 and 6 of the Ordinance.

Deposition of waste on landfills is a hazard to the environment, e.g., due to the generation of landfill gas - methane. The GWP (Global Warming Potential) index specifies the impact of the individual compounds on the greenhouse effect; for methane, it is 23 times higher than for CO₂. The higher value of the GWP index for methane is due to the stronger absorption of infrared radiation and also because the products of CH₄

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decomposition in the troposphere, due to the reaction with the hydroxyl radicals, also produce greenhouse gases. The annual global emission of methane from all sources is approximately 500–600 Tg, 200 Tg of which is generated by natural sources (Grubler, 1998). The three largest sources of anthropogenic methane emission are animal husbandry (85 Tg), rice farming (60 Tg) and **waste landfills (from 40 to 60 Tg)** (Lelieveld et al., 1998). Methane is explosive - the lower explosive limit is 5%, and the upper explosive limit is 15% (Rosik-Dulewska, 2008). One ton of municipal waste generates approximately 230 m³ of landfill gas in 20 years on average, i.e., approximately 11.5 m³ per year. Therefore, it can be estimated that out of 110 thousand tons of waste not used at ITPFP and deposited on landfills, 1,265,000 tons of landfill gas would be generated per year. The typical composition of landfill gas from a correctly created and operated deposit is as follows

- 45–58% methane,
- 32–45% carbon dioxide,
- 0–5% nitrogen,
- > 1–2% hydrogen,
- % oxygen and trace amounts of other compounds, e.g., hydrogen chloride, higher hydrocarbons, alkaline compounds, hydrogen sulfide (10–200 ppm), ammonia, carbon monoxide and other [Toward a Renewable Power Supply: The Use of Bio-based Fuels in Stationary Fuel Cells. Northeast Regional Biomass Program. Washington DC, USA, 2001].

If the planned Investment Project is not implemented, the legal requirements concerning the reduction of biodegradable components deposited on landfills will not be met, and the recommendations included in National Waste Management Plan 2014 regarding the recycling and recovery of packaging and post-consumer waste in the selective collection system will not be fulfilled.

Furthermore, abandoning the implementation of the planned Investment Project may result in:

- reduction of the amount of natural fossil fuel resources – use of those resources to generate heat for the city of Olsztyn,
- resultant increased air pollution in the city and near it in comparison to the pollution caused by the combustion of fuel from municipal waste,
- atmospheric air pollution caused by the transport of fossil fuels into the Combined Heat and Power Plant,
- development of unauthorized dumping sites,
- combustion of waste in household hearths, which contributes to the reduced quality of air, groundwater and surface water, destruction of forest resources and – in the long-term – negative impact on the individual components of the environment and on human health.

As mentioned before, if the planned Investment Project is not implemented, it will be necessary to generate heat for the municipal district heating system in Olsztyn in another source, e.g., a new coal-fired boiler house with a similar capacity.

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Variant of the alternative waste management method – Waste combustion at cement plants

If the Investment Project is not implemented, it will be necessary to otherwise manage the waste generated in Warmińsko-Mazurskie Voivodeship that would be burned in the grate-fired boiler with generation of heat and electricity. One of the methods used to manage waste is the combustion of waste at cement plants.

Cement batching methods can be divided into dry methods and wet methods, depending on the method of fuel preparation. In dry methods, the dry material is milled in ball mills or bowl mills. The prepared material is stored in silos. In the wet method, the dry material is milled in mills for the so-called wet milling. The raw material thus prepared is stored in the form of sludge in storage basins. The wet method involves the generation of a large amount of steam due to the evaporation of water from the sludge during the combustion process.

Waste combustion in cement kilns is a fairly common method. Cement kilns are suitable for the combustion of municipal and industrial waste due to the high temperature reached by the burned materials (approximately 1350–1450°C) and the minimum period of 10 seconds during which the materials are kept under that temperature. During combustion, chlorine and heavy metals released from waste are bound. The advantage of that method of waste management is the fact that no ash is created during combustion in a cement kiln. Combustion at 2000°C does not lead to the creation of dioxins, furans and aromatic hydrocarbons. However, not all waste can be burned. It is necessary to achieve temperatures reaching 2000°C to receive cement and clinker of a suitable quality. The parameters of the waste burned in the kilns must be monitored so that the process products generated during co-firing meet all standards.

Clinker is fired in rotary cement kilns, consisting primarily of tube kilns with rotating drums. The fuel supplied for the process is burned in the lower part of the equipment. The kiln is inclined at a specific angle, and the generated flue gas heats the material flowing down the incline. The kilns may be equipped with calciners, where a part of the fuel is burned just upstream of a heat exchanger. The flue gas is mixed with process gasses and emitted into the atmosphere.

Cement kilns emit CO₂, NO_x, SO₂, steam and other substances depending on the composition of the burnt material. Dust emission is reduced using electrostatic precipitators or bag filters. The disadvantage of that method of waste management, in addition to the emission of gaseous pollutants, is the probability of exhausting the waste combustion capacity of the cement plants. Such fuel must have a high net calorific value – exceeding 12 MJ/kg – which is difficult to achieve without separating the high-energy fraction from the waste. Fuel from waste is only a part of the batch in the kiln, and it must have specific parameters so that it does not have a negative effect on the properties of the process product, which may prevent the management of the entire required waste stream.

Variant of the alternative method of generating heat for the city – Heat generation at a heat generating plant

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If the Investment Project is implemented, the heat for the city would have to be generated in another source, e.g., a heat generating plant with a capacity similar to the capacity of ITPFP equipped with a water boiler. Currently, the fuel primarily used to generate heat is coal (76.6%), followed by gaseous fuels (7.9%), renewable energy sources (6.9%), other fuels (4.6%) and fuel oil (4%) (data provided by URE). Consequently, it can be assumed that a heat generating plant with a capacity similar to that of ITPFP being a heat source for Olsztyn would be fired with coal. It should be noted that the emission standards for facilities burning fuels other than waste with a fuel input capacity of 1–50 MW will become more stringent in accordance with the draft of the Directive of the European Parliament and of the Council on the limitation of emissions of certain pollutants into the air from medium combustion plants (MCP Directive). Those standards should be considered when the new sources are designed. In accordance with the MCP Directive, in all areas where the admissible air quality standards are exceeded, it will be necessary to observe the stricter emission standards for medium heat sources. Those standards are much more stringent. In such a situation, it will be necessary to use a denitrification plant, desulfurization plant and a dedusting system for the generated flue gas. The primary waste generated from coal combustion in grate-fired boilers is slag and fly ash, which are not hazardous waste. Slag as non-hazardous waste is collected by specialist companies for further management. Due to the ongoing changes of the legal conditions for sources with a fuel input capacity of 1–50 MW combusting fuel other than waste, the project of that type may be difficult until the new requirements are clearly specified regarding the standards for the emission of gaseous and particulate pollutants.

5.2. LOCATION VARIANTS

The selection of location for the planned Investment Project is always a complex process, including a number of local factors (e.g. availability of fuel, water, fuel transport, waste transport, availability of energy consumers, etc.). The optimum location of the waste to energy plant shall meet the following conditions:

- consistency with the Local Land Development Plans and other development plans of the city;
- lack of environmentally valuable areas, protected areas, archaeologically and architecturally protected facilities in the vicinity;
- convenient hydrological and geotechnical conditions of subsoil;
- suitable area of the plot, enabling foundation of facilities being a part of the plant and its future extension;
- suitable distance from residential development, guaranteeing minimizing the social disputes;
- lack of necessity of covering the costs of environmental compensations or their minimum amount;
- convenient and effective communication network guaranteeing easy access and lack of disputes in this regard;
- enabling direct access to the power grid and district heating network stations;
- possibility of ensuring demand for the generated heat and electricity.

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In the initial phase of project implementation, involving the construction of the Combined Heat and Power Plant in Olsztyn in order to ensure the necessary heat supply into the municipal district heating system in Olsztyn due to the breakdown of the current heat supply system, the potential locations of the investment projects were analyzed.

The analysis was performed as part of the "Preliminary Feasibility Study for the Construction of the Combined Heat and Power Plant in Olsztyn".

The following locations were considered within this work:

1. "Hałda popiołów" – plot in the area of ul. Kołobrzaska at Michelin Polska S.A.;
2. In the area of Michelin CHPP (the so-called water part of Michelin);
3. The plot between Sprzętowa and Towarowa streets;
4. "Lubelska" - the area of Warmia-Mazury Special Economic Zone (WMSSE) at ul. Lubelska;
5. "Na Tracku" – plot No. 18/1, cadastral district No. 148, in the area of the Track Lake;
6. Kortowo Heat Generating Plant.

The following locations were rejected in the initial phase of the works:

1. Kortowo Heat Generating Plant – the location was inconvenient for the new heat source; it would require a thorough alteration of the mains networks in the center of Olsztyn, generating high and unforeseeable costs and time required to make the arrangements concerning the land.
2. Plot between ul. Sprzętowa and ul. Towarowa – the land could not be quickly obtained – it is leased by Michelin Polska S.A. from the Municipality of Olsztyn.
3. "The water part" of Michelin CHPP — due to the negative position of Michelin Polska S.A. concerning the possibility to handover or transfer the part of land. Moreover, the construction of the new source is not possible without a significant interference in the Michelin CHPP infrastructure (coal handling systems, buried utilities, above-ground networks).

An analysis of advantages and disadvantages was performed for the remaining locations:

"Hałda popiołów" on Michelin land

The so-called "Hałda popiołów" on the land of Michelin Polska S.A. includes parts of plot No. 30, cadastral district No. 81, and plot No. 31, cadastral district 80.

– *Advantages of locating the Investment Project on that site:*

1. Conveniently located plot, in the vicinity of the following infrastructure:
 - district heating network (immediate vicinity of the district heating main),
 - power network (it would be necessary to erect a power line, most likely to Olsztyn1 switching station – approx. 5 km – or use the Michelin substation),

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- gas network (it would be necessary to construct a gas pipeline with a length of approx. 3.5 km and a metering station),
- railway line;
- 2. Close vicinity of a potential large consumer – Michelin Polska S.A.
 - *Disadvantages of locating the Investment Project on that site:*
 1. Relatively inaccessible land (4 ha), without access to a hard-paved road;
 2. Changing position of the land owner regarding the method and scope of site handover – it would be necessary to conduct laborious negotiations;
 3. High and uncertain costs of site preparation (PLN 15 million) and environmental rehabilitation;
 4. There is no land development plan – the period required to prepare the plan may be long (high complexity);
 5. It would be necessary to consult the shared use of road infrastructure with Michelin Polska S.A.

“Na Tracku” area

The “Na Tracku” area includes plot No. 18/1, cadastral district No. 148.

- *Advantages of locating the Investment Project on that site:*
 1. Readily available site (15 ha possessed by the City);
 2. Vicinity of the “Waste Treatment Plant (ZUO) construction” project;
 3. Relatively small distance to the Olsztyn1 substation (approx. 2500 m).
- *Disadvantages of locating the Investment Project on that site:*
 1. There is no technical infrastructure on or near the plot (there is only a railway line nearby);
 2. There are no hard-paved access roads – it would be necessary to use the road to be constructed as part of the ZUO project;
 3. At the current stage, it is impossible to determine the principles for the shared use of the road to be constructed as part of the ZUO project;
 4. It would be necessary to amend the local land development plan so that it permits the construction of the combined heat and power plant;
 5. Large distance from the district heating mains – approx. 1–2 km – requiring considerable outlays on the construction of the network and costs of network losses;
 6. Availability of the site depends on the ZUO design arrangements.

“Lubelska” in the area of Warmia-Mazury Special Economic Zone (WMSSE)

The so-called “Lubelska” area on land of the Warmia-Mazury Special Economic Zone (WMSSE) includes plots in cadastral district No. 89, “Industrial Quarter – East 3” area.

- *Advantages of locating the Investment Project on that site:*
 1. An area of approx. 4–8 ha or more is available, and the terms under which it can be purchased are flexible;
 2. Conveniently located plot, in the vicinity of the following infrastructure:

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- district heating network,
 - power network (it is possible to make a direct connection into the 110 kV line on the plot or connect to the Olsztyn1 substation – 3.4 km),
 - gas network (it would be necessary to construct a gas pipeline with a length of approx. 1 km and a metering station),
 - railway line,
 - verified possibility of supply from the water mains and reception of wastewater,
 - road access within the boundaries of the plot;
3. The local land development plan can be quickly amended (the procedure is ongoing);
 4. The location does not prevent heat supply (including the supply of process heat) to Michelin Polska S.A.
 - *Disadvantages of locating the Investment Project on that site:*
 1. High purchase cost;
 2. Varying soil conditions – it will be necessary to move relatively large amounts of earth;
 3. Protracting arrangements with the GDDKiA;
 4. The existing infrastructure reduces the available footprint area by approx. 3120 m²;
 5. It will be necessary to alter approx. 2.5 km of existing mains networks.

Summary

The comparison of the disadvantages, advantages and availability of the individual locations performed as part of the "Preliminary Feasibility Study for the Construction of the Combined Heat and Power Plant in Olsztyn" led to the conclusion that the most advantageous place for the location of the new Combined Heat and Power Plant is the location at Lubelska street.

The location of the Investment Project discussed in this Report was covered by the Local Land Development Plan passed with Resolution No. LVII/763/06 of the City Council of Olsztyn of February 22, 2006. Major part of the area was intended for industrial, storage and service development (2PS in the Local Land Development Plan), while the north part, at the boundary of the plot - for technical infrastructure areas. The area of the land to be used for the planned Investment Project is approximately 8 hectares. The entire site is currently undeveloped. The site is currently covered by grass with a very high amount of weeds. The site currently resembles a fallow. Grassland is present on a limited area. Such area was designated as class IV pasture. Small part of the Investment Project area forms class V meadows. They are present on waterlogged areas. Edges of a water hole are densely covered with gray willow vegetation.

Based on the applicable Study of Conditions and Directions of Spatial Development of the commune – Resolution No. LIII/866/14 of the City Council of Olsztyn of May 28, 2014, amendment of the "Local land

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development plan for the area located between the railway siding, ul. Lubelska and the boundary of the City of Olsztyn," referred to as "Industrial Quarter – East 3 in Olsztyn." In the general findings of the plan, the areas referred to as CEO are ***"areas for buildings and equipment used for district heating, power generation and waste management purposes"***:

The amendment of the Study was accompanied by the *"Forecast of the environmental impact for the amendment to the Study of Conditions and Directions of Spatial Development of the City of Olsztyn in order to enable the construction of a combined heat and power plant using renewable energy sources, located in the retail and economic area – G3."*

The purpose of the forecast was to determine the environmental impact of the construction of a combined heat and power plant using (among other fuels) renewable energy sources and present solutions to eliminate the negative consequences of those findings on the individual components of the environment. The forecast contains the following:

- assessment of the environmental conditions and values of the discussed area;
- description of the impact of the current method of land use on the environment;
- hazard to the environment caused by the implementation of the objectives of the amendment to the Study;
- methods of minimizing the negative impact on the environment;
- assessment of the expected significant impacts on the environment caused by the amendment to the Study.

The area to be used for the planned Investment Project is located in the eastern part of Olsztyn, to the south of ul. Lubelska. This site is limited by the railway tracks from the west, access road to the Logistics Center of Michelin Polska from the east, Logistics Center of Michelin Polska from the south and area intended for Olsztyn bypass (marked on the local land development plan with the symbol KG50 (2x2)) from the north. The site location is depicted in the following drawing (marked with the red line).

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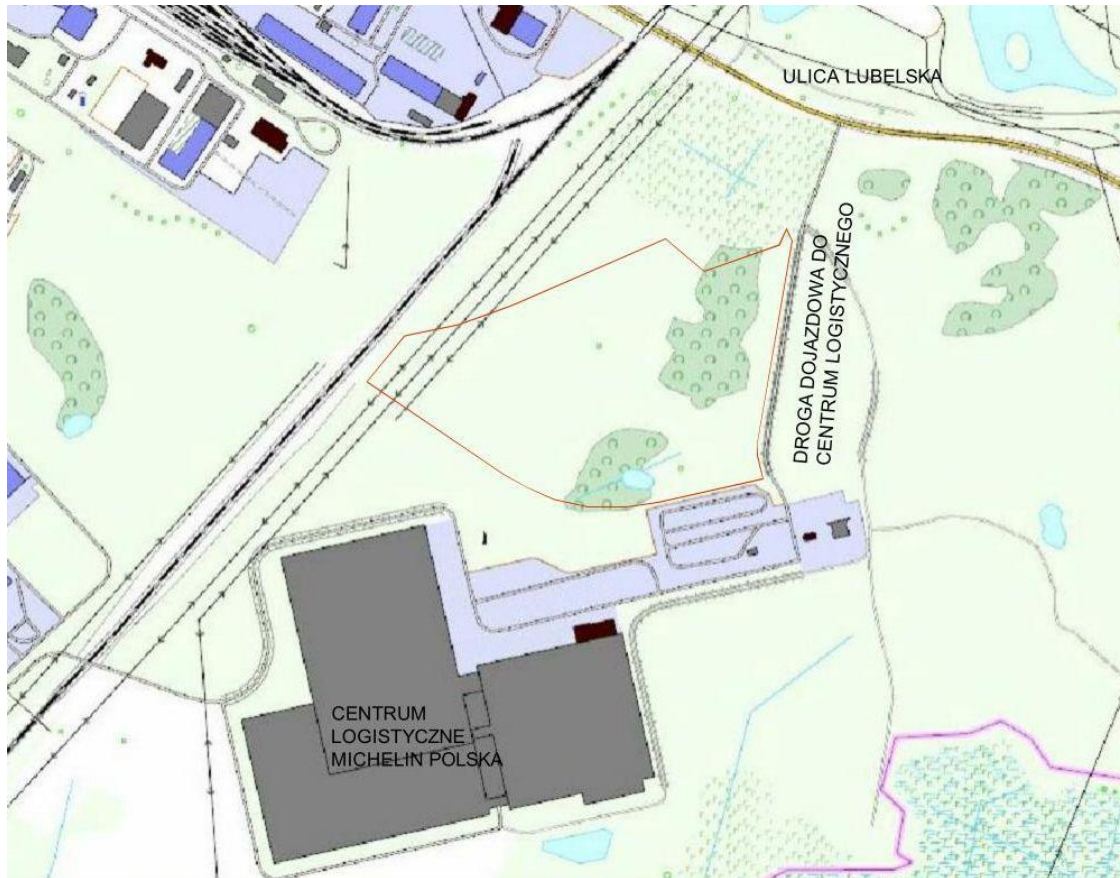


Figure 9. Location of the area intended for construction of ITPFP.

PL	EN
Droga dojazdowa do centrum logistycznego	Access road to the logistics center
Centrum logistyczne MICHELIN POLSKA	Logistics center of MICHELIN POLSKA
ULICA LUBELSKA	UL. LUBELSKA

The following plots are to be used for the planned Investment Project: 89-25/1, 89-25/3, 89-25/2, 94-6/1, 94-6/2 and 94-6/3 (marked in red in the drawing below).

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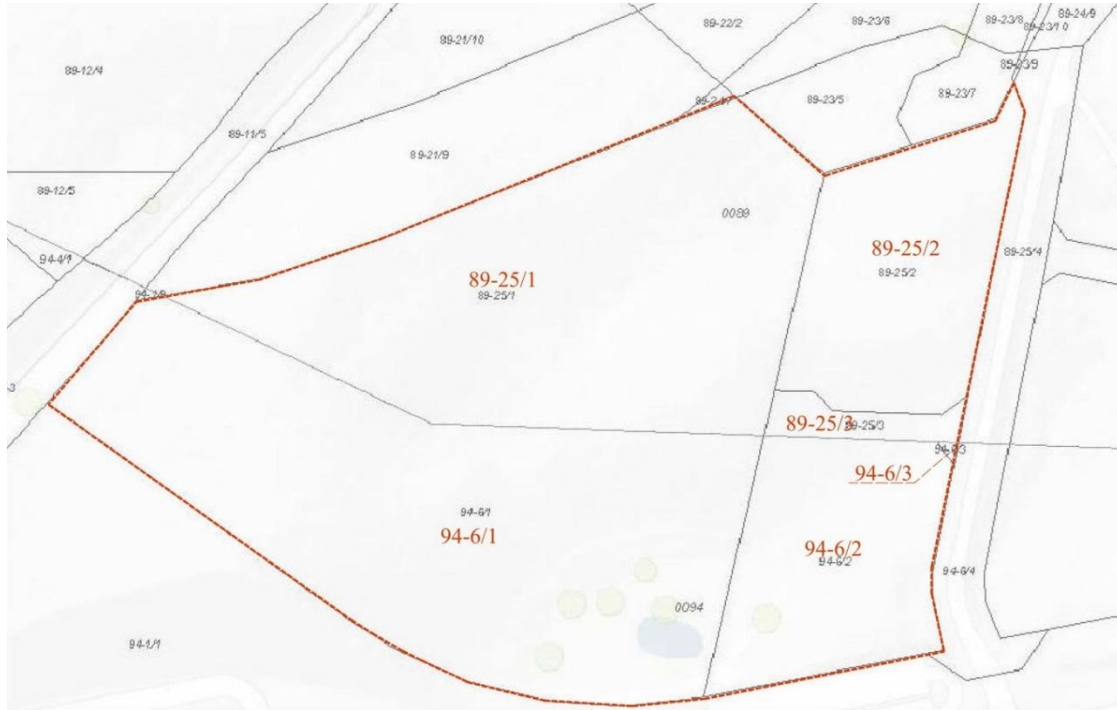


Figure 10. The site intended for the planned Investment Project divided into plots.

From plots No. 89-25/1 and 89-25/2, plots No. 89-25/10 and 89-25/12 were separated with the total surface area of 0.0779 ha. These plots were separated in order to take them over under the law by the State Treasury for the task of "Construction of Olsztyn bypass in the section of national road No. 16" The surface area of separated plot No. 89-25/10 amounts to 0.0630 ha, while the surface area of separated plot No. 89-25/12 is 0.0149 ha.

The analysis of the potential impact of the Planned Investment project on the environment included in the Forecast demonstrated that the construction and operation of the combined heat and power plant fired with fuel from municipal waste would not have a permanent negative effect on the environment. Local negative impacts during the construction stage will be unavoidable.

5.3. PROCESS VARIANTS

This chapter contains a description of the RotoSteril technology, pyrolysis, gasification, plasma waste treatment and waste-to-energy process in a fluidized bed boiler.

Currently, the most common method of thermal waste treatment is the combustion of waste in grate-fired boiler plants. In accordance with the BREF document, over 90% of plants designed for the treatment of municipal waste use grate-fired boilers. That technology is the most well-known and mature technology, and it enables the

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management of all types of municipal waste. Other methods of thermal waste treatment include combustion in a fluidized bed boiler (widely used), gasification, pyrolysis, plasma or sterilization in an autoclave (RotoSteril).

Table 3. Summary of the currently used thermal treatment techniques for the main types of waste in dedicated combustion plants.

Technique	Untreated municipal waste	Pre-treated MSW and RDF
Grate – reciprocating	Widely applied	Widely applied
Grate – traveling	Applied	Applied
Grate – rocking	Applied	Applied
Grate – roller	Applied	Widely applied
Grate – water-cooled	Applied	Applied
Grate plus rotary kiln	Applied	Not normally applied
Rotary kiln	Not normally applied	Applied
Rotary kiln – water-cooled	Not normally applied	Applied
Static hearth	Not normally applied	Not normally applied
Static furnace	Not normally applied	Not normally applied
Fluidized bed – bubbling	Rarely applied	Applied
Fluidized bed – circulating	Rarely applied	Applied
Fluidized bed – rotating	Applied	Applied
Pyrolysis	Rarely applied	Rarely applied
Gasification	Rarely applied	Rarely applied
The table only considers the use of the described technologies in dedicated plants. It does not include detailed considerations of the situations where more than one waste type is treated.		

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Source: BREF

Waste sterilization in an autoclave

The alternative solution of the waste treatment problem is the technology of waste sterilization in an autoclave. The technology involves subjecting the waste to the action of steam in the autoclave after its mechanical pre-treatment consisting of the removal of large-sized waste, shredding and homogenization. The steam for the process is generated by a steam generator equipped with a gas-fired boiler. The steam has a temperature of 120–160°C and pressure of 5–7 bar. Organic substances are defibred. Also, the steam removes the mineral fraction and enables full hygienization. The process is conducted periodically, which means that the empty chamber is filled with waste, the waste is heat-treated, and the autoclave is emptied. The cycle is repeated multiple times. After the process, the volume of waste is reduced by approximately 60% and its mass is reduced by 15%. The material produced in the autoclave is sent to the separation line, where reusable waste is separated. Magnetic separators are used to separate ferrous and non-ferrous metals from the product stream, mechanical/pneumatic screens and parallel flow separators are used to separate the pre-RDF fraction and optical sorters separate plastics and glass. The separated biodegradable fraction is sterile and uncontaminated with other fractions.

Fractional composition of the product:

- biomass – approximately 30% – main product. It may be used to improve soil properties or burned as alternative fuel owing to the high energy value.
- metals – approx. 9% – half of the metal fraction consists of ferrous metals, and the other half – of non-ferrous metals. The metals are suitable for recycling,
- plastics – approximately 15% – PET, PP, PE + PS fractions are separated – they may be used as material or energy source,
- glass – approximately 23% – the recovered glass in the form of cullet is suitable for recycling,
- pre-RDF – approximately 23% – that fraction is the raw material used to generate alternative fuel; it may be recovered in the form of energy.

Process components of the system:

- sterilizing equipment – autoclave,
- steam boiler providing steam for the sterilizers,
- loading dosing station,
- loading feeder,
- receiving feeder,
- transport feeders,

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- screening system,
- magnetic separator,
- optical sorters,
- mechanical/pneumatic screens,
- parallel flow separators,
- scales.

The steam generator system should be equipped with a water treatment plant in order to treat and prepare the water supplied to the boiler equipment and to maintain relevant operating parameters of the equipment during generation of process steam. The water treatment plant should have its own neutralizer for the effluent produced during water demineralization.

The recovered biomass may be used at a combined heat and power plant with an electric power output of 10 MW and thermal power output of 20 MW.

Waste pyrolysis

Pyrolysis is the process of decomposition of organic substances containing carbon. That process is endothermic, and it occurs in the absence of oxygen at elevated temperatures. Pyrolysis is conducted in reactors that can be divided into shaft reactors, fluidized bed reactors, rotary kilns, pusher-type furnaces and other. Both the composition and the quantity of the products created during pyrolysis depends primarily on waste composition, process temperature and time in the pyrolytic reactor. Products can be divided as follows:

- gaseous products – pyrolytic gas. It consists of steam, hydrogen, methane, ethane, higher aliphatic hydrocarbons, CO, CO₂, H₂S, NH₃, HCl, HF and HCN;
- solid products – pyrolytic coke, dust containing heavy metals;
- liquid products – condensate being a mixture of oils, tar and organic ingredients.

Pyrolysis can be used to:

- neutralize waste with direct combustion of the generated pyrolytic gas, producing ash, slag or pyrolytic coke;
- generate fuel gas and solid or liquid fuel;
- separate chemical compounds from the waste that can be used further.

The process generates virtually no flue gas to be treated, or the amount of the generated flue gas is very small. The pollutant that should be removed from the flue as is NO_x, which is produced during the combustion of the pyrolytic gas. Solid waste does not contain many valuable fractions that can be recovered (approx. 3% of metals). The volume of solid waste with low-quality that requires further treatment is high. There are also liquid

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remains (40–60% water, 15% oils and tar), which have to be managed as well. The process requires the supply of heat, and the energy recovery rate is approximately 70%. The pyrolysis technology is still in the testing stage, which creates the risk of high failure frequency.

Advantages:

- possibility of recovering ferrous and non-ferrous metals,
- absence or low volume of flue gas,
- safe working conditions.

Disadvantages

- the technology is still being tested. There are no plants of such type that have been in operation for long,
- risk of high failure frequency,
- small experience regarding the management of high waste volumes,
- large volume of generated solid waste, which include (among other waste) pyrolytic coke that has to be neutralized,
- many liquid remains are produced, and – due to their composition – those remains have to be managed,
- the process requires the supply of process energy,
- the process may generate odors.

Waste gasification

Gasification is the high-temperature decomposition of substances containing carbon. The generated gas consists primarily of CO, CO₂, H₂, CH₄, N₂, H₂O. Gasification differs from pyrolysis with the presence of a certain amount of oxygen and steam during the process. During gasification, carbon reacts with oxygen and steam, producing carbon dioxide and hydrogen. There are also secondary reactions between carbon monoxide and steam.

Advantages:

- low flue gas volume,
- the process produces slag that can be recovered,
- possibility of recovering ferrous and non-ferrous metals,
- safe working conditions,
- the volume of generated wastewater can be limited if dry or semi-dry flue gas treatment is used.

Disadvantages:

- the technology is still at the pilot stage,
- small experience regarding the management of high waste volumes,
- the generated gas contains trace amounts of tar and carcinogenic and toxic particles,

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- the process requires the delivery of energy,
- the process may generate odors.

Plasma processing methods

Plasma is a mixture of electrons, ions and neutral particles. Plasma is an ionized gas that conducts electricity. Plasma processes are conducted at very high temperatures (5000°C to 15000°C). Thermal plasma may be generated using the following methods:

- passing of direct or alternating current through gas placed between electrodes;
- use of a magnetic field with suitable frequencies without the use of electrodes,
- use of microwaves.

Plasma processing methods can neutralize harmful substances in the thermal treatment process without the need to use flue gas treatment systems. That process produces vitrified material that does not require further processing. Plasma processing methods are still being tested.

Advantages:

- it is not necessary to use complex flue gas treatment systems,
- the process produces vitrified material,

Disadvantages:

- the technology is still at the pilot stage,
- small experience regarding the management of high waste volumes,
- it requires the supply of a large amount of energy.

Oxygen gasification, pyrolysis, plasma processing methods and sterilization in an autoclave are technologies that are rarely applied to manage waste. Gasification, pyrolysis and plasma processing methods are modern, relatively expensive and still developing technologies, as a result of which they have not yet achieved satisfactory reliability. Currently, there are not many plants using those technologies in the world. The absence of proven solutions and experience in this regard results in the high failure frequency of the plants. Due to the complex technological process and ecological problems, systems using pyrolysis, gasification and plasma processing are not widely used. The waste sterilization technology is also not widely used at the moment. The most common solution is Europe are grate incinerators. The second most commonly used method of thermal waste disposal is waste combustion in fluidized bed boilers. Due to the above arguments, the technology of the waste-to-energy process in a fluidized bed boiler was selected as the reasonable alternative variant.

Waste-to-energy process in a CFB boiler

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The Feasibility Study included an analysis of the circulating fluidized bed (CFB) boiler designed to burn 110 thousand tons of fuel per year. Fluidized bed boilers require uniform fuel in terms of composition and size, making it necessary to construct a fuel preparation plant. The fuel for the fluidized bed boilers must be devoid of aluminum, which increases the risk of corrosion and may lead to bed agglomeration. The following fuel parameters are significant for a fluidized bed boiler:

- suitable fineness (at least 90% passing through a screen with 90x90 mm square mesh),
- low glass content (< 3% d.m.),
- low aluminum content (< 0.5% d.m.),
- low content of ferromagnetic metals (< 1% d.m.),
- low chlorine content (< 1%).

Such parameters can be obtained by using an additional plant in the form of a fuel separation and preparation unit. The fuel preparation unit consists of the following components:

- unloading node,
- shredder (80x100 mm mesh),
- electromagnetic separator – separation of ferrous metals,
- screen, e.g., Ø15 grizzly screen – separation of the fine mineral fraction,
- eddy current separator – separation of non-ferrous metals,
- aerodynamic separator – separator of the heavy fraction.

The advantage of fluidized bed boilers, in turn, is the fact that they can achieve higher steam parameters, and they can be quickly shut down and started. The boilers operate in such a temperature range that the generation of thermal NO_x compounds is virtually non-existent, and multi-stage combustion enables the reduction of the amount of NO_x generated from the nitrogen contained in the fuel. The denitrification plant ensures further NO_x reduction. During combustion in a fluidized bed boiler, a large portion of the heat exchange process takes place in the fluidized layer (bed), consisting of the inert mass (ash, sand, fuel), air and flue gas. That layer is kept in the fluidized condition by air supplied through nozzles located at the bottom of the furnace chamber. Bed fluidization occurs only in a specific air flow rate range. In the fluidized bed boiler, a part of the inert material (ash, sand) with fuel particles is lifted from the bed and leaves the boiler with the flue gas. The flue gas is sent into cyclones, where ash is separated and returned through a loop seal to the bottom of the bed. Such a solution enables two-stage combustion – the return of the particles guarantees that the substance is thoroughly burnt. Due to the circulating motion of the particles, that combustion technology is referred to as the circulating bed (CFB – circulating fluidized bed). The mixing of air, fuel and sand creates very good conditions for complete combustion. The hot bed accumulates a large amount of heat, ensuring uniform combustion temperature, also during instantaneous fluctuations of humidity or net calorific value of fuel. Heat exchange in the bed is much more intense than in the conventional solutions, which enables the reduction of the heating surfaces and, consequently, reduction of boiler size. Pollutants such as SO_x generated during combustion may be removed

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directly in the bed by adding lime to the bed or in the flue gas desulfurization plant. The fuel to be burned may be fed above the bed or below the bed by a screw conveyor. In order to use the screw conveyor, fuel has to be suitably prepared. If fuel particles are too large or if fuel contains rocks and stones, it could damage the conveyor. The uniform temperature distribution in the bed enables thorough combustion of fuel and low content of flammable fractions in the ash. The low combustion temperature and continuous movement of the bed considerably increase the share of fly ash in the total amount of ash and slag in comparison to grate-fired boilers. The content of heavy metals in the ash from the fluidized bed, in turn, is smaller. This is due to the distribution of the total amount of metals in a greater amount of ash. Ash with a high content of heavy metals is hazardous waste, which makes it more expensive to manage.

The operating experience indicates that fluidized bed boilers are highly sensitive to the presence of aluminum. Melted aluminum may cause agglomeration or vitrification. When aluminum reacts with chlorine, it forms aluminum chloride with a melting temperature of 450°C. That substance may settle on surfaces such as primary and secondary air nozzles, disturbing their operation.

Fluidized bed boilers require the installation of an inert material tank. It is used during the start-up of the system and, potentially, to make up minor shortages of the inert material during the process. If the fuel has a high ballast content, making-up is not necessary. Sand is discharged from the boiler together with ash through the bottom of the bed.

Removal of acid gas ingredients in the fluidized bed boiler

The acid ingredients of the flue gas from the fluidized bed boiler may be reduced by introducing limestone into the bed.

NO_x removal

The measures used to reduce NO_x emission can be divided into the two main groups of measures:

- primary measures – designed to control the amount of nitrogen oxides and/or reduce the amount of nitrogen oxides generated in the combustion process,
- secondary measures – designed to remove NO_x from the flue gas before it is introduced into the stack.

The nitrogen oxides (NO_x) generated during the combustion of solid fuels are primarily NO and NO₂. The flue gas contains approximately 95% of nitrogen oxide (NO) and approximately 5% of nitrogen dioxide (NO₂).

The amount of nitrogen oxides generated in the combustion process can be reduced (primary measures) by:

- reducing the excess air ratio,
- reducing the combustion temperature,
- double-zone fuel combustion,
- use of specially designed burners (low emission burners).

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Primary measures for the reduction of nitrogen oxides consist of suitable combustion. Suitably low combustion temperatures reduce the amount of thermal NO_x.

Most of the technologies applied to reduce NO_x emission (secondary measures) involve the injection of ammonia, carbamide or other components in the presence of the catalyst (SCR) or without the catalyst (SNCR) that react with the nitrogen oxides contained in the fuel, reducing them to ammonia nitrogen.

Dust removal

Dust emission can be reduced by using dedusting equipment with high efficiency, e.g., bag filter. The bag filter functions as described in chapter 7.1.2.

Waste generated during combustion

The combustion temperature in fluidized bed boilers is considerably lower than in grate-fired boilers. That is why the properties of waste from fluidized bed boilers are different from the waste from grate-fired boilers. The generated bottom ash has low slag content and small combustible fraction. The majority of heavy metals and other hazardous compounds are lifted with the fly ash, as a result of which the bottom ash is not hazardous waste and can be used as a filling material. The bottom ash is received from the bottom of the bed, cooled down and collected in a bottom ash tank. Bottom ash can be screened so that the finest particles are returned to the boiler, thus reducing the use of fresh sand. The waste left over after combustion in a CFB boiler includes bottom ash and fly ash. The fluidized bed boiler can generate waste such as the following:

- 19 01 19 Sands from fluidized beds,
- 19 01 15 Boiler dust containing hazardous substances,
- 19 01 13 Fly ash containing hazardous substances,
- 19 01 07 Solid waste from exhaust gas cleaning,

Excluding the sands from fluidized beds, all other waste is classified as hazardous waste. Table 3 presents the volumes of waste generated in a fluidized bed boiler.

Table 4. Volumes of furnace waste generated in a fluidized bed boiler

Furnace waste	unit	Fluidized bed boiler
Ash from the boiler and other flue gas treatment products - hazardous	thousand t/a	10.56
Bottom ash (dry) – non-hazardous	thousand t/a	14.52

Primary differences between grate combustion and fluidized bed combustion technologies

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The technology of waste disposal in grate-fired boilers is a proven technology, and it is the most commonly applied technology in Europe. The advantage of grate-fired boilers are the low requirements regarding fuel quality. It is not necessary to install the fuel preparation line.

In order to burn waste in fluidized bed boilers, the prepared waste should be mixed and shredded into particles smaller than 100 mm. Additionally, the fuel for the fluidized bed boilers must be devoid of aluminum, which increases the risk of corrosion and may lead to bed agglomeration.

Fluidized bed boilers enable the achievement of higher parameters of the generated steam than grate-fired boilers, which increases the efficiency of the plant and generation of electricity.

Comparison of the main technical parameters of the grate-fired boiler and fluidized bed boiler

The table below contains a summary of the most important parameters of the grate-fired boiler and fluidized bed boiler.

Table 5. Comparison of the main technical parameters of the grate-fired boiler and fluidized bed boiler

ITPFP Olsztyn		Grate-fired boiler	Fluidized bed boiler
New unit type		grate-fired boiler	CFB boiler
Gross power output in the nominal point	MW	11.3	12.1
Thermal power output of the Unit in the cogeneration mode	MW	32.0	31.1
Firing capacity	MW	48.5	48.5
Power output in live steam	MW	42.2	42.2
Steam parameters			
temperature	°C	420	470
pressure	bar	50	65
Steam boiler efficiency	%	0.87	0.89
Steam turbine type		Back pressure	Back pressure
Cooling system		subcooling towers	subcooling towers
Power output of dry cooling tower		12.2	11.4

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Gross electrical efficiency in the nominal point	%	23.3%	24.9%
Average net calorific value	MJ/kg	13.5	13.5
Annual amount of fuel	TJ/a	1350	1350
Annual amount of fuel	thousand t/a	110	110

Combustion of waste in grate-fired boilers generates lower volume of hazardous furnace waste related to fluidized bed boilers. In grate-fired boilers most of the combustion waste generated is slag — usually approximately 75-85%. Slag is a non-hazardous waste which enables its disposal or industrial usage. Fly ash with the products of grate-fired boiler flue gas treatment constitutes 20-25% of the whole mass of furnace waste. Most of heavy metals and other harmful compounds are raised with the fly ash, which makes the ash a hazardous waste that must be disposed according to the regulations on hazardous waste. In fluidized bed boilers the significant part of furnace waste stream is fly ash. Depending on the applied technology, the fly ash share in the total waste stream may range up to 90%. For fuel from waste, the fly ash share is usually within the 50–80% range. The use of fluidized bed boilers requires the management of large volumes of hazardous waste. In Poland, there are limited possibilities of disposing of high hazardous waste volumes.

Table 6. Comparison of the volumes of furnace waste generated in grate-fired boilers and fluidized bed boilers

Furnace waste	unit	grate-fired boiler	fluidized bed boiler
Ash from the boiler and other flue gas treatment products - hazardous	thousand t/a	5.5	10.56
Slag/bottom ash (dry) – non-hazardous	thousand t/a	18.7 (slag)	14.52 (bottom ash)

The quantity of the product after the performance of waste stabilization is higher in case of fluidized bed boiler than for the grate-fired boiler. The table below contains a summary of product volumes after the stabilization process in grate-fired boilers and fluidized bed boilers.

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Table 7. Estimated product volume after the stabilization process in grate-fired boilers and fluidized bed boilers

Furnace waste	unit	grate-fired boiler	fluidized bed boiler
Estimated amount of post-stabilization product	thousand t/a	8.14	14.3

The raw water demand of units with grate-fired boilers is greater than it is for fluidized bed boilers. The greater volume of furnace waste generated in fluidized bed boilers will result in a greater demand for the water necessary to manage that waste. The table below contains a summary of the demand for raw water for units with the grate-fired boiler and fluidized bed boiler.

Table 8. Raw water demand of the unit with the grate-fired boiler and the unit with the fluidized bed boiler

Item	Name	Unit	grate-fired boiler	fluidized bed boiler
	Raw water for the new unit, including the following:	m ³ /h	ca. 13.7	ca. 12.7
1.	Raw water for the generation of softened water	m ³ /h	7.6	6.7
1.1.	Softened water for the Municipal District Heating System	m ³ /h	5.0	5.0
1.2.	Water for the generation of demineralized water	m ³ /h	2.1	1.4
1.2.1.	Demineralized water used to make up the steam-water cycle	m ³ /h	1.4	1.3
1.2.2.	Demineralized water for the deNO _x system	m ³ /h	0.6	0.0
1.2.3.	Losses from the demineralized water station	m ³ /h	0.1	0.1
1.3.	Losses from the softening station	m ³ /h	0.5	0.5
2.	Water to FGDP	m ³ /h	3	2.2
3.	Water for furnace waste management	m ³ /h	1.7	2.4
4.	Water for other purposes (washing, etc.)	m ³ /h	1.0	1.0
5.	Water for domestic purposes	m ³ /h	0.4	0.4

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The volume of wastewater generated in both of the variants analyzed above is comparable in both of the analyzed technologies.

Table 9. Predicted volume of generated industrial wastewater in the unit with the grate-fired boiler and the unit with the fluidized bed boiler

Item	Name	Unit	grate-fired boiler	fluidized bed boiler
	Wastewater, including:	m ³ /h	3.3	3.1
1.	Wastewater from the demineralized water station and softening station	m ³ /h	1.2	1.0
2.	Surface and bottom blowdown from the boiler	m ³ /h	1.1	1.1
3.	Other wastewater (from washing, etc.)	m ³ /h	~1.00	~1.00

Due to the fact that the technology of municipal waste neutralization in grate-fired boilers is the most proven and most commonly applied technology in Europe and due to the small differences between the volumes of generated wastewater, in this Report it is recommended that ITPFP use grate-fired boilers to burn waste.

5.3.1. Expected environmental impact of each variant being analyzed, including the potential case of serious industrial failure as well as potential cross-border environmental impact

This chapter contains a comparison of the considered technological variants:

- variant (proposed by the Applicant) based on the waste-to-energy process involving municipal waste combustion in a grate-fired boiler,
- variant (reasonable alternative variant) based on the waste-to-energy process involving municipal waste combustion in a fluidized bed boiler

in the context of their environmental impact, in case of a serious industrial failure, and possible cross-border impact.

The table below contains a comparison of the emission standards specified for each of the above-mentioned variants in Directive 2010/75/EU of the European Parliament and of the Council of November 24, 2010 on industrial emissions and the arising maximum admissible annual levels of the emission of gaseous and particulate pollutants into the air (for the same periods of operation). The table also contains a comparison of the annual levels of carbon dioxide emissions that may be emitted in the considered variants.

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Table 10. Comparison of the emission of gaseous and particulate pollutants into the air depending on the considered variant

Item	Type of emitted pollutant	Emission rates		
			grate-fired boiler	fluidized bed boiler
			at 11% of oxygen content in exhaust gases	
1.	sulfur dioxide	emission standard	50 mg/m ³ _u	50 mg/m ³ _u
		annual emission	43.87 Mg/year	43.87 Mg/year
2.	nitrogen oxides converted into nitrogen dioxide	emission standard	200 mg/m ³ _u	200 mg/m ³ _u
		annual emission	175.48 Mg/year	175.48 Mg/year
3.	dust	emission standard	10 mg/m ³ _u	10 mg/m ³ _u
		annual emission	8.774 Mg/year	8.774 Mg/year
4.	carbon dioxide	annual emission	130,311.5 Mg/year	130,311.5 Mg/year
5.	carbon monoxide	emission standard	50 mg/m ³ _u	100 mg/m ³ _u
		annual emission	43.87 Mg/year	87.74 Mg/year
6.	heavy metals and their compounds expressed as metal		average test results for test duration of 30 minutes to 8 hours	
	cadmium + thallium	emission standard	0.05 mg/m ³ _u	0.05 mg/m ³ _u
		annual emission	0.0438 Mg/year	0.0438 Mg/year
	mercury	emission standard	0.05 mg/m ³ _u	0.05 mg/m ³ _u

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		annual emission	0.0438 Mg/year	0.0438 Mg/year
	antimony + arsenic + lead + chromium + cobalt + copper + manganese + nickel + vanadium	emission standard	0.5 mg/m ³ _u	0.5 mg/m ³ _u
		annual emission	0.438 Mg/year	0.438 Mg/year
7.	dioxins and furans	emission standard	average test results for test duration of 6 to 8 hours 0.1 mg/m ³ _u	average test results for test duration of 6 to 8 hours 0.1 mg/m ³ _u
		annual emission	0.000000088 Mg/year	0.000000088 Mg/year

Annual emission values of the six pollutants covered with the emission standards will be the same in case of combustion of fuel from municipal waste in a grate-fired boiler and a fluidized bed one. It results directly from the value of the emission standards. Only the emission of carbon monoxide from the fluidized bed boiler may be higher than the emission from the grate-fired boiler (by approx. 44 t/year), which results directly from different emission standard for each of the above mentioned type of boilers. Therefore, in both analyzed variants the same concentration values of the individual pollutants (except for CO) in the air shall be expected,

Air pollution is virtually the only nuisance that may be have a cross-border impact. The analysis of the impact of ITPFP on air quality in the cross-border context is presented in chapter 8 of the Report. The maximum concentrations of gaseous and particulate pollutants generated by such a plant may be present approx. 300 m away from the emission sources of the plant, and at the border between Poland and Russia, approx. 88 km away from the planned Investment Project, they will only be a small fraction of the reference values for the investigated pollutants. If the fuel from municipal waste is burned in a fluidized bed boiler, the only difference may be observed for carbon monoxide.

The remaining impacts, including noise, will only be local – similarly to the impacts generated by a unit with a grate-fired boiler fired with fuel from waste.

Table 10 contains a comparison of the volumes of generated furnace waste and waste produced in the waste stabilization process in both of the considered variants.

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Table 11. Comparison of the volumes of generated waste depending on the considered variant

Item	Waste code	grate-fired boiler	fluidized bed boiler
1.	19 01 12 Slags and furnace ashes other than 19 01 11,	18.7 thousand t/year	N.A.
2.	19 01 13* Fly ash containing hazardous substances, including 19 01 15* Boiler dust containing hazardous substances,	5.5 thousand t/year	10.56 thousand t/year
3.	19 01 19 Sands from fluidized beds	N.A.	14.52 thousand t/year
4.	19 01 07* Solid waste from exhaust gas cleaning, or 19 01 10* Spent activated carbon from flue gas treatment	3.3 thousand t/year	no data
5.	Quantity of post-stabilization product: 19 03 07 Solidified non-hazardous waste, or 19 03 05 Stabilized non-hazardous waste	8.14 thousand t/year	14.3 thousand t/year

Type of waste from the flue gas treatment plant depends on the adopted technical solutions. For example, activated carbon may be used in the form of deposit or as injection to the flue gas flow in dry conditions downstream the flue gas desulfurization plant.

The nearest existing residential buildings are not covered by the Local Land Development Plan. The levels of noise emitted into the environment will be comparable in both of the considered variants. Their emission is specified in chapter 13.3 of the Report. The great majority of noise sources will not exceed a sound pressure level of 85 dBA at a distance of 1 m away from the equipment. The worst noise source may be the dry mechanical draft cooling tower, which emits noise from the outlet windows to the west and to the north, where there are existing residential buildings.

Table 13 contains the types of industrial failures that may occur depending on the considered variant.

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Table 12. Types of industrial failures depending on the considered variant

Failure type	Fluidized bed boiler	Grate-fired boiler
fire	may occur	may occur
leakage of fuel oil used as start-up fuel	may occur	may occur
leakage of turbine oil from the turbine oil system	may occur	may occur
light fuel oil ignition	may occur	may occur
leakage of substances hazardous to the environment	may occur	may occur
leakage of transformer oil into the environment	may occur	may occur

The potential locations of serious industrial failures in a grate-fired boiler equipped with a flue gas desulfurization plant and in a fluidized bed boiler are similar.

The next table contains a comparison of the remaining types of possible environmental impacts depending on the considered variant.

Table 13. Comparison of other types of impacts depending on the considered variant

Environment component	Grate-fired boiler	Fluidized bed boiler
ground waters	impact may take place in the construction phase	impact may take place in the construction phase
climate	no significant impact	no significant impact
electromagnetic field	no impact	no impact
plants, animals, fungi and natural habitats	impact may take place in the construction phase	impact may take place in the construction phase
ground surface, including mass wasting	impact in the construction phase	impact in the construction phase

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human health	due to the limited emission of pollutants such as sulfur dioxide, nitrogen dioxide or particulate matter, no significant impact on human health is expected	due to the limited emission of pollutants such as sulfur dioxide, nitrogen dioxide or particulate matter, no significant impact on human health is expected
tangible property	no impact	no impact
monuments and cultural landscape	no impact	no impact
mutual impact between components of the environment	no impact	no impact
protected areas	no impact	no impact

The conducted analysis indicates that the impact of both of the above-mentioned variants on air quality is comparable. The impact on the acoustic climate of areas subject to noise protection that are located within the range of the combined heat and power plant's potential impact is comparable. The impact in both variants can be effectively reduced using various types of noise-attenuating equipment and solutions. The volume of wastewater generated during the operation of the unit with the grate-fired boiler and unit with the fluidized bed boiler is similar.

5.3.2. The most environmentally friendly variant

In the light of the analysis in the Report, the solution most advantageous for the environment is the implementation of the Investment Project consisting in construction of the municipal waste-to-energy plant, that will constitute one of the elements of the system of municipal waste management in Olsztyn. The system was elaborated in order to address the waste management problem in the area of 37 communes of the central part of Warmińsko-Mazurskie Voivodeship. The Investor – Miejskie Przedsiębiorstwo Energetyki Ciepłej in Olsztyn – proposes the variant where heat for the municipal district heating system and electricity are generated by combustion of the combustible fraction generated during the processing of municipal waste in a grate-fired boiler equipped with flue gas treatment plants. The description of the plant and the processes conducted there are included in chapter 7 of the Report. The impact of the technological variant proposed by the Investor on the individual components of the environment is included in chapter 8 of the Report.

When selecting the combustion technology, the Investor decided to implement the combustion of fuel from waste in a grate-fired boiler, assuming that one of the commonly applied grates will be used at the plant (e.g.

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reciprocating or roller grate types). It should be noted that, in Europe, approximately 90% of plants designed for the treatment of municipal waste are equipped with grate technologies, usually involving the reciprocating grate. In comparison to the combustion of fuel from municipal waste in a fluidized bed boiler, the use of a grate-fired boiler will be advantageous due to the type of the generated furnace waste. Fluidized bed boilers generate more hazardous waste. The volume of fly ash generated by fluidized bed boilers may exceed the volume of that waste generated by grate-fired boilers as much as two times. This results in a greater environmental burden and greater financial outlays related to the management of the hazardous waste.

The following systems for the reduction of the emission of gaseous and particulate pollutants in flue gas have been proposed for ITPFP:

- reduction of dust emission (including heavy metals) – use of a bag filter,
- reduction of acid compounds: SO₂, HF, HCl – use of the semi-dry flue gas desulfurization method,
- reduction of nitrogen oxides – use of primary measures and secondary reduction of NO_x emission involving the SCR or SNCR methods using a solution of ammonia or carbamide,
- reduction of heavy metals, dioxins and furans – use of the entrained flow method involving activated carbon.

The waste-to-energy process will generate heat and electricity. The generation of electricity from the combustion of the residual fraction of municipal waste will enable avoidance of the alternative emission from the combustion of conventional fuels in Olsztyn. The additional recovery of energy from waste from which nothing can be recovered anymore is an example of reasonable behavior regarding waste management and energy saving related to the obtaining of a new energy source that is currently classified by the EU as a renewable energy source.

The proposed configuration of ITPFP plant enables the observance of all stringent requirements concerning the conditions of the waste-to-energy process, emission standard, energy efficiency, etc., included in Directive 2000/76/EC of December 4, 2000 (OJ L 332, of December 28, 2000) on the incineration of waste and its equivalents in the Polish law.

In the light of the analysis included in the Report on the environmental impact of the planned Investment Project, it is found that the variant requested by the Investor is also the most environmentally friendly variant. To reduce nuisance of the waste generated, in particular the negative impact on the ground surface, the maximum utilization of the generated waste as a raw material or semi-finished product in other processes and minimization of the volume of landfilled waste are planned. The method of water and wastewater management involving the supply of water from the water supply system of the city of Olsztyn and discharge of wastewater into the sewerage system of PWiK will not have a direct impact on the quantity and quality of surface water and groundwater. The noise emitted by the new combined heat and power plant under normal operating conditions of the plant into areas subject to noise protection will not exceed acceptable noise levels. ITPFP will not have a significant negative impact on the surrounding nature, including the plants, animals, landscape, habitats,

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protected areas and NATURA 2000 network. The condition of habitats and natural habitats in NATURA 2000 areas will not deteriorate as a result of the implementation of this Investment Project. The applied technical and process solutions will ensure that the nuisance related to the operation of ITPFP will be limited to the boundaries of the site to which the Investor holds legal title. The impact of ITPFP will be monitored regarding the most important components of the surrounding environment. The comparison of the environmental impact of the requested variant to the reasonable alternative variant and the different fuel variant (hard coal combustion in a grate-fired boiler) is presented in chapter 5 of the Report. The emission levels and impact of the variant requested by the Investor on environmental quality within the range of ITPFP's potential impact that are included in the above-mentioned chapter indicate that the generation of heat for the city of Olsztyn at the plant fired with fuel from waste create the smallest environmental burden, both due to the levels of emission of gaseous and particulate pollutants into the air and due to the volume and type of generated waste as well as the noise, water demand and volume of generated wastewater.

Conclusions:

- *If it is decided that the Investment Project will not be implemented, it could be necessary to manage waste otherwise and generate heat for the municipal district heating system in another source. Additionally, in that situation, the legal requirements for waste neutralization might not be fulfilled.*
- *The designed ITPFP will generate heat for district heating, domestic hot water and electricity.*
- *The area to be used for the implementation of the Investment Project is located in the eastern part of Olsztyn, at ul. Lubelska 48. The area is covered by the Local Land Development Plan, providing for the construction of a facility of that type, there are no environmentally sensitive, protected items in the vicinity, the hydrological and geotechnical conditions are good and the size of the plot is suitable for the erection of the individual structures. The area meets the requirements for the optimum location.*
- *Fuel from municipal waste will be burned in a grate-fired boiler. The analysis of the variants demonstrated that the above-mentioned technical solution would be optimal. Comparison of the technology of waste combustion in the grate-fired boiler and in the fluidized bed boiler demonstrated that the use of the grate-fired boiler would be better. Fluidized bed boilers generate much more hazardous waste in comparison to grate-fired boilers.*
- *The conducted analysis found that the most environmentally friendly solution would be the implementation of the Investment Project involving the disposal of waste with simultaneous generation of heat and electricity at a plant equipped with a grate-fired boiler burning fuel from waste.*

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6. DESCRIPTION OF THE PLANNED INVESTMENT PROJECT

6.1. CHARACTERISTICS OF THE INVESTMENT PROJECT AND LAND USE CONDITIONS IN THE IMPLEMENTATION PHASE AND OPERATION PHASE

Construction of ITPFP will last for 32-36 months from the moment the Contractor takes over the construction site until the new plant is commissioned. The site handover to the EPC Contractor will take place upon obtaining all the necessary decisions, permits and approvals. Civil works will be commenced immediately after the site is handed over and will be completed upon ITPFP commissioning and hand-over for operation. During the maximum intensity of the works, 300 workers will be engaged on site. It is assumed that most of them will be workers of local companies.



(Photo No. 1)

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(Photo No. 2)

Photos No. 1 and No. 2. Site to be used for ITPFP.

More photos of the site to be used for ITPFP are included in Appendix No. 16.

Site preparation

ITPFP construction will commence with ground leveling, preparation of haul road connecting the construction site with public roads, and supply of necessary utilities.

Main facilities:

The main facilities of ITPFP include the following:

- Boiler house building including flue gas treatment and discharge systems,
- Turbine hall building housing the steam turbine with auxiliary systems and equipment,
- Peak load back-up boiler house,
- Unit control room with the electric switching station,
- stack,
- fuel collection and unloading point,
- waste bunker and process fuel supply,
- furnace waste handling system.

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The technical feasibility to start the execution of the facilities and process systems will depend on completing the construction site preparation and on preparing the necessary detailed engineering. The construction of the abovementioned facilities, including erection of main equipment, will be carried out simultaneously for most of the project implementation period. Interfaces between the process systems, their acceptance, start-up and hand-over for use shall be planned in the time schedule at the final stage of completion.

The facilities and systems requiring shorter execution time to include:

- oil management facilities,
- water preparation facilities,
- transformer stand,
- other auxiliary facilities.

Construction of the new plant will require the following works:

- excavations for the designed facilities,
- reinforced concrete works with respect to construction of foundations, strip footings, reinforced concrete structures of channels, floors, etc. for the planned facilities,
- erection of the steel structure of the main building for the new unit and structure of the associated and auxiliary facilities,
- civil works, mechanical, electrical and plumbing works, as well as finishing works in the built facilities, and construction of access roads to the facilities,
- erection of process equipment and devices in the facilities,
- construction of pipe rack routes,
- construction site demobilization and ordering after the civil works are completed.

After construction completion, ITPFP site will be leveled using the soil from excavations for foundations of individual facilities.

Water intake and sewage discharge

Water for the designed plant will come from the designed Ø400 mm water main running from ITPFP to ul. Piłsudskiego. The water line route will pass the planned ITPFP site, through plots Nos. 89-25/1 and 94-6/1. The planned length of the main section will amount to 2,600 m. PWiK in Olsztyn has contracted the preparation of the design documentation for the main. Technical conditions for connection of the MPEC facilities may be issued after the water main design is approved.

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The body receiving the sewage from the planned ITPFP will be the Ø600 mm sanitary sewer located along ul. Lubelska, also on plot No. 88-17/1. The connection requires construction of a sanitary sewerage network section from the main sewer to the level of the real property. The valid long-term plan for modernization and extension of water and sewerage facilities, issued by PWiK, does not provide for construction of such network. However, PWiK is able to sign an appropriate contract for co-financing the execution of the design documentation and construction of the necessary drainage network section. The source of water for the new CHPP will be the water mains operated by PWiK, whereas the sewage will be discharged to PWiK sewerage network.

Gas supply

The city of Olsztyn is supplied with high methane natural gas of E group, by the distribution network operated by PSG. The city is not provided with the natural gas transmission network of Gaz-System.

Approximately 800 m from the site intended for the planned CHPP in Olsztyn, there is Grądek pressure reducing and metering station, supplied by a high-pressure DN 150 gas pipeline, running from Bartąg to Dobre Miasto. Apart from the existing gas pipeline, a new high-pressure DN300 MOP 5.5 gas pipeline is planned running through Nidzica-Olsztynek-Grądek.

The gas for the gas-fired generating units operated in the prospective CHPP in Olsztyn will be delivered from the PSG distribution network.

The indicated place of gas fuel delivery and receipt is the designed high pressure gas station located on the premises of the new plant at ul. Lubelska in Olsztyn. The designed high-pressure gas pipeline DN300 MOP5.5 Nidzica-Olsztynek-Grądek will be the place of connection to the gas network.

Power output line

The new plant will be located near the 110 kV power line connecting Olsztyn 1 and Michelin stations. The service connection requirements for the plant were issued on April 2, 2014. In accordance with the issued requirements for connection to the 110 kV power system of Energa Operator, the power output line will be connected to the new 110 kV switching station, to which the line between Olsztyn and Michelin substations will be connected. In the new 110 kV switching station, the unit transformer of the new Olsztyn CHPP will be connected to minimum one bay.

Heat output

The peak thermal power output from the new plant will be approx. 90 MW_t. The new CHPP will feed the areas of Pojezierza and Zatorze housing co-operatives, as well as other zones.

ITPFP will be connected to the Municipal District Heating System by a new DN500 district heating main, executed as a preinsulated network.

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Conclusions:

- Construction of ITPFP will last for 32-36 months from the moment the Contractor takes over the construction site until the new plant is commissioned.
- The construction will begin with site leveling and preparation of technological road access. When the construction site is prepared and when the necessary detailed engineering designs are prepared, it will be possible to start the construction of the main facilities and process systems.
- Water for the designed ITPFP will come from the designed water main running from ITPFP to ul. Piłsudskiego.
- The wastewater generated during the operation of ITPFP will be discharged into the sanitary sewerage system main sewer located along ul. Lubelska.
- The delivery and collection site for the gaseous fuel shall be the high-pressure gas station to be located in ITPFP area.
- Power will be output to the new 110 kV switching station, to be connected to the line from Olsztyn substation to Michelin substation. In the new 110 kV switching station, the unit transformer of the new Olsztyn CHPP will be connected to minimum one bay.
- ITPFP will be connected to the municipal district heating system by a new district heating main installed as a pre-insulated network. The facility will feed the areas of Pojezierze and Zatorze housing co-operatives as well as other zones.

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7. MAIN CHARACTERISTICS OF THE SELECTED PRODUCTION PROCESS

7.1. GENERAL TECHNICAL CONCEPT OF THE INVESTMENT PROJECT

The main module of the planned Investment Project will be a waste-to-energy plant using waste in the form of alternative fuel – Combustible Fractions of Municipal Waste. The plant will be equipped with a grate-fired boiler that is going to generate steam supplied to the turbine. The heat exchanger supplied by steam from the turbine will generate heat (heating water) for the district heating system of the city of Olsztyn. The turbine will drive the generator generating electricity, which will be supplied to the new 110 kV switching station of Olsztyn Combined Heat and Power Plant. The unit shall be adapted for operation in accordance with the requirements of the Distribution System Operator (DSO). Back-up power supply for auxiliaries shall be made from the 15 kV network. The Unit shall have technical solutions ensuring high availability and reliability. The facility will include a water peak load back-up boiler house fired with natural gas or light fuel oil. The boiler house will generate heat for the district heating system of the city of Olsztyn.

Regarding the environmental impact, the Unit and the Peak Load Boiler House will conform to the requirements of the Polish law and EU law. The Unit will conform to the requirements, rules and standards specified by the Best Available Techniques (BAT).

The technical concept of the planned Investment Project provides for the construction of the Unit combusting up to approximately 110 thousand t/a of fuel from municipal waste, with a time of operation of up to 8200 t/a, resulting from the availability of the equipment. ITPFP will be equipped with a grate-fired boiler and district heating steam turbine with heating water subcooling system enabling Unit operation with the full load of the boiler in the summer period, with receipt of heat at the minimum level of 18 MW_t.

ITPFP will cover the total demand of the city of Olsztyn for heat in the summer period and a part of the demand in the heating season. In the summer period the generation will be performed in the Unit only, except for the period of overhaul or unit failure (approx. 1000 h). It is assumed that in this period the heat will be produced in Kortowo Heat Generating Plant.

The main technology used at ITPFP will be the method of energy generation that has been used for as at power plants/combined heat and power plants, consisting of the following:

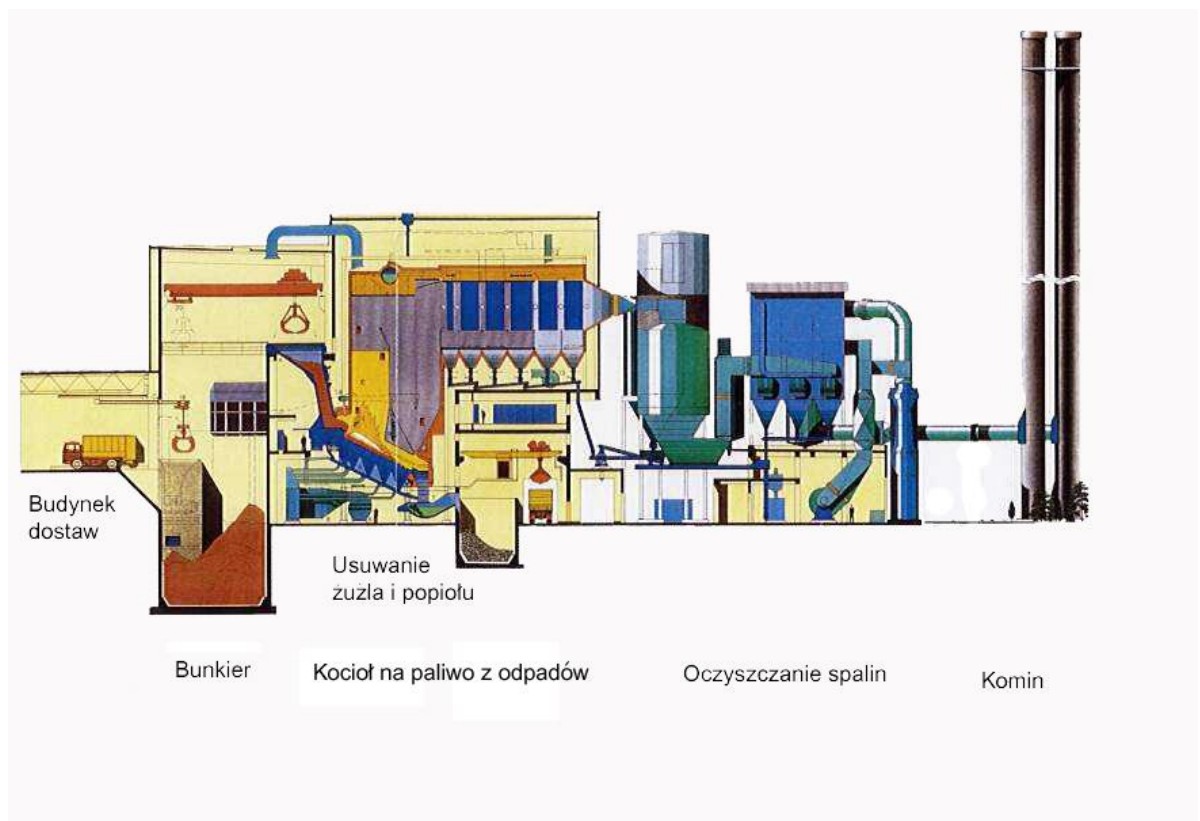
- generation of heat in the form of steam in the boiler,
- transformation of the heat contained in the steam into mechanical energy of the rotating steam turbine,
- transformation of the mechanical energy to electricity in the generator (which is connected to the steam turbine).

The technology of waste combustion in grate-fired boilers is a proven technology that is commonly used in the industry. grate-fired boilers are the most commonly applied technology of waste combustion. They are a

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technically proven solution and can be offered by numerous suppliers. The boiler will be used to burn waste after processing.

Below, there is a schematic diagram of the combustion system to be used for the combustion of fuel from municipal waste.



PL	EN
Budynek dostaw	Delivery building
Bunkier	Bunker
Usuwanie żużla i popiołu	Slag and ash removal
Kocioł na paliwo z odpadów	Boiler for fuel from waste
Oczyszczanie spalin	Flue gas treatment
komin	stack

Figure 11. Schematic diagram of the system for the combustion of municipal waste

(Source: Feasibility Study, Volume 1)

The prospective Investment Project involves construction of the following facilities:

- fuel reception and unloading point,

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- waste bunker and process fuel supply,
- boiler house including a waste-fired boiler,
- flue gas treatment system,
- stack with the flue gas monitoring system,
- furnace waste handling system,
- turbine hall,
- external systems,
- Peak Load Boiler House,
- auxiliary systems — auxiliary fuel (light fuel oil), water preparation station, sorbent and ammonia (24% ammonia water) or carbamide management station

as well as other auxiliary facilities and land development features. The unit will generate electricity with a gross efficiency of approx. 23% in cogeneration. The Unit will generate heat and electricity using power equipment (boiler and turbine). The steam generated in the boiler will be fed to the turbine. Electricity will be generated by the generators. Fuel from the storage bunker will be fed by means of the overhead traveling crane with grabber to the boiler tank with the capacity ensuring supply of fuel for half an hour. The fuel from the boiler bunker will be fed into the furnace chamber of the boiler by gravity or using an additional short conveyor. That chamber will be an integral part of the boiler. Combustion will take place on the grate. The auxiliary fuel and start-up fuel for the boiler burning fuel from municipal waste will be natural gas or, alternatively, light fuel oil. In order to reduce emission of harmful compounds to the atmosphere, systems for removal of these compounds from flue gas were installed. The requirements of the EU and Polish law concerning the emission of harmful substances (SO₂, NO_x, dust) to the atmosphere for the sources fired with fuel from municipal waste are significantly more stringent than the requirements for the sources fired with conventional fuel (coal, oil, gas). The required level of the emission of nitrogen oxides will be achieved using primary measures and a system for the reduction of nitrogen oxides (injection of ammonia water). Due to low temperature, the "thermal" formation of NO_x by oxidation of nitrogen molecule is insignificant. Creation of NO_x due to the nitrogen in the fuel is reduced by the "stage" combustion. Sulfur dioxide (SO₂) and other acid gases in the flue gas emitted from the grate-fired boiler into the air will be reduced using the semi-dry flue gas desulfurization plant. Lime or hydrated lime will be used as sorbent in the reactor. The flue gas will be dedusted in highly efficient dedusting equipment, after which the flue gas will be introduced into a stack with height $H \geq 60$ m. The emission of dioxins, furans and mercury will be reduced using activated carbon introduced into the plant between the reactor and the highly efficient dedusting equipment.

The flue gas treatment system will consist of the following elements:

- multi-stage injection of ammonia water (24%) or carbamide solution – SNCR or SCR,
- semi-dry flue gas desulfurization reactor,
- dry injection of activated carbon,

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- bag filters.

Fly ash will be buffer-stored in a retention tank, solidified/stabilized into the form of non-hazardous waste and removed from the plant for further management. Slag may be processed at ITPFP and then transferred for further use or handed over outside without seasoning. Solid waste from flue gas treatment is hazardous waste. It will be managed in accordance with the Waste Act. The new Unit will be equipped with a closed cooling water system. The condenser of the turbine of the Unit will be cooled by the main cooling water system, using a mechanical draft cooling tower, and it will be made-up with decarbonized water. The closed cooling water system for the Unit auxiliary equipment shall be filled and made up with demineralized water. Demineralized water will be used to make up the water-steam cycle of the steam boilers and to dilute the reacting substance in the deNO_x system. Below, there is a diagram of the new Unit with an estimated balance of materials and products.



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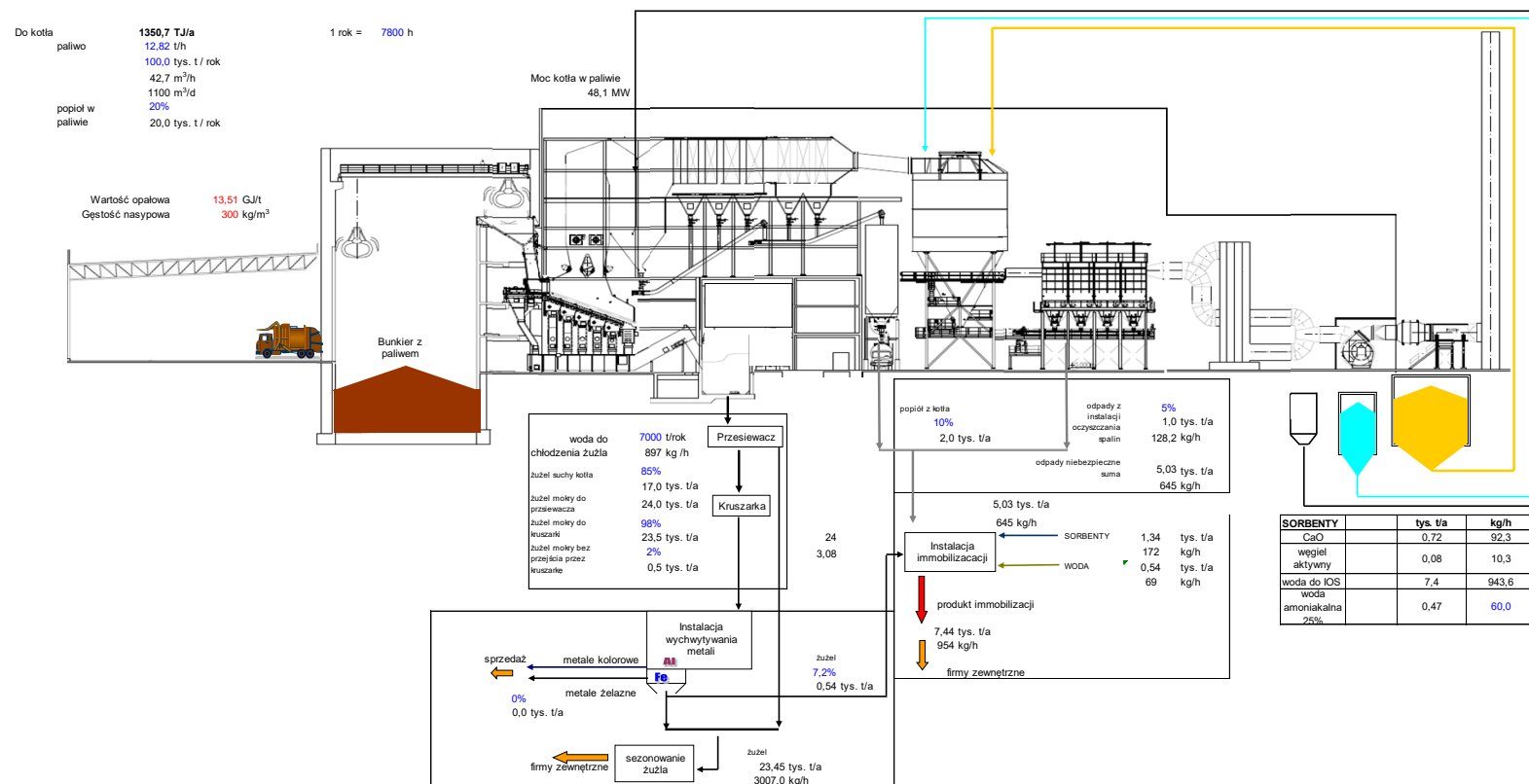


Figure 12. Estimated balance of materials and products

(Source: Feasibility Study, Volume 1)

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The table below contains the main technical specifications of ITPFP equipped with a grate-fired boiler and auxiliary systems.

Table 14. Basic technical parameters of the new plant

Specification	Unit	Value
UNIT		
Available gross power output of the Unit	MW _e	11.3
Available thermal power output in the cogeneration mode	MW	32
Gross efficiency	%	approximately 23
Auxiliaries (including transformer losses)	MW _e	1.7
Available net power output of the Unit	MW _e	9.6
Gross electricity generation	GWh/year	approx.100
Global capability factor	h/year	8200
BOILERS		
Grate-fired boiler		
Boiler efficiency	%	86
Thermal power output of the boiler in fuel	MW _t	48.5
Nominal flue gas volume (dry, 11% O ₂)	m ³ _u /h	107 000
Flue gas temperature	K	413
Start-up fuel type		gas
Peak load back-up boiler house boilers		
Boiler efficiency	%	91.5
Thermal power output of the boiler in fuel	MW _t	38
Nominal flue gas volume (dry, 3% O ₂)	m ³ _u /h	40 000
Flue gas temperature	K	368/383
Start-up fuel type		gas

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Diesel generator set			
Thermal power output in fuel		MW _t	0.85
Fuel consumption		l/h	58.7
EMISSION SOURCES			
grate-fired boiler emission source	height	m	60
	outlet diameter	m	2
	flue gas temperature	K	413
Peak load back-up boiler house emission source	height	m	25
	outlet diameter	m	2x0.9
	flue gas temperature	K	368 – for gas combustion / 383 – for light fuel oil combustion
Diesel generator set emission source	height	m	approximately 5
	outlet diameter	mm	125
Fly ash tank emission source	height	m	22
	outlet diameter	m	0.4
Sorbent retention tank emission source	height	m	14
	outlet diameter	m	0.3
Light fuel oil tank emission source	height	m	10
RETENTION TANKS			
Light fuel oil tank	capacity	m ³	1000
Ash retention tank	capacity	m ³	300
Sorbent retention tank	capacity	m ³	150
Ammonia water tank	capacity	m ³	2 x 30
Water tank	capacity	m ³	300

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SYSTEMS		
Flue Gas Desulfurization Plant	type	semi-dry
	flue gas desulfurization efficiency	90 %
Flue gas denitrification plant	type	Selective Non-Catalytic Reduction (SNCR) Selective Catalytic Reduction (SCR)
	flue gas denitrification efficiency	50%
Flue gas dedusting plant	type	bag filter
	flue gas dedusting efficiency	99,98 %
System for the reduction of dioxins, furans and mercury	type	Adsorption system using activated carbon
	flue gas dedusting efficiency	97%
FUEL		
Fuel for the grate-fired boiler		
Fuel type	fuel from municipal waste	
Annual amount of fuel	Mg/year	110 000
Hourly fuel consumption	Mg/h	12.8
Fuel net calorific value	MJ/kg	11- 16
Moisture content	%	to 20
Chlorine content	%	<1
Chemical energy of fuel	TJ/a	1450
Fuel for the peak load back-up boilers		
Fuel type	natural gas	
Annual amount of fuel	thousand Nm ³ /year	1300
Hourly fuel consumption	Mg/h	3.9 per boiler

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Natural gas net calorific value	MJ/m ³	≥ 31.0
Chemical energy of natural gas	TJ/year	1450
Fuel for the peak load back-up boilers		
Fuel type	light fuel oil	
Annual amount of fuel	tons/year	1050
Hourly fuel consumption	Mg/h	max. 6.6
Fuel oil net calorific value	MJ/kg	42.6
Chemical energy of fuel oil	TJ/year	44
SORBENTS		
Burnt/hydrated lime		
	Mg/year	1200/1500
Ammonia water, 24% solution	60 kg/h	
	Mg/year	400
WASTE		
Amount of slag/bottom ash 19 01 12	Mg/year	18 700
Amount of dust – fly ash 19 01 13*	Mg/year	5 500
Amount of boiler dust containing dangerous substances 19 01 15*	Mg/year	2200
Solid waste from exhaust gas cleaning	Mg/year	3300
Spent activated carbon from flue gas treatment 19 01 10*	Mg/year	100
Capacity of the storage tank with 7-day retention to be used for the storage of fly ashes and waste from the flue gas treatment plant	m ³	300
NOISE		
Level of sound power (or sound pressure level 1 m away from the equipment) of the unit transformer	dB(A)	85

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Level of sound power (or sound pressure level 1 m away from the equipment) of the tap transformer	dB(A)	85
Level of sound power (or sound pressure level 1 m away from the equipment) of the stand-by transformer	dB(A)	85
Level of sound power (or sound pressure level 1 m away from the equipment) of MV and LV motors	dB(A)	85

5.3.3. 7.1.1 Facilities included in the scope of the planned Investment Project

1. Main building

The main building of the new combined heat and power plant will consist of the following facilities:

- boiler house with the grate-fired boiler,
- turbine hall with the complete turbine generator unit,
- unit control room with the office part.

2. Electric power output facilities

The new combined heat and power plant will include the following electric power output facilities:

- 110/6.3 kV unit transformer,
- 110 kV electric switching station,
- 6.3/0.4 kV auxiliary transformer,
- 6.3 kV switching station,
- 15/0.4 kV stand-by power supply transformer

3. Cooling system facilities

Cooling system facilities will be as follows:

- dry mechanical draft cooling tower.

4. Water and wastewater management facilities

Water preparation facilities will be as follows:

- water treatment station building (water softening station, water demineralization station),

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- raw water tank with a pumping station,
- soft water storage tank with a pumping station,
- demineralized water storage tank with a pumping station,

Wastewater management facilities will be as follows:

- industrial wastewater equalization tank
- rain water tank and rain water treatment system.

5. Fuel management facilities

Fuel management facilities will be as follows:

- delivery station,
- waste receipt station,
- waste storage station,
- boiler fuel supply station.

6. Ash and slag management facilities

Ash and slag management facilities will be as follows:

- ash storage tank,
- secondary waste stabilization hall,
- storage shelter for slag and products,
- slag processing facilities – crusher, metal separation.

7. Sorbent management facilities

Sorbent management facilities will be as follows:

- sorbent storage tank,
- ammonia water or carbamide tank.

8. Auxiliary boiler house

Oil management facilities

Oil management facilities will be as follows:

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- light oil tank,
- light oil pump station,
- light oil unloading point.

9. Flue gas evacuation facilities

- grate-fired boiler stack,
- peak load boiler house stacks

10. Auxiliary facilities

- The new combined heat and power plant will have the following auxiliary facilities: gatehouse,
- workshop hall, warehouse,
- laboratory,
- PSG gas station,
- Diesel generator set.

The location of the facilities at ITPFP site is depicted in the Land Development Plan – Appendix No. 3 to the Report.

The **main building** is the primary facility at every combined heat and power plant. It is used for the main processes conducted in order to generate energy. The boiler house will contain systems and equipment cooperating with the grate-fired boiler and the so-called general unit equipment (pipelines, lighting, ventilation, horizontal and vertical transport routes). The boiler will be used to burn fuel in the form of

- waste from ZGOK Olsztyn - alternative fuel with code 19 12 10 - Flammable waste (alternative fuel);
- high-energy fraction left over after municipal waste sorting;
- high-energy fraction left over after composting of the 20–80 mm fraction;
- waste with parameters similar to those of the above waste.

As a civil structure, the boiler house will be a space adjusted to the functions and dimensions of the equipment it contains. The boiler house will have a steel structure founded on a common reinforced concrete foundation slab. The area of the boiler house building will be approximately 1600 m². In the turbine hall a back-pressure turbine will be installed, equipped with deaerator and two heat exchangers with a heating water subcooling system in the closed cooling circuit with dry mechanical draft cooling tower. A turbine generator unit shall be equipped with all systems required for its proper operation. The turbine hall will additionally contain assemblies of auxiliary systems cooperating directly with the turbine generator unit. The area of the turbine hall building will be approximately 450 m². A

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synchronous generator will operate at the new combined heat and power plant. It will be designed to generate electricity for the transmission network with a frequency of 50 Hz. Power will be output from the generator using busducts located inside an insulated and screened coating.

7.1.2 Systems included in the scope of the planned Investment Project

The scope of the planned Investment Project will include the following systems:

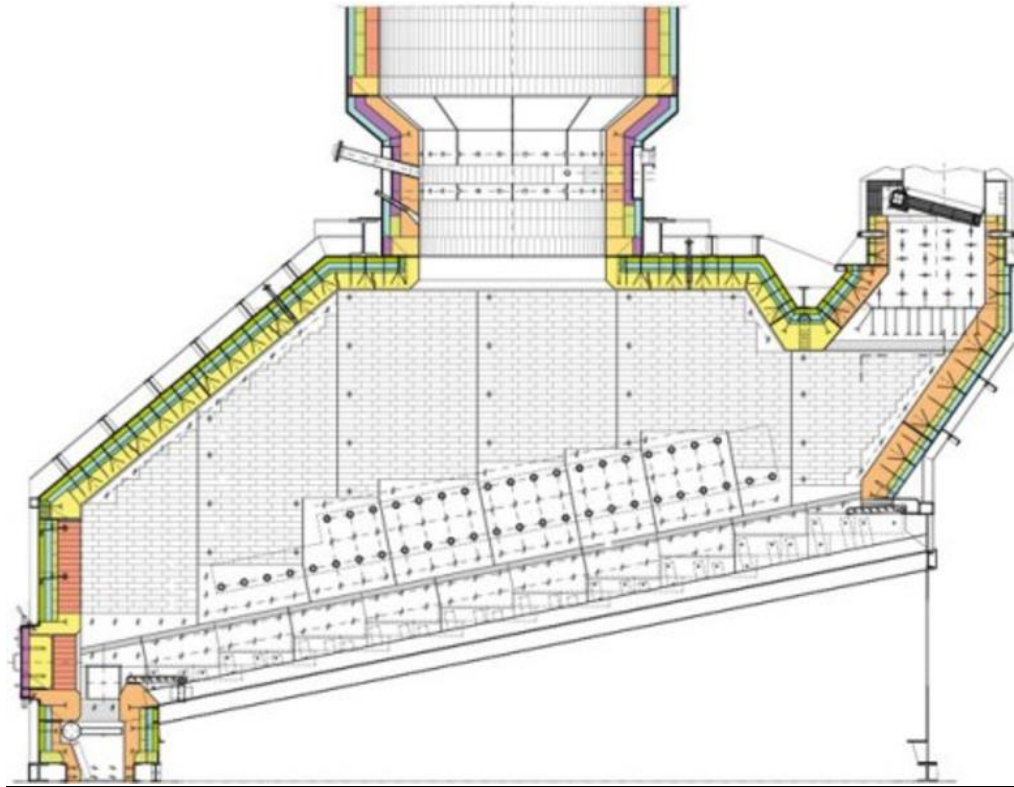
Boiler – system for the combustion of fuel from municipal waste

The boiler is a complex of equipment and systems designed to:

- effectively generate energy by burning fuel in the furnace chamber,
- generate live steam with high thermodynamic parameters from the supplied feed water,
- superheat the steam supplied from the turbine in a line of reheat steam superheaters.

The boiler shall be equipped with:

- combustion air system – systems designed to draw air from the atmosphere, preheat the air and transport it into the furnace chamber,
- flue gas evacuation system – system receiving flue gas from the boiler and transporting it into the systems designed to: preheat boiler air and denitrify and dedust flue gas,
- furnace waste removal system – system receiving materials discharged from the furnace chamber, preparation of the materials for transport and transport of the materials outside the boiler house.

**Figure 13. Sample grate-fired boiler cross-section**

(source: <http://www.rath-group.com/pl/branze/przemysl-energetyczny-i-inzynieria-srodowiskowa/kociol-rusztowy/>)

Fuel will be fed from the bunker to the boiler tank with the capacity ensuring supply of the fuel for half an hour. The fuel from the boiler tank will be fed to the furnace chamber by gravity. Combustion will take place on the grate. The fuel supporting the combustion process and the start-up fuel in the boiler of the Unit will be natural gas or, alternatively, light fuel oil.

At the initial section of the grate, the waste is dried, deaerated, gasified and then properly burned, after which the products that have not been fully burnt (if any) undergo post-combustion. Above the main grate combustion zone, there is an after-combustion chamber ensuring after-combustion of solids and gases generated during combustion. In the after-combustion chamber, above the secondary air nozzles, supportive burners are installed aimed at maintaining flue gas temperature at the level of 850°C, supporting the start-up and shutdown of the boiler. The boiler will be provided with systems designed to limit the emission of harmful compounds into the atmosphere. The flue gas treatment system consists of the following components:

- multi-stage injection of ammonia water (24%) or carbamide solution – SNCR or SCR,
- semi-dry reactor for flue gas treatment to remove acid components,



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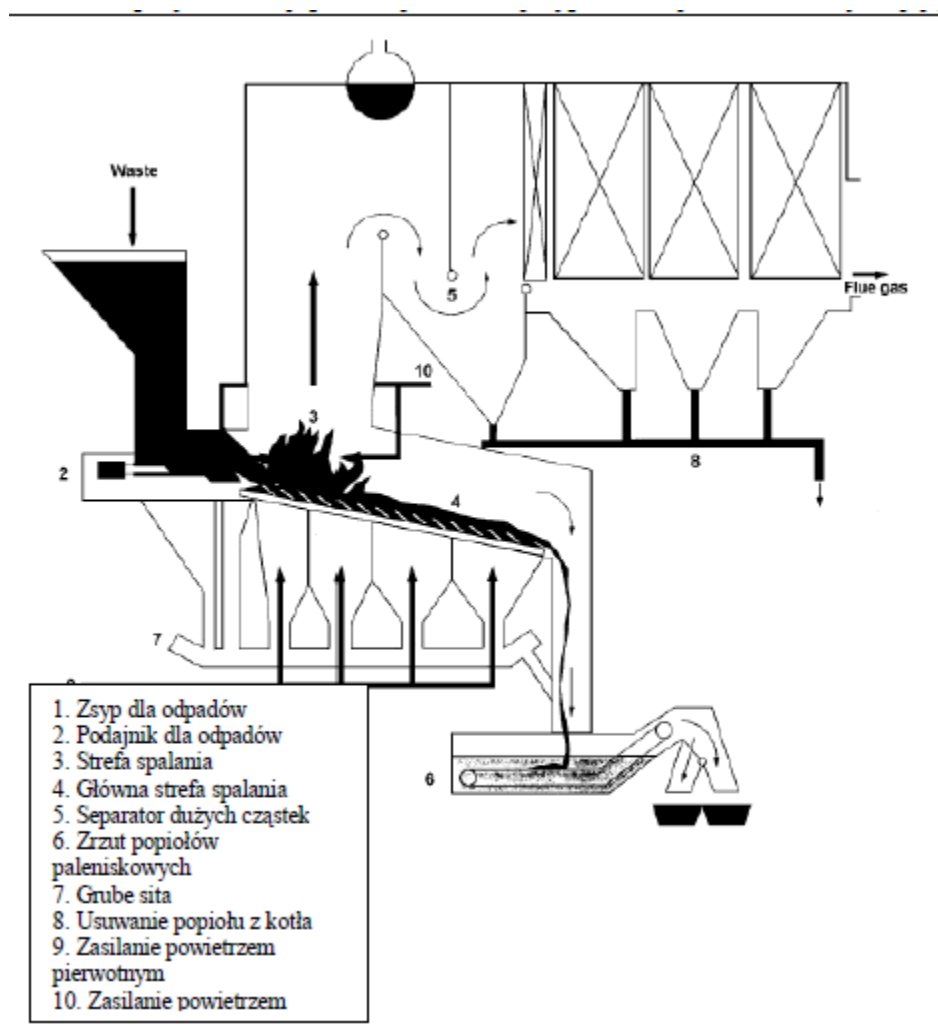
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- dry injection of activated carbon.
- bag filters.



PL	EN
Zsyp dla odpadów	Waste chute
Podajnik dla odpadów	Waste feeder
Strefa spalania	Combustion area
Główna strefa spalania	Main combustion area
separator dużych cząstek	Separator of large particles
Zrzut popiołów paleniskowych	Furnace waste discharge
Grube sita	Coarse screens
Usuwanie popiołu z kotła	Ash removal from the boiler
Zasilanie powietrzem pierwotnym	Primary air supply
Zasilanie powietrzem	Air supply

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Figure 14. Grate, furnace and heat recovery system in a sample municipal waste combustion plant

(source: BAT Reference Document for waste combustion, August 2006).

Peak load back-up boiler house

The peak load back-up boiler house will be the source covering the peak power demand in the system of MPEC Olsztyn. The peak load back-up boiler house will consist of two oil- and gas-fired flame- and smoke-tube boilers with a total capacity of 76 MW_t. The boiler house will be located in the vicinity of the office building and control room.

The auxiliary boilers will be natural-circulation boilers consisting of tight membrane walls. Each boiler will consist of a furnace with gas- and oil-fired burners, combustion air supply system with FD fans for each burner, flue gas evacuation system with flue gas ducts and stacks with individual flues for each boiler, control and monitoring devices for unmanned operation, all necessary water level indicators and automatic burner system.

The auxiliary boiler will be fired with natural gas or, alternatively, light fuel oil.

Main parameters of the peak load back-up boiler house:

- number of boilers: 2
- thermal power input in the fuel from each boiler – approx. 38 MW_t,
- boiler efficiency at nominal load – 91.5%,
- maximum fuel consumption – 3.3 Mg/h/boiler.

The flue gas from each boiler will be evacuated to the air with a separate emission source – two flues, each with height $h = 25$ m and outlet diameter $d = 0.9$ m.

Emergency supply equipment

In order to provide emergency power supply, the combined heat and power plant will be provided with a generator driven by a diesel engine, supplied with diesel oil, in order to enable start-up and safe shutdown of Unit equipment in case of power outage. Flue gas from the diesel engine shall be evacuated to air with an emission source with a height of $h=5$ m and outlet diameter of $d = 125$ mm.

The power generator set is an emergency device, which is not used during the normal operation of the facility.

Diesel oil will be stored in the tank with the capacity of 400 l. The technical parameters of the diesel generator are specified below:

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thermal power output in fuel - 0.85 MW_t

power output – 0.2 MW_e,

electrical efficiency – 36%,

fuel consumption – 47 l/h.

Steam turbine and other systems of the turbine hall

The steam turbine is a heat engine where the potential energy of high pressure steam is transformed into kinetic energy. The inside of the steam turbine consists of a quickly rotating shaft with multiple blades. The steam is supplied by nozzles into the turbine, where – due to the pressure drop – it is accelerated. Next the steam is directed to the blades of the turbine rotor, to which it transfers its energy.

In the new Unit, a back-pressure turbine will be used, equipped with deaerator and two heat exchangers with a heating water subcooling system in the closed cooling circuit with dry mechanical draft cooling tower. Exhaust steam from the turbine will be directed to the DH exchanger. The second DH exchanger will be fed from the steam turbine extraction. The Unit will be equipped with a system of feed water pumps in 2x100% configuration with capacity control by means of an inverter. The Unit will be equipped with a system of condensate pumps in 2x100% configuration with capacity control by means of an inverter. The Unit will be equipped with a system of dumping stations in 2x50% configuration of live steam capacity to DH exchangers. The Unit will be equipped with a DH cogeneration unit, consisting of two heating water heaters. The DH exchangers will be able to be fed from separate pressure reducing stations from the live steam pipeline directly from the boiler, bypassing the steam turbine in the case of its tripping.

Fuel storage and feeding system

The waste management system will consist of the following stations:

- delivery station (W),
- waste receipt station (RP),
- waste storage station (RM),
- boiler fuel supply station (K).

Delivery station

As part of the delivery station, it is assumed to provide, i.a., a parking space for trucks waiting for entrance to the unloading station, an entrance gate with a rising barrier, a weighbridge, a building with

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a gatehouse and a place for storage of samples and a system for control of traffic and identification of waste suppliers.

The measurement of the volume of waste delivered by individual suppliers based on the indications of the weighbridge will be performed at the delivery station. Readouts from the weighbridge will be registered in the Combined Heat and Power Plant computer system.

After weighing, the vehicles delivering waste will be directed to the waste unloading station.

Receipt of waste deliveries

In the scope of the means of transport, it is assumed that fuel from waste may be delivered by different means of transport with the possibility of back unloading, i.e. a truck tractor with a dump semitrailer, a self unloading trailer with walking floor, trucks with trailers with hook containers. As a standard mean of transport, the truck tractor with a dump semitrailer with the cargo capacity of approx. 40 m³ was assumed. Assuming the truck unloading time of 15 minutes, the time of staying of the truck on the Plant site shall be approx. 30 minutes.

In order to cover the weekly fuel demand of the boiler, arrival of approx.: 40 trucks per day for the boiler combusting 110 thousand tons of waste per year is necessary from Monday to Friday.

Waste delivered to the premises of ITPFP will be unloaded in the waste collection hall. The hall will be a closed building enabling separation of unloading works from the external environment, thus enabling reduction of the possibility of odor and noise penetration when unloading waste. The closing and opening of gates leading to the unloading hall will be automatically controlled with light signals installed accordingly at the gates to the unloading hall. The signaling system will be integrated with the traffic control system. Stations for unloading of trucks will be separated inside the hall. Minimum dimensions of the hall will be 20x18 m. Each unloading station will be provided with a dedicated entry gate. The minimum height of the hall will be 12 m from the floor to the floor slab. The driver, before entering the waste collection hall, should know which unloading station located by the bunker is assigned to it. The receipt station capacity will enable covering of the rated boiler demand for fuel, at the same time building a stock and assuming that deliveries will be accepted from Monday through Friday, from 8:00 a.m. to 8:00 p.m. Negative pressure will be maintained in order to prevent odors from escaping. At least 50% of primary combustion air will be supplied from the waste collection hall. In front of the hall, a manoeuvre yard will be planned for trucks delivering fuel, with a place for unloading the hook containers and removing the deliveries tarpaulin sheet.

Waste storage

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As the waste storage facilities, it is planned to construct a storage bunker for 5 days of reserve, which is the minimum retention of storage, guaranteeing the continuity of fuel deliveries to the plant during the so-called long weekends.

In the case of the planned plant, part of the necessary retention may be maintained on the premises of the planned ZGOK located approx. 3 km away from the plant (transport distance according to ZGOK), whereas reduction of retention at the CHPP site will be related to the necessity of providing deliveries during holidays.

From the bunker, the fuel will be fed by means of the overhead traveling crane with grabber to the boiler tank with the capacity ensuring supply of fuel to the boiler for half an hour. The system will be equipped with two automatic overhead traveling cranes (one stand-by), operating for 24 hours/day. The overhead traveling cranes can operate in the automatic mode and can be handled by the operator. It is assumed that the overhead traveling crane may be handled by the operator during two shifts. On the third shift, the crane will operate in the automatic mode.

The task of the operator will be to feed the waste to the boiler bunkers and mix the waste in order to homogenize its parameters.

The bunker design will include stand-by and overhaul stations for clamshells and overhead traveling cranes. The waste bunker area will include fire detection and alarm devices as well as devices for automatic extinguishing of fire spots. The storage interior will be visible from the main control center facilities which will be divided from one another with glazing.

Table 15. Storage retention specification

parameter		value
Description		grate-fired
Fuel		waste
Boiler thermal capacity	MW	41.8
Boiler efficiency	%	87%
Boiler power output in fuel	MW	48.5
Fuel power share	%	100%
Energy flow rate in fuel	MW	48.5
Net calorific value	MJ/kg	13.5
Bulk density	t/m ³	0.30

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parameter		value
Fuel stream	t/h	12.8
	m ³ /h	42.7
	t/d	307.8
	m ³ /d	1026.0
STORAGES		
Fuel stock	days	5
	t	1231.2
	m ³	4103.8
STORAGE HALL/BUNKER		
YES		
Capacity	m ³	4200
BOILER BUNKER		
YES		
Capacity of the boiler bunker	h	0.5
Number of boiler bunkers	pc.	1
	m ³	25

For the purpose of the plant with a grate-fired bunker, it is planned to install a bunker with the capacity of approx. 4000 m³. Accumulation of approx. 4000 m³ of waste will provide the unit with a stock for approx. 5 days.

Flue gas evacuation system - stack

Grate-fired boiler stack

Flue gas will be evacuated from the grate-fired boiler through a free-standing emission source E-1 with the height of $H \geq 60\text{m}$ and outlet diameter of $d_e \leq 2\text{ m}$. Flue gas treated in the relevant systems will be evacuated to the stack which will be located to the south-west from the main building, through a flue gas duct. The design and material solutions of the stack will be adapted to the evacuated flue gas parameters, including their temperature. The stack flue will not have any local narrowing. The maximum velocity of flue gas in the stack will be 16 m/s. The stack solution will ensure the run-off of condensate to the inside of the stack, so as to prevent the stack from getting dirty on the outside. If there is a

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possibility that the condensate accumulates in the stack, the stack will be equipped with condensate evacuation system with a condensate tank, if the condensate parameters prevent the condensate discharge to the drainage system. The stack shall be equipped with the following accessories and systems:

- inspection openings and maintenance manhole,
- nozzles for continuous and periodic monitoring of flue gas,
- lighting protection system and electric system,
- ladder and service platforms.

Peak load boiler house stack

The boiler will be equipped with complete flue gas ducts necessary for correct equipment operation. Expansion joints, flaps, manholes, measuring ports, flow meters and supports will be installed on the ducts. For flue gas evacuation from the peak load boiler house, one new, complete steel multi-flue stack with lines dedicated to each boiler or individual stacks will be executed. Stack parameters: height of $H \geq 25$ m and outlet diameter of $d_e \leq 0.9$ m. Each stack flue will be equipped with:

- inner lining or steel insert which will be resistant to detrimental flue gas impact.
- thermal insulation.
- system for taking periodic measurements and controlling emissions to determine SO_2 , NO , NO_2 , CO and particulate matter levels in the flue gas stream (measurements and emission control), as well as nozzles enabling to install a continuous monitoring system,
- platforms.

The stack will be also equipped with:

- control galleries with ladders, stairs, accesses and passages, transportation and vertical communication,
- complete control and overhaul equipment,
- lightning protection system,
- condensate draining system with condensate neutralizer,
- anticorrosive protection of stack steel components and concrete components exposed to detrimental flue gas impact,
- protection of reinforced concrete components below the ground level.
- benchmarks, signs for geodetic measurements during construction and in the period of operation,
- other equipment and systems required for correct and safe stack operation.

Sorbent feeding system for reduction of SO_2 emission

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Sorbent in the form of burnt or hydrated lime for removal of acid components from flue gas (semi-dry technology - reactor with a bag filter) will be stored in a retention tank with the capacity of 60m³, equipped with a bag filter and ID fans. A transport pump will be installed under the sorbent tank.

The system will consist of the following elements:

- unloading system for sorbent transported by trucks,
- storage with silos and auxiliary equipment,
- sorbent dosing system for the flue gas treatment process system,
- pneumatic and mechanic transport systems within the storage and unloading points.



Figure 15. Reactor for semi-dry desulfurization by Keppel Seghers

(source: www.keppelseghers.com)

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Sorbent feeding system for reduction of NO_x emission

Ammonia water with concentration of 24% or carbamide will be transported to the plant by means of road transport (including road tankers). The road tankers will be unloaded in the carbamide unloading point, on a leakproof unloading tray with a leakproof soak pit, collecting leaks that may occur during the unloading process. Dimensions of the tray will enable unloading of one road tanker. The leakproof tray will be provided with the possibility of discharge of possible ammonia water and rain water leaks. The ammonia water feeding system from unloading to the storage tank will consist of a pipeline route made of acid resistant steel. An unloading pump will be used for unloading. A double-shell tank made of polyester and glass resin will be used as the storage tank. Around the tank, a leakproof basin will be executed enabling discharge of possible ammonia water and rain water leaks. These leaks will be collected by a specialized company. Ammonia water will be transported from the storage tank to the pumps using a pipeline. It is assumed to transfer ammonia water from the pumping station building to the boiler house building using a pipeline made of acid resistant steel, laid on a process pipe rack. Pumps, ammonia water pipelines and fittings will be made of stainless steel. Size of the system (injections, number of lances, number of injection levels and number of catalytic layers) will be adjusted to nitrogen oxide content at the outlet from the boiler, resulting from fuel parameters and operational parameters of the executed boiler. The volume of injections will be based on the NO_x and NH₃ content in flue gas downstream the boiler. For this purpose, an automatic regulation system with flue gas analyzer will be incorporated into the control system.

Selective non-catalytic reduction plant for nitrogen oxides

Emissions of nitrogen oxides from flue gas may be reduced by means of ammonia water or carbamide injection to the boiler. The system of feeding sorbent to the boiler will enable provision of the process (injection) nozzles with approx. 60kg of ammonia water per hour (24% of carbamide water solution) or carbamide.

Selective catalytic reduction plant for nitrogen oxides

Emissions of nitrogen oxides from flue gas may be reduced only using the SCR method. The SCR plant may operate based on the use of ammonia water or carbamide solution, dosed to the individual lines introducing sorbent within the entire flue gas flow cross-section in the duct upstream the SCR reactor. Catalytic reduction of nitrogen oxides is performed in the reactor on the installed catalytic modules.

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System for dust capture from flue gas

In front of the boiler house, apart from the main building, in its immediate vicinity, a high-efficiency equipment for fly ash removal from flue gas flow rate from the boiler - a bag filter - will be located. The filter will consist of several modules. A structure composed of several modules will enable inspections, replacements and maintenance of the bags without shutdown of the entire plant. The filter will guarantee dust emission level compliant with the standards in all operating conditions, for the entire range of fuel properties and environment conditions. The dust settling from the bags will be directed to the filter bottom hoppers, from where it will be collected using the dust collection system. In this type of system, the bag filter is not only a flue gas dust separator, but it also supports operation of the reactor in further flue gas desulfurization, reducing SO₂ to even 10%.



Figure 16. Exemplary fabric filter

(source: Best Available Techniques (BAT) Reference Document (BREF) for Waste Incineration, August 2006).

Odors

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In order to reduce the noxious odor generated during waste landfilling, an air intake for the combustion process will be installed in the feed bunker building. In the bunker chamber, negative pressure will be maintained and odors will not be present outside the building. Air taken from the bunker building will pass through the boiler and the flue gas treatment plant. Gas leaving the stack will be free from odors.

Furnace waste discharge systems

The following furnace waste will be generated in the process of municipal waste combustion in the grate-fired boiler:

- slag,
- fly ash,
- other flue gas treatment products.

Type of waste from the flue gas treatment line depends on the adopted technical solutions. Depending on the technical solutions, waste with the following codes may be generated in the grate-fired boiler:

- 19 01 12 Slags and furnace ashes other than 19 01 11,
- 19 01 15* Boiler dust containing hazardous substances,
- 19 01 13* Fly ash containing hazardous substances,
- 19 01 07* Solid waste from exhaust gas cleaning,

(*) In accordance with the terminology adopted in the Ordinance on the waste catalog, the star means hazardous waste.

The below table includes the anticipated volumes of furnace waste generated in ITPFP.

Table 16. Volume of furnace waste generated in the grate-fired boiler

Furnace waste		Size of waste
Ash from the boiler and other flue gas treatment products - hazardous	thousand t/a	5.5
Slag (dry) - non-hazardous	thousand t/a	18.7

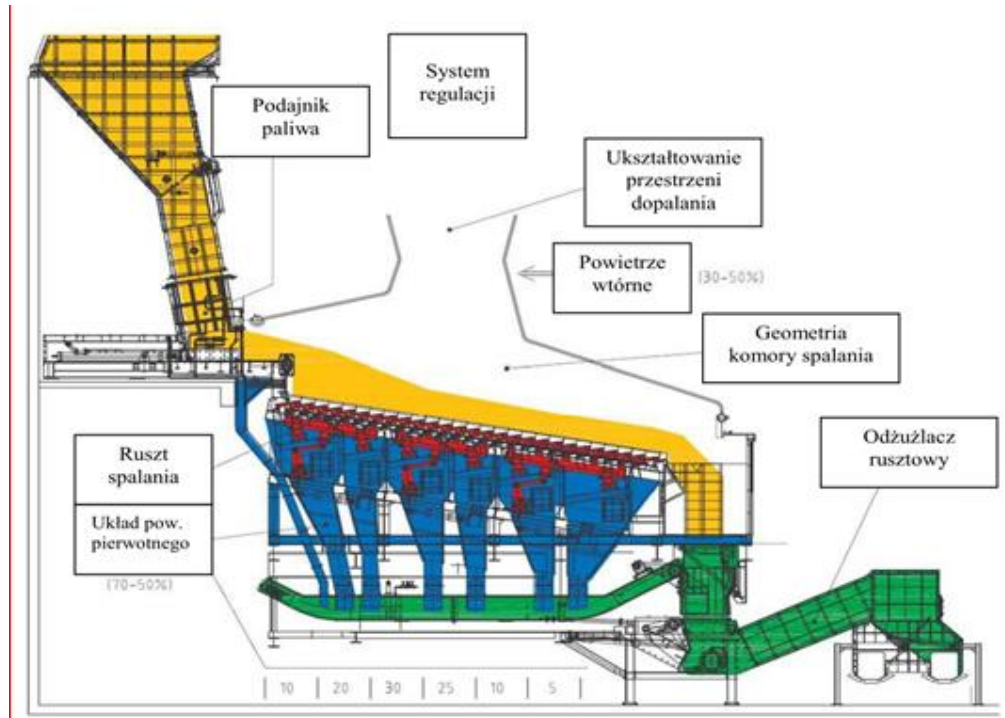
It is assumed that slag will be collected by external companies after valorization or not, whereas ash and waste from the flue gas treatment plant will be stabilized to non-hazardous form and then also collected by external companies or landfilled. Alternatively, ash may be provided to a specialized company in a non-stabilized form.

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Slag

Slag as non-hazardous waste will be collected by specialized companies, after seasoning. Slag that is created as a result of a waste-to-energy process will be transported from the slag removal equipment with a water seal using conveyors.

Seasoning is aimed at improvement of slag properties, mainly at reduction of metal leachability and stabilization of the waste. Slag should be stored on a concrete surface under a shelter, equipped with a system for discharging and collection of leachate water. The main substances reacting with compounds contained in the waste cover carbon dioxide contained in the air and water (air humidity, rain). As a result of seasoning, reduction of metal leachability and slag stabilization occurs. Slag should be regularly raked to ensure similar seasoning conditions for all particles. In practice, the time of slag seasoning is from 6 to 20 weeks. After this period, slag may be used as an additive to bitumen. It is planned that as a result of slag seasoning, a small leachate will be generated in the amount of approx. $\sim 0.2 \text{ m}^3/\text{h}$ which will be pre-treated prior to discharge to the industrial wastewater drainage system. Slag will be raked and loaded on trucks by means of a wheel loader. Protection against secondary dusting shall be provided by an appropriate structure of the seasoning shelter. Seasoning shall be performed in separated areas, divided with appropriately high walls and roofed. For the purpose of slag seasoning, it is planned to install a shelter with dimensions of approx. 16x20, including a slag crusher and possible metal capture in slag separators. It is also planned to collect slag by specialized companies without preliminary processing and seasoning.



PL	EN
Podajnik paliwa	Fuel feeder
System regulacji	Regulation system
Ukształtowanie przestrzeni dopalania	Shape of the after-combustion space
Powietrze wtórne	Secondary air
Geometria komory spalania	Combustion chamber geometry
Odzużlacz rusztowy	Grate-fired slag removal equipment
Ruszt spalania	Combustion grate
Układ pow. pierwotnego	Primary air system

Figure 17. Example of a combustion grate including fuel feeder and slag removal equipment

(source: <http://ecogenerator.eu/aktualnosci/102.html>)

Fly ash

Fly ash and waste from the flue gas treatment plant will be stabilized on the premises of the new CHPP or, possibly, at an external site, e.g. at ZGOK, and then collected. Ash and waste from the flue gas treatment plant, prior to feeding to the stabilizing line, will be stored together. Retention of the storage tank will amount to approx. 7 days.

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Hazardous waste in the form of ash and waste from flue gas treatment plant will be subject to stabilization during which their physical and chemical parameters will change. The post-stabilization product is non-hazardous and can be stored on landfills for non-hazardous waste. Waste stabilization is aimed at reduction of washing out of elements and compounds through closing chemical compound chains. Stabilization results in chemical binding of pollutants washed out from waste (mainly metals), and the leachability of these pollutants from the stabilized material will be within the range allowed under Polish and European Union regulations.

Stabilization occurs with the use of:

- binding agent, the concentrate of which is a mixture of inorganic and organic monomers and surface active polymers
- hydraulic binder - most often cement,
- water,
- chemicals,
- possible, solid additives of slag, lime, sand.

The essence of the technology is based on the fact that the monomers and polymers activate binding properties of the hydraulic binder (cement) through change of the surface tension. Components of the binding agent form with the pollutants contained in waste crystalline structures and direct molecular bonds, effectively binding these pollutants and preventing their washout from waste.

As the minimum temperature in which stabilization is possible amounts to +5°C, the plant will operate in the building.

There are technologies ensuring that secondary waste after stabilization may be used for manufacture of functional products for the construction or road construction industry. In such a case waste will be processed based on two stages:

- preparation of mass through mixing of ashes with stabilizing materials,
- production of functional products from the prepared mass (e.g. linear drainage, flood slabs, elements of sewer manholes, road slabs, elements of roads and highways, railway traction weights).

In addition, the amount of chemicals and binding substances, in the case it is needed to obtain products, may significantly differ from the amount and composition of substances that ensure binding of non-hazardous substances only. At the same time, there is a risk of lack of potential customers for such products. In this document, it is assumed that both technologies may be used; however, the stabilization and solidification of secondary waste to parameters that will enable storage of the generated product are less advantageous for the environment.

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For the needs of the stabilization plant, it is planned to install a hall with dimensions of approx. 12x20 m. It is not assumed to produce construction materials on the premises of the Combined Heat and Power Plant. It is assumed that the solidification and chemical stabilization plant will operate 60 hours per week (i.e. 12 hours per day, 5 days per week) - 2 shifts. 4 persons will be employed per shift.

Table 17. Estimated amount of post-stabilization product

Furnace waste		grate-fired boiler
Estimated amount of post-stabilization product	thousand t/a	8.14

The stabilization process will result in generation of non-hazardous waste with the following codes:

- 19 03 07 Solidified non-hazardous waste, or
- 19 03 05 Stabilized non-hazardous waste.

Technical indicators of the waste stabilization and solidification system according to technology of one of the suppliers was the basis to calculate the amount of post-stabilization product. The following indicators have been adopted for the calculations:

- total volume of waste – approx. 67.7%,
- cement, binding agent, burnt lime, water – 22.97%,
- filler – 7.2% - Slag from the boiler has been used as the filler,
- chemicals ($\text{Na}_2\text{S} \times \text{H}_2\text{O}$, $\text{FeSO}_4 \times 7 \text{ H}_2\text{O}$) – 2.13%.

The waste generated in the stabilization process may be deposited at the landfill in Wysieka which is planned to be extended. For the landfill, an environmental decision was issued on February 11, 2010 by the Head of the Municipality of Bartoszyce. On October 27, 2009, ZGO Sp. z o.o. in Bartoszyce applied for the decision on environmental constraints for implementation of the Investment Project consisting in Extension of Zakład Gospodarki Odpadami Komunalnymi Sp.z o.o in Wysieka, Municipality of Olsztyn. In accordance with the statement of grounds, the landfill in Wysieka will act as the regional landfill where mainly the waste remaining after the processes of recovery and neutralization of waste will be stored. One of the tasks of the Investment Project includes construction of a landfill basin, area IV, for stabilized waste after neutralization at ZGOK in Olsztyn. It is also possible to collect waste without stabilization.

Oil systems

Light fuel oil will be used for the needs of the peak load back-up boiler house only.

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Consumption of light fuel oil will amount to a maximum of approx. 6.6 t/h at the maximum load of the oil-fired peak load back-up boiler house, i.e. two boilers with a capacity of 38 MW_t each. Light oil will be stored in an overground double-shell tank with the maximum capacity of 1000 m³. Oil will be delivered by road tankers. The unloading station will be equipped with unloading pump system 2 x 100%. Capacity of each pump will enable unloading of a road tanker with the capacity of 20 m³ in the period not longer than 0.5 hour.

Gas system

The scope of the customer shall include execution of the following elements of gas infrastructure:

- connection gas pipeline - from the PSG gas station to the ITPFP gas station,
- ITPFP gas station,
- internal gas pipelines.

Diameter of the connection pipeline from the PSG gas station to the ITPFP gas station will be DN 100 PN 63. In the gas station, lines for gas preliminary cleaning and reduction of pressure to the level suitable for feeding the boilers shall be installed. The station shall be unmanned and it shall consist of separate reducing station and I&C rooms, separated from each other by means of a gastight wall. A gas pipeline will be provided from the station to the grate-fired boiler and the peak load boiler house.

Electricity output system

Power shall be output from the steam turbine generator by means of a cable line to the 110kV switching station through the 6.3kV switching station and the 110/6.3kV unit transformer. Power supply of the Unit auxiliaries and own consumption systems will be provided from the 6.3kV switching station through the 6.3/0.4kV transformer and the 0.4kV two-section switching station.

Stand-by power supply shall be provided from the nearby running 15kV line through the 15/0.4kV transformer. Installation of a diesel generator is planned as an additional emergency power supply.

Cooling water system and steam-water cycle

The scope of the cooling water system for the purposes of heat discharge from the turbine generator unit and heat receipt from process equipment will include the mechanical draft cooling tower and circulating pumps.

The cooling tower will be the source of permanent noise, hence its location influences the technical solutions in order to ensure the allowable noise level in the areas subject to noise protection, located around ITPFP.

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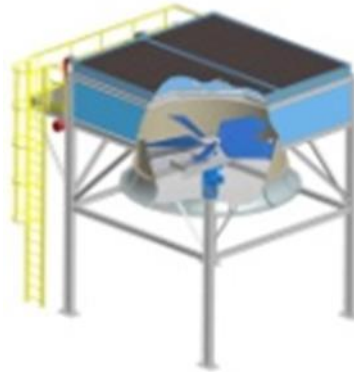


Figure 18. An example of the dry mechanical draft cooling tower

(source: http://www.uniserv.com.pl/pl/budowa_chlodni_wentylatorowych_suchych.html)

Systems and equipment for collection, treatment and discharge of industrial wastewater, rain and thaw water

Sanitary, industrial and rain water drainage system will be in operation on the site of ITPFP. Rain and thaw water will be pre-treated in the plant and then discharged to one of the consumers, i.e. the existing irrigation and drainage system (Struga Szczęsne) and/or to the soil on the premises of the planned Investment Project. Rain water may be also managed in the area of the plot to which the investor holds a legal title. It is planned that the rain water pre-treatment system will be composed of:

- hydrocarbon separation system,
- suspended matter sedimentation system,
- retention tank.

Industrial wastewater after pre-treatment and gray and black water will be discharged to the wastewater equalizing tank and then to the drainage system of Przedsiębiorstwo Wodociągów i Kanalizacji (Municipal Water and Sewerage Company) - hereinafter referred to as PWiK, in accordance with the conditions agreed upon with the utility company. At the facilities generating wastewater contaminated with suspended matter or containing oil, pre-treatment and protection equipment will be used:

- sedimentation tanks,
- separators.

Gray and black water and industrial wastewater discharged to the drainage system of PWiK will meet the requirements set out in the Ordinance of the Minister of Construction concerning methods of fulfilling the duties of industrial wastewater suppliers and conditions for introducing wastewater to drainage facilities (Journal of Laws of 2006 No. 136, item 964). Prior to introduction to the consumer, rain and thaw water will be pre-treated in the rain water treatment system. In the case of heavy rainfall, rain water will be directed to the retention tank. At the facilities generating wastewater contaminated with

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suspended matter or containing oil, pre-treatment and protection equipment will be installed (sedimentation tank, separators).

7.2. Main processes in the systems of the planned Investment Project

Combustion of fuel from waste in the grate-fired boiler will be the basic process from the perspective of the environmental protection that will be implemented in ITPFP to generate power.

Fuel combustion process

The technology of municipal waste combustion in grate-fired boilers is a widely used and approved technology. Grate-fired boilers are the most often used technology for municipal waste combustion. They are a technically proven solution and can be offered by numerous suppliers.



Figure 19. Photo of a grate-fired boiler

(source: http://www.ec.olsztyn.pl/technologie_noweg_zrodla/nowe-zrodlo)

In grate-fired boilers it is possible to use different types of grates - fixed, moving. The grate structure depends on the properties of the used fuel and is different for unprocessed municipal waste and fuel generated from waste. Each waste combustion plant, pursuant to the Law, is equipped with gas or oil burners. The purpose of the burners is to support start-up and stop of the boiler. During shutdowns, the burner supports the process as long as not combusted waste is present in the combustion chamber.

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Similarly, during start-up the burners operate as long as waste combustion ensures the appropriate temperature, required under the Law. The burners activate automatically also when the gas temperature drops below 850°C. Waste will be combusted in the furnace chamber which is an integral part of the boiler and the heat of hot flue gas is received by the boiler convection surfaces. Parameters of steam produced from waste combustion are low compared to parameters of steam from boiler fired with conventional fuel. This is due to the composition of fuel from waste and the related higher risk of corrosion of the boiler convection surface. The grate structure will ensure transport of waste on the grate and appropriate supply of combustion air. Suppliers of boilers offer different types of grates (reciprocating, belt, roller and other). At the initial section of the grate, waste will be dried, deaerated, gasified, and next the main combustion and possible after-combustion of the not completely combusted waste will follow. Above the main grate combustion zone, there is an after-combustion chamber ensuring after-combustion of solids and gases generated during combustion. In the after-combustion chamber, above the secondary air nozzles, supportive burners are installed aimed at maintaining flue gas temperature at the level of 850°C, supporting the start-up and shutdown of the boiler. The combustion process will be implemented so as to ensure complete combustion of flammable substances, high efficiency of heat transfer and low emission of harmful substances to the environment. The obtained heat will be used for generation of steam in the steam boiler. The boiler will be of drum type with natural circulation and negative pressure in the combustion chamber. Boiler walls will be made of tight membrane walls. The boiler pressure system will be composed of water preheaters, an evaporator with a drum and steam reheat.

Process of sulfur dioxide emission reduction

The process of reduction of sulfur oxide emission generated during combustion of fuel from municipal waste in the grate-fired boiler will be implemented in the semi-dry flue gas desulfurization plant. In this process the flue gas flow through the scrubber, in which solutions or suspended matters of alkaline compounds (mainly calcium and sodium) are sprayed and SO₂ is absorbed on the droplets surface, penetrates to their inside and reacts forming sulfates and sulfites. The amount of water in a semi-dry FGDP is adjusted so that it completely evaporates (dry product).

The temperature of post-process flue gas equals 70-80°C. In order to achieve high efficiency of desulfurization, the flue gas is present in the scrubber for 5 - 10 seconds. Dry flue gas desulfurization products are captured in the dust separator. Flue gas desulfurization efficiency in a semi-dry FGDP ranges from 60 to 90%. Efficiency of the process depends on the Ca/S relation, time of absorbent contact with flue gas, size of the phase-to-phase surface, temperature of the process. Flue gas will be mixed with water sorbent solution in the form of lime or hydrated lime in the semi-dry reactor. Sprayed sorbent will react with SO₂, HCl and HF with simultaneous complete evaporation of water and reduction of flue gas temperature of up to approx. 140°C. In order to ensure proper spraying of lime solution and cooling

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water, atomizer will be used in the reactor. In the reactor, partial reduction of the volume of dust and heavy metals will occur as well. Dust, part of the dry reaction product and unreacted sorbent will settle on the bottom of the absorber and will be discharged to the ash retention tanks by means of a conveyor. The majority of particles follows the flue gas to the final dust separator, which is the bag filter. To increase the reliability of desulfurization, two-stage desulfurization may be used. The first stage includes a semi-dry reactor with water sorbent solution - lime milk. The second stage covers injection of dry sorbent - sodium bicarbonate - to the flue gas duct. Sodium bicarbonate allows for maintaining emission standards in the case of large fluctuations of fuel quantity and abrupt increase in the amount of acid gas in flue gas. At present, the necessity of using the second desulfurization stage is not assumed - already the first stage allows for reducing the emission below the level set out in the emission standards.

Process of NO_x emission reduction

Emission of nitrogen oxides from the grate-fired boiler will be reduced using the primary and secondary methods:

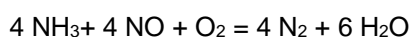
Primary methods

Reduction of nitrogen oxides using primary methods consist in maintaining the combustion temperature at a low level (850 - 900°C), which hinders forming of thermal nitrogen oxides and reduces penetration of nitrogen bound in fuel to flue gas and, through combustion air supply in stages and optimum oxygen content. Due to the low temperature in the boiler, the "thermal" formation of NO_x by oxidation of nitrogen molecule is insignificant. Creation of NO_x due to the nitrogen in the fuel is reduced by the "stage" combustion.

Secondary methods - selective non-catalytic reduction (SNCR) of nitrogen oxides

Reduction of nitrogen oxide emission using secondary methods consists in dosing a reacting substance to flue gas which reacts with nitrogen oxides.

In the designed grate-fired boiler, the SNCR method can be used. The SNCR method consists in multi-point injection of the reacting substance to the boiler where the reacting substance reacts with nitrogen oxides without the catalyst. Ammonia water will be the reacting substance. Ammonia will react with nitrogen oxides according to the overall reaction:



Nitrogen oxide reactions are most effective in the temperature of 850 ÷ 1,050°C. The use of the SNCR method minimally influences the combustion process and boiler operation. The minimum, resulting from the requirement to maintain the nitrogen oxide emission standard, reduction rate for

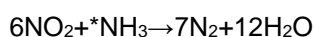
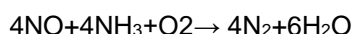
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emission of this pollutant in the grate-fired boiler combusting fuel from waste is presented in chapter 14 of the Report. Carbamide may be a reacting substance in the SNCR plant as well.

Secondary methods - selective catalytic reduction (SCR) of nitrogen oxides

In the designed grate-fired boiler, the SCR method can be used as well. The SCR technology consists in reduction of nitrogen oxides as a result of a catalytic reaction. In these methods the reaction of NO and NO₂ with NH₃ is used. This method employs the catalysts on the surface of which the reaction of NO and NO₂ with NH₃ at temperatures as low as 130°C is possible. In order for the reaction to be implemented properly, a number of parameters must be maintained. The basic advantage of the SCR process is the reduction of reaction temperature between ammonia and nitrogen oxides. Owing to the above, the ammonia combustion process does not take place and the hazard of breakthrough of unreacted NH₃ may be reduced to minimum (normally in the range between 1 and 3 ppm). In the SCR process, the ammonia is injected to the flue gas upstream one or more layers of catalyst. The quantity of injected ammonia depends on NO_x concentration at the inlet and on the required NO_x removal rate. It is worth noting that the entire NO_x reduction process is carried out with only minimum losses in the form of unreacted ammonia (NH₃ slip).

The main chemical reactions occurring on the catalyst surface:



Due to selective components, the catalyst shows high activity towards NO_x reduction and selective activity towards other compounds. Ammonia and NO_x react molecularly to form nitrogen and water. The oxygen is constantly required to maintain correct degree of oxidation and is supplied from the oxygen present in the flue gas from the boiler.

Process of dust emission reduction

Emission of dust from the grate-fired boiler will be reduced using high-efficiency dedusting equipment - bag filters. The process of treatment of flue gas from dust in the bag filter will be carried out in a two-stage mode, i.e. by means of expansion of flue gas in the hoppers and chambers (modules) of the filter, causing gravitational precipitation of the thickest fractions of dust from the flue gas stream - 1st stage, and then on the outer surface of the filter bags - 2nd stage, where the process of fine flue gas treatment by retaining dust particles on the outer surface of the filter material - the bag - is performed. Dust settled on the outer surface of bags creates a supportive filtration layer. This layer protects the

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bags against wear and improves the effect of dust particles separation from flue gas. In addition, in the "dust cake" created on the bags surface, during the dedusting process, further reduction of acid gas components (SO_2 , SO_3 , HCl , HF), heavy metals, dioxins and furans occurs as a result of reactions between these components and the unreacted calcium hydroxide and activated carbon. Along with the increasing thickness of the dust cake, the resistance of flue gas flow through filter grows and the dust cake is periodically removed from the bag surface. Dust is removed (filter regenerated) periodically – with impulses of compressed air blown into each bag. The bag filter is not only a flue gas dust separator, but it also supports operation of the reactor in further flue gas desulfurization, reducing SO_2 to even 10%. The minimum, resulting from the requirement to maintain the dust emission standard, reduction rate for emission of this pollutant in the grate-fired boiler combusting fuel from waste is presented in chapter 14 of the Report.

Process of reduction of dioxins, furans and mercury emission

Between the reactor and the bag filter, activated carbon will be introduced to the plant. Dry activated carbon introduced to the plant adsorbs mercury, dioxins and furans. Reactions of the reduction of the amount of harmful substances from flue gas take place in both the flue gas ducts and on the bag filter surface.

Reduction methods of PCDD/PCDF (dioxins/furans) emission to the level required for the tested plant have been divided into primary and secondary.

Primary methods should be understood as techniques preventing formation of pollutants that comprise reduction or elimination of PCDD/PCDF generation from the plant. These methods may include

- appropriate preparation of fuel,
- use of after-combustion.

Secondary methods comprise techniques for pollutant emission reduction. These are not methods for prevention of PCDD/PCDF formation at the source, but methods for reduction of their emission to air. These methods may include:

- after-combustion
- high-efficiency equipment for dust removal,
- adsorption on activated carbon in combination with the use fabric filters.

Boilers supplied with waste are equipped with additional after-burners. Adequately high combustion temperatures cause decomposition of dioxins, furans and their precursors. It turns out that the temperature exceeding of which results in destruction of structure of certain dioxins and furans amounts to 850°C , with the assumption that the time of this temperature action is not shorter than 2 seconds and - in the best scenario - longer than 3.0 seconds.

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Further reduction of the quantity of dioxins and furans follows owing to the use of activated carbon. Carbon can be injected to the flue gas duct or used in the form of a bed. During injection of the activated carbon dust, PCDD/PCDF are adsorbed on carbon particles. These particles must be captured on the fabric filter. The adsorption process occurs also on the fabric filter surface. Therefore, it is necessary to evenly distribute the activated carbon on all sleeves of the fabric filter. Such absorber eliminates also residues of heavy metals (in particular mercury vapor) from flue gas, which are absorbed by activated carbon or coke. Depending on the flue gas treatment technology, type of fuel and type of the activated carbon used, flue gas in the quantity of 50 to 150 mg/Nm³ is introduced to the plant. The minimum, resulting from the requirement to maintain the mercury emission standard, reduction rate for emission of this pollutant in the grate-fired boiler combusting fuel from waste is presented in chapter 14 of the Report.

Water treatment process

Water treatment plant

In the Water Treatment Plant, for the purpose of making up the cooling circuit, water treatment process will be implemented. The Water Treatment Plant will be supplied with water from PWiK. The Water Treatment Plant consists of:

- water filtering system with auxiliary systems,
- water softening system with auxiliary systems,
- water demineralization system with auxiliary systems.

In addition, it is planned to execute a feed water connection pipeline, raw water tank with a pumping station, softened water storage tank with a pumping station and demineralized water tank with a pumping station. Chemicals used in the water treatment process are specified in chapter 7 of the Report.

For the purpose of the planned Investment Project, a complete rain water treatment system and a industrial wastewater retention and equalizing tank will be provided, enabling discharge thereof from the premises of ITPFP, which will be composed of:

- industrial wastewater retention and equalizing tank with at least 24-hour retention, with auxiliary systems,
- rain water treatment system and rain water retention tank,
- pipelines discharging industrial wastewater to the drainage system of PWiK and rain and thaw water to the irrigation and drainage system of the city of Olsztyn.

Wastewater from the water treatment process

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Wastewater generated in the process of water softening and treatment will be used for management of furnace waste.

Treatment process of wastewater containing oil

Wastewater containing oil will be locally treated using oil traps (oil separators) in which water will be separated from oil and discharged to the drainage system, whereas oil accumulated in the separator chamber will be periodically collected in barrels and, as waste, provided to authorized entities. Tanks, trays or basins will be used to protect against possible oil leaks. First of all, oil separators will be installed at the oil management facilities.

Treatment process of wastewater contaminated with suspended matter

Wastewater contaminated with suspended matter, in particular wastewater from floor washing, will be treated in the industrial wastewater drainage system using separators for preliminary sludge removal.

7.3. Main design assumptions for raw materials and fuels that will be used in ITPFP

Primary fuel

Fuel for the grate-fired boiler will include:

- waste from ZGOK Olsztyn - alternative fuel with code 19 12 10 - Flammable waste (alternative fuel)
- high-energy fraction remaining after municipal waste sorting;
- high-energy fraction remaining after composting of 20-80mm fraction;
- waste with parameters similar to those of the above waste.

The below table includes types and quantities of fuel from waste and waste intended for combustion in the new unit.

Table 18. Types and quantities of fuel from waste and waste intended for combustion in the grate-fired boiler

Item	Fuel	Fuel stream in thousand t/year	Remarks
1.	Combustible fraction of municipal waste from ZGOK	40-55	Fuel from waste of parameters compliant with the declaration of ZGOK

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2.	Fuel from waste generated in plants other than ZGOK	0-15	
3.	High-energy fraction left over after municipal waste sorting	25-50	High-energy fraction left over after municipal waste sorting at RIPOK (Regional Municipal Waste Processing Plant) and from other sources, provided that the waste parameters are similar to the parameters of the high-energy fraction from RIPOK
4.	High-energy fraction remaining after composting of municipal waste fraction	0-20	Fraction left over after composting is to a great extent a fraction with grain size ranging between 20 and 80 mm, less often 20 and 120 mm. The energy parameters of this waste fraction are lower than those of other waste intended for combustion at the Unit. The fraction after composting contains significant amount of glass.
5.	Non-hazardous industrial waste	0-20	Other waste that could be combusted in the Combined Heat and Power Plant (including the wastewater sludge) with parameters similar to those of fuels defined in lines 1-3 of this table

Fuel from waste produced at ZGOK

At the moment of ITPFP handover for operation, in the area of the city of Olsztyn, ZGOK will function in which the plant for biological waste processing using biological drying of municipal waste will operate. The technology applied shall be compliant with the requirements of paragraph 4, section 4 of the Ordinance of the Minister of Environment of September 11, 2012 (Journal of Laws of 2012, item 1052) concerning mechanical and biological processing of mixed municipal waste. The waste generated in the process of biological drying of waste shall subsequently undergo further mechanical processing in

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accordance with paragraph 5 and 6 of the Ordinance. The waste thus processed will be used as fuel for the grate-fired boiler. Parameters of fuel defined as above are specified in the table below.

Table 19. Parameters of fuel from waste produced at ZGOK

Item	Parameter	Unit	Value
1.	Net calorific value	MJ/kg	15-17.0
2.	Moisture content	-	up to 20%
3.	Chlorine content	-	<1%
4.	Volume weight	kg/m ³	200-300
5.	Fraction grading		90% below 150 mm

Fuel from waste generated in plants other than ZGOK

Municipal waste transported to the waste processing plant is subjected to mechanical processing in accordance with the requirements specified in paragraph 3 of the Ordinance of the Minister of Environment of September 11, 2012 (Journal of Laws of 2012, item 1052) on mechanical and biological processing of mixed municipal waste. After separation of fractions suitable for use as materials and of fraction requiring further biological processing, the fraction suitable for energy generation is left. This fraction is subsequently treated and shredded. Such product constitutes a fuel from waste, with parameters specified in the table below.

Table 20. Parameters of fuel from waste produced outside ZGOK

Item	Parameter	Unit	Value
1.	Net calorific value	MJ/kg	10-14
2.	Fraction grading		90% below 90mm

High-energy fraction left over after municipal waste sorting

Municipal waste transported to the MDP Plant is subjected to mechanical processing in accordance with the requirements specified in paragraph 3 of the Ordinance of the Minister of Environment of September 11, 2012 on mechanical and biological processing of mixed municipal waste (Journal of Laws of 2012, item 1052). After separation of fractions suitable for use as materials and of fraction requiring further biological processing, the fraction suitable for energy generation is left. This fraction will constitute fuel for the Unit. Parameters of fuel defined as above are specified in the table below.

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Table 21. Parameters of high-energy fraction left over after segregation of municipal waste at MBT

Item	Parameter	Unit	Value
1.	Net calorific value	MJ/kg	9-14
2.	Fraction grading		<300 mm

High-energy fraction left over after composting of municipal waste fraction at RIPOK

In the process of mechanical processing of mixed municipal waste, biodegradable fraction with grading of at least 0-80 mm is separated and, subsequently, subject to biological treatment in accordance with paragraph 4 of the Ordinance of the Minister of Environment of September 11, 2012 on mechanical and biological processing of mixed municipal waste (Journal of Laws of 2012, item 1052). As a result of biological processing, a stabilized compost is produced the biological parameters of which are specified in the above Ordinance. After classification of the stabilized compost on screens with mesh size of up to 20 mm, a waste is created, called in this case the High-Energy Fraction left over after composting of municipal waste fractions which can be used as the fuel for the Unit. Parameters of such fuel are specified in the table below.

Table 22. Parameters of high-energy fraction left over after composting of 0-80 mm fraction of municipal waste

Item	Parameter	Unit	Value
1.	Net calorific value	MJ/kg	6-8
2.	Fraction grading		90% in the range 20 - 80 mm

Auxiliary fuels

Natural gas

Natural gas with the below parameters will be the start-up and supporting fuel for the grate-fired boiler, as well as the fuel for the peak load back-up boiler house:

Table 23. Parameters of the network natural gas of E type acc. to PN-C-04753:2011

Item	Parameter	Unit	Value
1.	Upper Wobbe index		
1.1.	nominal	MJ/m ³	53.5
1.2.	range of variability	MJ/m ³	45.0-56.9

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Item	Parameter	Unit	Value
2.	Gross calorific value	MJ/m ³	≥ 34.0
3.	Net calorific value	MJ/m ³	≥ 31.0
4.	Odor intensity	% (V/V)	1.0
5.	Hydrogen sulfide content	mg/m ³	≤ 7.0
6.	Mercaptan sulfur content	mg/m ³	≤ 16.0
7.	Total sulfur content	mg/m ³	≤ 40.0
8.	Mercury vapor content	µg/m ³	≤ 30.0
9.	Oxygen content	% mole/mole	≤ 0.2
10.	Content of particulate matter with a particle size exceeding 5 µm	mg/m ³	≤ 1.0

Table 24. Parameters of the network natural gas of E type acc. to PN-C-04752:2011

Item	Parameter	Unit	Value
1.	Hydrogen sulfide content	mg/m ³	≤ 7.0
2.	Oxygen content	% mole/mole	≤ 0.2
3.	Carbon dioxide content	% mole/mole	≤ 3.0
4.	Dew point for water at the pressure of 5.5 MPa from April 1 to September 30	°C	+3.7
5.	Dew point for water at the pressure of 5.5 MPa from October 1 to March 31	°C	- 5.0
6.	Hydrocarbon dew point*	°C	0.0
7.	Content of hydrocarbons that may condensate at - 5°C at the gas pipeline pressure	mg/m ³	≤ 30
8.	Content of particulate matter with a particle size exceeding 5 µm	mg/m ³	≤ 1.0

Back-up fuel

L1 light fuel oil acc. to PN-C-96024:2011 with the below parameters will be the fuel for the peak load back-up boiler house:

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Table 25. Parameters of the L1 fuel oil acc. to PN-C-96024:2011

Item	Parameter	Unit	Value
1.	Density at 15 °C, max.	kg/m ³	860
2.	Net calorific value, min.	MJ/kg	42.6
3.	Flash point, min.	°C	56
4.	Kinematic viscosity at 20 °C, max.	mm ² /s	6
5.	Fractional composition:		
6.	- up to 250°C, max.	%(V/V)	65
7.	up to 350°C, min.	%(V/V)	85
8.	Flow temperature, max.	°C	-20
9.	Carbon residue after coking in 10% distillation residue, max.	%(m/m)	0.3
10.	Sulfur content, max.	%(m/m)	0.1
11.	Water content, max.	mg/kg	200
12.	Solid pollutant content, max.	mg/kg	24
13.	Residue after incineration, max.	%(m/m)	0.01
14.	Color	-	red

Sorbent for the flue gas desulfurization plant

For the flue gas desulfurization plant, sorbent in the form of burnt or hydrated lime will be used. It is assumed to use sorbents generally available and manufactured by different manufacturers. Minimum parameters of sorbents are presented in the table below.

Table 26. Hydrated lime

Item	Parameter	Value
1.	CaO	>70%
2.	MgO	<1.5%
3.	CaO + MgO _{reactive}	>66.7%
4.	CO ₂	< 3%
5.	SO ₃	<1%

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Item	Parameter	Value
6.	Moisture content	<2%
7.	Density	430-540 kg/m ³
8.	Granulation sieve residue	1mm – 0% 0.2mm < 2% 0.09mm < 7%

Table 27. Burnt lime

Item	Parameter	Value
9.	CaO	>90%
10.	MgO	<3%
11.	CaO + MgO _{reactive}	>90%
12.	CO ₂	<3%
13.	SO ₃	<1%
14.	Al ₂ O ₃	<0.6%
15.	Fe ₂ O ₃	<0.6%
16.	Density	800-1100kg/m ³
17.	Granulation sieve residue	1mm – 0% 0.09mm < 15%

The quantity of sorbent used for SO_x reduction is presented in table 12 of the Report.

Sorbent for NO_x reduction

24% ammonia water or carbamide will be the reacting substance for the plant for NO_x reduction in flue gas. It is assumed to use the products dedicated for the deNO_x plants generally available and manufactured by various chemical plants. Ammonia water - content of NH₃ min. 24% by weight,

The table below presents an excerpt from the ammonia solution material safety data sheet.

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Table 28. Identification of the substance acc. to the material safety data sheet

Component name	EC number	CAS number	Concentration, % by weight	Hazard designation	Classification
Ammonia, 24% solution	215-647-6	1336-21-6	24% NH ₃	R 10	C; R34 N; R50

Physical and chemical properties

Molecular weight (24% ammonia water):	17.91
State of aggregation, color, smell (20°C):	colorless liquid of characteristic, pungent smell of ammonia.
Reaction:	alkaline
Boiling point:	44°C
Melting point:	-50°C
Flammability:	non-flammable; there is a risk of vapor ignition
Explosion hazard:	there is a risk of vapor explosion
Water solubility:	very good.

The quantity of sorbent used for NO_x reduction is presented in table 12 of the Report.

Water for process purposes

Raw water characteristics - admissible values in accordance with the Ordinance of the Minister of Health of March 29, 2007 on the quality of water intended for human consumption (Journal of Laws of 2007 No. 61, item 417, as amended).

Table 29. Limit parameters of the raw water from the water supply main of PWiK in Olsztyn.

Item	Parameter	Unit	Value
1.	pH	-	6.5-9.5
2.	Conductivity	μS/cm	2500
3.	Turbidity	NTU	1

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Item	Parameter	Unit	Value
4.	Total organic carbon	mg/l	5.0
5.	Nitrates	mg/l	50
6.	Nitrites	mg/l	0.5
7.	Sulfates	mg/l	250
8.	Chlorides	mg/l	250
9.	Manganese	mg/l	0.05
10.	Sodium	mg/l	200
11.	Iron	mg/l	0.2
12.	Copper	mg/l	2.0
13.	Lead	mg/l	0.01
14.	Mercury	mg/l	0.001
15.	Hardness	mg/l	60-500

Annual water demand of ITPFP is presented in table 54 of the Report.

Potable water

Przedsiębiorstwo Wodociągów i Kanalizacji (Municipal Water and Sewerage Company) in Olsztyn will be the source of potable water for the employees working at operation of ITPFP. Average daily demand for potable water for the planned personnel has been estimated at 0.38 m³/h

Chemicals

- **water and wastewater management**

The following chemicals will be used in the water and wastewater management:

- raw water softening
 - softener regeneration - 60 kg of NaCl per one regeneration
 - regeneration after production of 55 - 72 m³ of softened water
- water demineralization station - RO membrane washing
 - ultrafilter 75 1l/ 2x per year, Ultrafilter 110 1l/ 2x per year.

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7.4. Relations with other investment projects

The Investment Project being the subject of this Report will be related to the Investment Project implemented in the city of Olsztyn, pertaining to organization of the waste management in the area of part of Warmińsko-Mazurskie Voivodeship. ITPFP will be an element of this system.

(based on the website of ZGOK – Zakład Gospodarki Odpadami Komunalnymi Sp. z o.o.)

The Investment Project is in particular aimed at solving the problem of waste management in the area of 37 municipalities of the central part of Warmińsko-Mazurskie Voivodeship. Implementation of the Investment Project through solving the problem of municipal waste management guaranteeing achievement of the Polish and European standards will contribute to improvement of the environmental condition within its impact. Construction of a specialized waste neutralization plant will contribute to reduction of waste deposited on the landfills. Thus, the Investment Project will contribute to the increase in the level of waste recovery also through an extended program for selective collection and environmental education.

The investment projects proposed as part of the Investment Project constitute support for the main development objective of the region by protection of the environmental resources and elimination of certain restrictions for sustainable economic development. Based on the performed analysis of the option, it has been assumed to implement in the ZUOK (municipal waste neutralization plant) the technology of aerobic stabilization of municipal waste prepared in the processed of mechanical segregation and reduction.

Plants comprised by the system and the reinstatement works are planned in the following municipalities:

- Municipality of Olsztyn - Zakład Unieszkodliwiania Odpadów Komunalnych (Municipal Waste Neutralization Plant) in Olsztyn.
- Commune of Mrągowo (Polska Wieś), Commune of Lidzbark Warmiński (Medyny) and Municipality of Szczytno (Trelkowo) - reloading stations with voluntary waste collection points (PDGO) (except for the station in Trelkowo).
- Municipality of Pisz (Kocioł Duży), Municipality of Dywity (Dywity), Municipality of Biskupiec (Adamowo), Municipality of Mikołajki (Zelwagi), Commune of Lidzbark Warmiński (Medyny), Municipality of Kiwity (Kierwiny), Municipality of Sępólno (Długa), Municipality of Barczewo (Łęgajny) - reinstatement of landfills.

Location of all plants and facilities covered by the construction works as part of the Project Investment is presented in the figure below:



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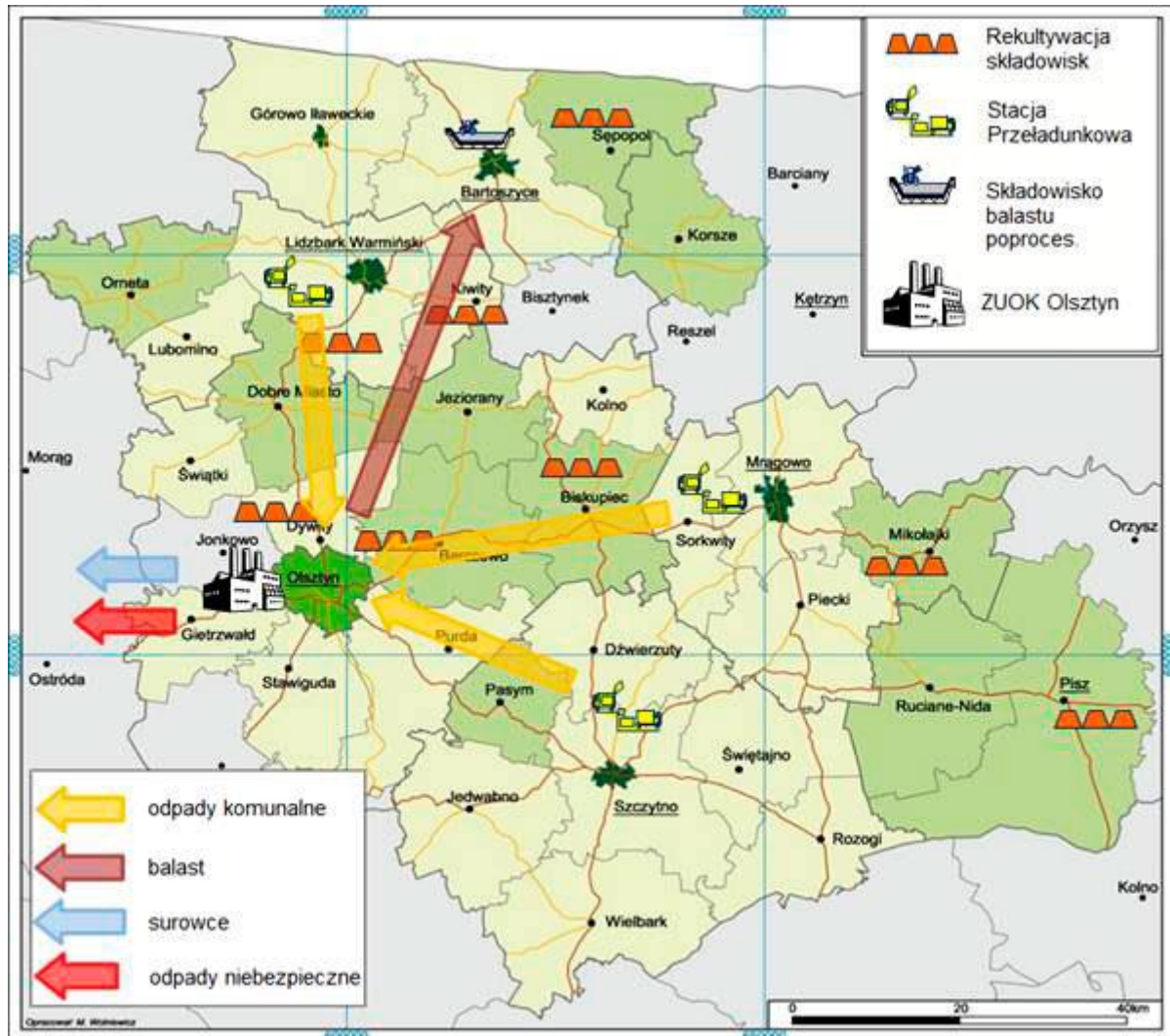


Figure 20. Plants related to organization of waste management in part of Warmińsko-Mazurskie Voivodeship

PL	EN
Rekultywacja składowisk	Reinstatement of landfills
Stacja przeładunkowa	Reloading station
Składowisko balastu poproces	Post-process ballast landfill
ZUOK Olsztyn	ZUOK Olsztyn
Odpady komunalne	Municipal waste
Balast	ballast
surowce	raw materials
Odpady niebezpieczne	hazardous waste

In addition, the investment projects related to ITPFP will include:

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- designed Ø400 mm water supply main from ITPFP to ul. Piłsudskiego; planned length of the section of the main will be 2,600 m,

For this investment project, Przedsiębiorstwo Wodociągów i Kanalizacji Sp. z o.o. in Olsztyn - the Investor - obtained on April 16, 2014 the Decision on environmental constraints (letter ref. No. WOOŚ.4210.16.2013.MG.23), and thereafter the Decision on the building permit.

On July 25, 2014, PWiK Sp. z o.o. issued the technical conditions for connection to the water supply and sewerage network for the real property comprising plots No. 25/1, 25/2, 25/3 cadastral district 89 and 6/1, 6/2 cadastral district 94 at ul. Lubelska in Olsztyn – Elektrociepłownia MPEC Sp. z o.o.

- sanitary sewerage system main sewer Ø600 mm, located along ul. Lubelska,

On April 4, 2014, PWiK Sp. z o.o., in the letter concerning the technical conditions for connection to the water supply and sewerage network for the real property comprising plots No. 25/1, 25/2, 25/3 cadastral district 89 and 6/1, 6/2 cadastral district 94 at ul. Lubelska in Olsztyn – Elektrociepłownia MPEC Sp. z o.o. specified the place and method of wastewater discharge from ITPFP.

- the designed high-pressure gas station on the premises of the Combined Heat and Power Plant; the designed high-pressure DN300 MOP5,5 gas pipeline between Nidzica, Olsztynek and Grądek will be the place of connection to the gas network,

on October 13, 2014, Polska Spółka Gazownictwa Sp. z o.o. Branch in Gdańsk specified the facility connection conditions to the gas network.

On September 2, 2014, Polska Spółka Gazownictwa Sp. z o.o. Branch in Gdańsk – the Investor - obtained the Decision on environmental constraints for the investment project consisting in construction of, i.a., the high-pressure gas pipeline.

- power output to the new 110kV switching station,

On April 2, 2014, Energa operator issued (case ref. No. 33/OL/MRP/2014) the connection conditions to the power system of ENERGA – OPERATOR SA. for the Olsztyn CHPP.

- new DN500 district heating main,

The concept of the district heating system main route was submitted by the President of Olsztyn to the contractor of the design documentation along with the program concept for ul. Towarowa, as the starting material for development of the building permit design being the basis for application for the decision on the permit to implement the road investment project.

- rain water drainage system,

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Considering all the conditions, mainly those of the Local Land Development Plan and technical conditions - 3 options are actually practicable:

- to the irrigation and drainage system (Struga Szczesne) - by means of gravitation or pressure (depending on the possibility of crossing the neighbors' plots;
- to the soil in the area of the plot;
- combination of a) and b).

Conclusions:

- The main component of the designed ITPFP will cover a unit used to manage the municipal waste combustible fraction ensuring the heat generation (heating water) for the purpose of the municipal district heating system of the city of Olsztyn and electricity to be supplied to the new 110kV switching station of Olsztyn CHPP. The unit will combust approx. 110 thousand t/year of fuel with the designed average annual time of utilization of the rated power in fuel of up to 8200h/year. The unit gross efficiency will amount to approx. 23%, gross available power output to 11.3 MW_e, whereas net power output to 9.6MW_e.
- The grate-fired boiler will be equipped with a combustion air system, flue gas evacuation system and furnace waste discharge system. Fuel will be fed from the bunker to the boiler bunker and then to the furnace chamber. Boiler efficiency will amount to 86%, and thermal power in fuel to 48.5 MW_t. Gas will be the start-up fuel.
- In the area of ITPFP, the peak load back-up boiler house will also be constructed, equipped with two natural gas-fired or light oil-fired boilers with thermal power input in fuel of approximately 38 MW_t each. Their efficiency will be at least 91,5%. Flue gas from the boilers will be evacuated with separate emission sources with a height of h=25m and outlet diameter of d = 0.9m each.
- In the unit, a back-pressure turbine will be used, equipped with deaerator and two DH exchangers with a heating water subcooling system in the closed cooling circuit.
- Emergency power supply will be provided by Diesel engine supplied with diesel oil. Flue gas from the generator will be evacuated to air with an emission source with a height of h=5m and outlet diameter of d = 125mm. Thermal power input in fuel will amount to approx. 0.85 MW_t, and electric efficiency to 36%.
- The fuel will be delivered to the plant by trucks. A weighbridge for the measurement of the amount of waste delivered by the supplier will be installed by the delivery station. Fuel in the quantity of 110 thousand t/day will be delivered by approx. 40 trucks from Monday to Friday.
- The bunker will ensure approx. 5 days of fuel stock. Fuel will be transported from the bunker to the boiler tank ensuring fuel deliveries to the boiler for half an hour.
- Flue gas will be evacuated using a free-standing emission source – stack, with a height of H≥ 60m and outlet diameter of d_e ≤ 2 m.

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- *Burnt or hydrated lime used in semi-dry technology (reactor with a bag filter) will be used as the sorbent for SO₂ reduction.*
- *The quantity of generated nitrogen oxides will be reduced using the SCR or SNCR method. Ammonia water or carbamide delivered to the premises of the plant using trucks will be the sorbent.*
- *A high-efficiency equipment in the form of a bag filter composed of several modules will be used to remove dust from flue gas. The dust settling from the bags will be directed to the filter bottom hoppers, from where it will be collected using the dust collection system.*
- *The bunker structure and the air intake for the combustion process in the bunker building will enable reduction of odors generated during waste landfilling.*
- *Slag will be subjected to seasoning in order to improve its properties. Then, it will be collected by external companies. The seasoning shelter structure will prevent secondary dusting.*
- *Fly ashes will be stabilized on the premises of ITPFP or beyond it, e.g. at ZGOK and then collected by companies holding relevant permits.*
- *The scope of the cooling water plant for the purpose of heat discharge from the turbine generator unit and heat receipt from process equipment will include a dry mechanical draft cooling tower, cooling water system and circulating pumps.*
- *Sanitary sewerage, industrial wastewater and rain water drainage system will be in operation in the area of ITPFP. Rain and thaw water will be pre-treated in the plant and then discharged to the existing irrigation and drainage system of the city of Olsztyn. Industrial wastewater will be pre-treated and then directed to a wastewater equalizing tank and next to the PWiK drainage system.*
- *The Investment Project will be related to organization of the waste management in the area of Warmińsko-Mazurskie Voivodeship.*
- *The Investment Project is compliant with Directive 2008/98/EC on waste, Directive 91/156/EEC on hazardous waste, Directive 1999/31/EC on the landfill of waste, Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC, Directive 94/62/EC on packaging and packaging waste.*

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8. PROJECTED EMISSION LEVELS RESULTING FROM OPERATION OF THE PLANNED INVESTMENT PROJECT

8.1. GASEOUS AND PARTICULATE POLLUTANT EMISSIONS INTO THE AIR

The Waste-to-Energy process is the source of gaseous and particulate pollutant emissions into the air. The purpose of waste combustion, as in the case of most of the processes related to waste processing, is its disposal and reduction of its volume and resulting hazards, with simultaneous capture (and thus concentration) or destruction of potentially hazardous substances. The combustion process may at the same time deliver agents enabling recovery of energy and mineral and/or chemical components contained in waste.

According to information included in BREF for waste combustion (August 2006), emissions of HCl, SO₂, HF, NO_x, particulate matter and heavy metals depend most of all on the waste structure and quality of the flue gas treatment process. CO and VOC emissions are influenced mainly by technical parameters of the furnace and the degree of heterogeneity of waste at the combustion stage. To a large extent, structure of the furnace and its operation influence also NO_x. Particulate matter emission largely depends on the efficiency of flue gas processing. PCDD/PCDF emissions into the air depend on the waste structure, furnace (temperature and exposure time) and conditions of operation of the plant (reformation and *de novo synthesis* are possible in specified conditions) and efficiency of flue gas treatment.

The table below presents typical concentration values in raw flue gas downstream the boiler in which municipal waste is combusted and before the flue gas treatment process.

Table 30. Concentrations of pollutants in flue gas downstream the boiler (raw flue gas) in the municipal waste processing plant

Type of pollutant	Unit	Concentration in flue gas (reference oxygen concentration of 11%)
Particulate matter	mg/Nm ³	1000-5000
Carbon monoxide (CO)	mg/Nm ³	5-10
Total organic carbon (TOC)	mg/Nm ³	1-10
PCDD/PCDF	mg TEQ/Nm ³	0.5-10
Mercury	mg/Nm ³	0.05-0.5
Cadmium + thallium	mg/Nm ³	<3
Other heavy metals (Pb, Sb, As, Cr, Co, Cu, Mn, Ni, V, Sn)	mg/Nm ³	<50
Inorganic chlorine compounds (as HCl)	mg/Nm ³	500-2000

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Inorganic fluorine compounds (as HF)	mg/Nm ³	5-20
Sulfur compounds, total SO ₂ /SO ₃ , expressed as SO ₂	mg/Nm ³	200-1000
Nitrogen oxides expressed as NO ₂	mg/Nm ³	250-500

Source: BREF

The following sources of organized gaseous and particulate pollutant emissions into the air will be operated on the premises of ITPFP:

- grate-fired boiler combusting fuel from municipal waste and high-energy fraction left over after municipal waste sorting and 20-80 mm fraction obtained after waste composting and screening;
- two gas- and oil-fired boilers in the peak load back-up boiler house
- Diesel generator set
- sorbent storage silo for the FGDP
- fly ash storage silo
- activated carbon storage silo
- light fuel oil tank.

In addition, the sources of gaseous and particulate pollutant emissions into the air will cover:

- engines of trucks delivering the individual utilities
- ventilation system of the secondary waste stabilization hall.

Emissions of pollutants from the grate-fired boiler

The emission of gaseous and particulate pollutants into the air, generated in the process of combusting fuel from municipal waste in the grate-fired boiler cannot exceed the emission standards specified in the following documents:

- Directive 2000/76/EC of December 4, 2000 (OJ EC L 332 of December 28, 2000, p. 91, as amended) on the incineration of waste,
- Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control),
- and the Ordinance of the Minister of Environment of November 4, 2014 concerning emission standards of certain plants, fuel combustion sources and other waste incineration or co-incineration facilities (Journal of Laws of November 7, 2014, item 1546) compliant with the Directive.

The below table 30 presents emission standards for waste combustion plants in accordance with the applicable ordinance on emission standards for certain types of plants..., which are at the same compliant with requirements of the above Directive.

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Table 31. Emission standards for waste combustion plants in accordance with the applicable ordinance of the Minister of Environment

Item	Name of substance	Unit	Emission standards at 11% of O ₂ in exhaust gases		
			Average daily	Average 30-minute	
				A	B
1.	Total particulate matter	mg/m ³ _u	10	30	10
2.	Organic substances in the form of gas and vapor converted into total organic carbon	mg/m ³ _u	10	20	10
3.	hydrogen chloride	mg/m ³ _u	10	60	10
4.	hydrogen fluoride	mg/m ³ _u	1	4	2
5.	sulfur dioxide	mg/m ³ _u	50	200	50
6.	carbon monoxide				
6.1.	grate furnaces	mg/m ³ _u	50	100	150 (average 10-minute value)
6.2.	fluidized-bed furnaces	mg/m ³ _u	100 (average hourly)		
7.	nitrogen oxide and nitrogen dioxide converted to nitrogen dioxide	mg/m ³ _u	200	400	200
8.	heavy metals and their compounds expressed as heavy metals	mg/m ³ _u	Average test results for test duration of 30 minutes to 8 hours		
9.	cadmium + thallium	mg/m ³ _u	0.05		
10.	mercury	mg/m ³ _u	0.05		
11.	antimony + arsenic + lead + chromium + cobalt + copper + manganese + nickel + vanadium	mg/m ³ _u	0.5		

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Item	Name of substance	Unit	Emission standards at 11% of O ₂ in exhaust gases		
			Average daily	Average 30-minute	
				A	B
12.	dioxins and furans	ng/m ³ _u	Average test results for test duration of 6 to 8 hours 0.1 As a sum of concentration products for dioxins and furans in exhaust gas and their toxic equivalency factors		

In accordance with the Ordinance, the standards of emissions from waste combustion plants are deemed to be met if in the case of continuous measurements of substance emission values the following conditions are simultaneously met:

1) average daily concentration values of

- a. particulate matter,
- b. organic substances in the form of gas and vapor converted to total organic carbon,
- c. hydrogen chloride,
- d. hydrogen fluoride,
- e. sulfur dioxide and
- f. nitrogen oxide and nitrogen dioxide converted to nitrogen dioxide,

and in the case of 97% carbon monoxide, the average daily concentration values during a calendar year, counting from the beginning of the year, do not exceed the emission standards specified for these substances, defined as average daily in the table above;

2) average 30-minute concentration values of

- a. particulate matter,
- b. organic substances in the form of gas and vapor converted to total organic carbon,
- c. hydrogen chloride,
- d. hydrogen fluoride,
- e. sulfur dioxide and
- f. nitrogen oxide and nitrogen dioxide converted to nitrogen dioxide

do not exceed value **A** of emission standards for these substance specified in the table above or 97% of average 30-minute concentration values of these substances during a calendar year, counting from the beginning of the year, do not exceed value **B** of emission standards specified for these substances, defined in the table above.

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- 3) average 30-minute concentration values of carbon monoxide do not exceed value **A** of the emission standard for this substance, specified in the table above, or 95% of average 30-minute concentration values of this substance within 24 hours do not exceed value **B** of the emission standard for this substance, specified above,

Pollutant emissions from the peak load back-up boiler house

Each of the gas- and oil-fired boilers will meet the emission standards specified for this type of emission sources in the Ordinance of the Minister of Environment of November 4, 2014 concerning emission standards for certain plants, fuel combustion sources and waste incineration or co-incineration facilities (Journal of Laws of November 7, 2014, item 1546):

- sulfur dioxide - $35\text{mg}/\text{m}^3_{\text{u}}$ / $850\text{mg}/\text{m}^3_{\text{u}}$, *
- nitrogen dioxide - $150\text{mg}/\text{m}^3_{\text{u}}$ / $400\text{mg}/\text{m}^3_{\text{u}}$, *
- particulate matter - $5\text{mg}/\text{m}^3_{\text{u}}$ / $50\text{mg}/\text{m}^3_{\text{u}}$, *

* - in mg/m^3 of dry exhaust gases in contractual conditions with 3% content of the oxygen

.../... - standard in the case of natural gas combustion / emission standard in the case of light fuel oil combustion

The remaining emission sources that will be installed on the premises of ITPFP are not covered with emission standards under the Ordinance of the Minister of Environment or the above Directives.

BAT (BEST AVAILABLE TECHNIQUES) REQUIREMENTS

Municipal waste combustion

Emission limits for the basic pollutants according to the BAT Reference document for the new plants amount to:

Table 32. Emission limits for the basic pollutants according to the BAT Reference document for the new waste combustion plants

Admissible air emission values			
Impurities	Average daily values	Average 30-minute values	97% Average 30-minute values
* Total particulate matter (mg/m^3)	10	30	10
* HCl (mg/m^3)	10	60	10

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* SO ₂ (mg/m _u ³)	50	200	50
* HF (mg/m _u ³)	1	4	2
* NO + NO ₂ as NO ₂ (mg/m _u ³)	200	400	200
* NH ₃ (mg/m _u ³)	10	-	
* CO (mg/m _u ³)	50	100 or 150 for average 10-minute value	
* Organic substances in the form of gas and vapor converted to total organic carbon (mg/m _u ³)	10	20	10
	Average values relating to the sampling period of minimum 30-minutes and of maximum 8-hours		
* Cd+Tl (mg/m _u ³)	0.05		
* Hg (mg/m _u ³)	0.05		
* Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V(mg/m _u ³)	0.5		
	Average values measured in the sampling period of minimum 6-minutes and of maximum 8-hours		
* Dioxins and furans (ng/m _u ³)	0.1		

References:

Standardized values in normal conditions – 11% oxygen, dry gas, temperature 273 K and pressure 101.3 kPa.
BAT levels for dioxins and furans have been provided using the equivalent coefficients in accordance with Directive 2000/76/EC.

Emission standards for a grate-fired boiler, resulting from the Ordinance of the Minister of Environment of November 4, 2014 concerning emission standards for certain types of plants, fuel combustion sources and waste incineration or co-incineration facilities (Journal of Laws of November 7, 2014, item 1546), such as emission limits for the basic pollutants according to the BAT Reference document for the new waste combustion plants. Therefore, the boiler will meet the requirements of both of the above mentioned documents.

Under BREF, it is preferred to implement solutions regarding reduction of gaseous and particulate pollutant emissions into the air from combustion of waste such as:

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Sulfur dioxide, hydrogen chloride, hydrogen fluoride

Control of waste, grinding and mixing may reduce the changes of pollutant concentrations in raw gases that could lead to increase the short-term emission levels. Dry FGT systems have usually larger absorption capacity and deliver the lowest emission levels for these substances, but are generally more expensive.

Nitrogen oxide (NO) and nitrogen dioxide (NO₂); expressed as nitrogen dioxide for the plants using SCR

Techniques for control of combustion and waste together with SCR generally result in operation within these emission ranges. The use of SCR involves additional demand for energy and costs. Basically, in larger plants, the use of SCR results in less significant additional costs per one ton of waste subject to processing. High content of N in waste may cause increase in NO_x concentration in raw gas.

Nitrogen oxide (NO) and nitrogen dioxide (NO₂); expressed as nitrogen dioxide for the plants not using SCR

Techniques for control of combustion and waste together with SCR generally result in operation within these emission ranges. average 24-hour below this range usually requires the use of SCR, although the level of less than 70 mg/Nm³ was achieved owing to SNCR, e.g. when raw NO_x is too low and/or in the case of higher reagent dose rates). If in SNCR high dose rates of reagents are used, leaks of NH₃ may be controlled using dry FGT equipped with tools for handling ammonia wastewater. High content of N in waste may cause increase of NO_x concentration in raw gas.

Total particulate matter

Basically, the use of fabric filters allows achievement of lower levels of these emissions. Effective maintenance of the particulate matter control systems is very important. Energy consumption may increase along with increase in the average emission levels. Control of the emission levels at the same time reduces emission of metals.

Carbon monoxide, gas and fly organic substances, such as TOC

Techniques that enhance the combustion conditions reduce emissions of these substances. FGT does not have a significant impact on emission concentrations. CO levels may be higher during commissioning and shutdown and for the new boilers that have not yet reached the normal operational pollutant level.

Dioxins and furans (ngTEQ/Nm³)

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Combustion techniques destruct PCDD/F in waste. An appropriate design and temperature control reduce *de-novo* synthesis. Except for such measures, the reduction techniques using coal absorbents ultimately reduce the final emissions to this emission range. Increased doses of coal absorbents may contribute to formation of emissions of even 0.001, but result in increase in consumption and leaving residues.

Σ of other metals

Techniques for particulate matter level control basically control these metals as well.

Gas or light fuel oil combustion

As part of the peak load back-up boiler house, two gas- and oil-fired boilers will be used with thermal power input in fuel of 38MW_t each. Due to the power output of <50MW_t they will not be subject to the BAT requirements.

8.2.1. The planned Investment Project in view of the discussed documents

Miejskie Przedsiębiorstwo Energetyki Ciepłej in Olsztyn - the Investor - plans to construct on its premises at ul. Lubelska 48 in Olsztyn ITPFP using fuel from municipal waste, high-energy fraction left over after municipal waste sorting, high-energy fraction left over after municipal waste composting at RIPOK, equipped with emission sources - a grate-fired boiler and a gas- and an oil-fired boiler. The rated thermal power of the grate-fired boiler will be approx. 48.5MW_t understood as the quantity of energy output in fuel to the plant over a unit of time, at rated load. Flue gas from the boiler will be evacuated into the air through the stack, being E-1 emission source, with the following parameters:

- height ≥ **60m**,
- outlet diameter ≤ **2m**.

Emission of gaseous and particulate pollutants from the grate-fired boiler

The table below presents the hourly gaseous and particulate pollutant emissions from combustion of fuel from the above waste in relation to the applicable emission standards.

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Table 33. Hourly emissions of gaseous and particulate pollutants from combustion of fuel from municipal waste in relation to the applicable emission standards

Item	Name of substance	Unit	Pollutant emission size		
			Average daily	Average 30-minute	
				A	B
1.	Total particulate matter	kg/h	1.07	3.21	1.07
2.	Organic substances in the form of gas and vapor converted into total organic carbon	kg/h	1.07	2.14	1.07
3.	hydrogen chloride	kg/h	1.07	6.42	1.07
4.	hydrogen fluoride	kg/h	0.107	0.428	0.214
5.	sulfur dioxide	kg/h	5.35	21.4	5.35
6.	carbon monoxide				
6.1.	grate furnace	kg/h	5.35	10.7	16.05
7.	nitrogen oxide and nitrogen dioxide converted to nitrogen dioxide	kg/h	21.4	42.8	21.4
8.	heavy metals and their compounds expressed as heavy metals				
9.	cadmium + thallium	kg/h	0.00535		
10.	mercury	kg/h	0.00535		
11.	antimony + arsenic + lead + chromium + cobalt + copper + manganese + nickel + vanadium	kg/h	0.0535		
12.	dioxins and furans	kg/h	0.000000107		

Hourly emission of gaseous and particulate pollutants from the grate-fired boiler has been calculated according to the following formula:

$$\text{emission standard [mg/m}^3\text{]} \times \text{rated hourly flue gas flow rate [m}^3\text{/h]}$$

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In accordance with the "Feasibility Study", the quantity of dry flue gas at oxygen content of 11% from combustion of fuel from municipal waste will amount to 107,000[Nm³/h].

Example of calculations for three selected pollutants:

– **sulfur dioxide:**

$$50 \text{ mg/m}^3_u \times 107,000 \text{ [Nm}^3\text{/h]} / 1,000,000 = 5.35 \text{ [kg/h]}$$

– **nitrogen oxides converted to nitrogen dioxide:**

$$200 \text{ mg/m}^3_u \times 107,000 \text{ [Nm}^3\text{/h]} / 1,000,000 = 21.4 \text{ [kg/h]}$$

– **particulate matter:**

$$10 \text{ mg/m}^3_u \times 107,000 \text{ [Nm}^3\text{/h]} / 1,000,000 = 1.07 \text{ [kg/h]}.$$

Hourly emissions of other pollutants for which emission standards are defined in the Ordinance of the Minister of Environment have been calculated based on the same formula.

Annual emissions of gaseous and particulate pollutants, resulting from the emission standards for the grate-fired boiler will amount to:

Table 34. Annual emissions of gaseous and particulate pollutants from combustion of fuel from municipal waste in relation to the applicable emission standards

Item	Name of substance	Unit	Pollutant emission size
1.	Total particulate matter	Mg/year	8.74
2.	Organic substances in the form of gas and vapor converted into total organic carbon	Mg/year	8.774
3.	hydrogen chloride	Mg/year	8.774
4.	hydrogen fluoride	Mg/year	0.8774
5.	sulfur dioxide	Mg/year	43.87
6.	carbon monoxide		
6.1.	grate furnace	Mg/year	43.87

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Item	Name of substance	Unit	Pollutant emission size
7.	nitrogen oxide and nitrogen dioxide converted to nitrogen dioxide	Mg/year	175.48
8.	heavy metals and their compounds expressed as heavy metals		
9.	cadmium + thallium	Mg/year	0.04387
10.	mercury	Mg/year	0.04387
11.	antimony + arsenic + lead + chromium + cobalt + copper + manganese + nickel + vanadium	Mg/year	0.4387
12.	dioxins and furans	Mg/year	0.000000088

The basis for calculation of the annual emission of gaseous and particulate pollutants into the air from the grate-fired boiler covers the planned operation time of the new boiler during a year - annual time of use of the installed power of up to 8200h, emission standards specified in the above legal acts and the projected rated quantity of flue gas from the grate-fired boiler, fired with fuel from municipal waste (converted to dry flue gas, 11% oxygen).

Annual emission of gaseous and particulate pollutants from the grate-fired boiler has been calculated according to the following formula:

$$\text{hourly emission of pollutants [kg/h]} \times \text{annual boiler operation time [h/year]}$$

Example of calculations for three selected pollutants:

– **sulfur dioxide:**

$$5.35[\text{kg/h}] \times 8,200 [\text{h/year}] / 1,000 = 43.87 [\text{Mg/year}]$$

– **nitrogen oxides converted to nitrogen dioxide:**

$$21.4[\text{kg/h}] \times 8,200 [\text{h/year}] / 1,000 = 175.48 [\text{Mg/year}]$$

– **particulate matter:**

$$1.07[\text{kg/h}] \times 8,200 [\text{h/year}] / 1\,000 = 8,774 [\text{Mg/year}].$$

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Annual emissions of other pollutants for which emission standards are defined in the Ordinance of the Minister of Environment have been calculated based on the same formula.

Ammonia emission

The use of selective non-catalytic reduction plant may result in excessive emission of ammonia, but only in the cases of overdosing or wrong control of NO_x reduction agents. According to BREF, emission of ammonia (NH₃) for boilers equipped with equipment for reduction of nitrogen oxides using the SNCR technique may amount to 1-10mg/Nm³. According to BREF, the average ammonia concentration amounts to 4mg/Nm³. The hourly emission of ammonia from a grate-fired boiler fired with fuel from municipal waste and operating with rated load may amount to 1.07 kg.

CO₂ emission

In accordance with provisions of the draft Act on renewable energy sources, a waste-to-energy plant is *"a renewable energy source plant being a waste combustion or co-combustion plant in the meaning of the Waste Act of December 14, 2012 (Journal of Laws of 2013, item 21, as amended), in which part of the generated electricity and heat comes from the biodegradable part of industrial or municipal waste of animal or vegetable origin, including waste from the waste processing plant and waste from water and wastewater treatment, in particular wastewater sludge, in accordance with the waste regulations as regards qualification of part of the energy recovered a part of the waste-to-energy process"*; The fact that 50% of municipal waste weight composition may be made up of biodegradable components, formed as a result of CO₂ photosynthesis, is an important and valuable property thereof. This means that the balance of carbon dioxide emission during combustion of waste and formation in the photosynthesis process amounts to zero, so it is neutral in terms of CO₂ emission (Odpady komunalne jako odnawialny surowiec energetyczny – problemy i uwarunkowania związane z jego wykorzystaniem (Municipal waste as a renewable energy source - problems and conditions related to its use) – Polityka energetyczna, Volume 13, Book 2, 2010). CO₂ emission rate for non-biogenic municipal waste according to a document developed by KOBIZE (Krajowy Ośrodek Bilansowania i Zarządzania Emisjami - National Center for Emission Balancing and Management), 2013) titled.: Wartości opałowe (WO) i wskaźniki emisji CO₂ (WE) w roku 2011 do raportowania w ramach Wspólnotowego Systemu Handlu Uprawnieniami do Emisji za rok 2014 (Calorific values and CO₂ emission rates for reporting within the Community Emissions Trading Scheme, applicable in 2014) amounts to 89.87kg/GJ. Annual emission of this greenhouse gas may amount to 130,311.5Mg. **Municipal waste combustion plants do not participate in the ETS.**

N₂O emission

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This compound (N_2O) may be emitted if the combustion process is not correct. Such situation occurs in the case of improper combustion temperature (e.g. below $850^{\circ}C$) and if oxygen content is not sufficient. Emission of N_2O from the combustion process may be sometimes correlated with emission of CO. If SNCR is used for removal of NO_x , increase in N_2O generation may occur, depending on the dose rates and temperature. During combustion of municipal waste N_2O emission occurs at the level of 1-12 mg/Nm^3 (individual measurement) with the average emission of 1 – 2 mg/Nm^3 . Hourly N_2O emission from a grate-fired boiler fired with fuel from municipal waste and operating with rated load may amount to 1,284 kg, and annual emission of this greenhouse gas to 10.5Mg.

PM2.5 particulate matter emission

According to Guidebook 2009, a document by the European Environment Agency, average emission of PM2.5 particulate matter from one ton of combusted waste amounts to approx. 0.15kg. Hourly PM2.5 particulate matter emission from a grate-fired boiler fired with fuel from municipal waste and operating with rated load may amount to 1.92 kg and annual emission of this pollutant to 15.7Mg.

Emission of pollutants from the peak load back-up boiler house

Two gas- and oil-fired boilers will be the source of gaseous and particulate pollutant emissions in the peak load back-up boiler house. Boilers will be the gas-fired sources with thermal power in fuel of $38MW_t$ each. Light fuel oil will be the back-up fuel. Flue gas from each boiler will be evacuated into the air through a separate stack with the following parameters:

- height $\geq 25m$,
- outlet diameter $\leq 0.9m$ (two ducts).

Each of the two gas- and oil-fired boilers will meet the emission standards specified for this type of sources in the Ordinance of the Minister of Environment of November 4, 2014 concerning emission standards for certain plants, fuel combustion sources and waste incineration or co-incineration facilities (Journal of Laws of November 7, 2014, item 1546):

- sulfur dioxide - $35mg/m^3_u / 850mg/m^3_u$,*
- nitrogen dioxide - $150mg/m^3_u / 400mg/m^3_u$,*
- particulate matter - $5mg/m^3_u / 50mg/m^3_u$.*

* - in mg/m^3 of dry exhaust gas in contractual conditions with 3% content of the oxygen.

(.../...) - emission standard for gas combustion/emission standard for light fuel oil combustion

CO emission from gas combustion in back-up peak load boilers will amount to $100mg/m^3_u$

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Rated dry flue gas flow rate, 3% O₂ from each of the gas- and oil-fired boilers during natural gas/light fuel oil combustion amounts to 40,000 Nm³/h.

Hourly emission of gaseous and particulate pollutants from each of the back-up peak load boilers has been calculated according to the following formula:

$$\text{emission standard [mg/m}^3_{\text{u}}] \times \text{rated hourly flue gas flow rate [m}^3_{\text{u}}/\text{h]}$$

The table below presents the hourly emissions of gaseous and particulate pollutant from combustion of fuel in the back-up peak load boilers in relation to the applicable emission standards.

Table 35. Hourly emissions of gaseous and particulate pollutants from the back-up peak load boiler

Item	Type of emitted pollutant	unit	Hourly emission (.../...)– gas/light fuel oil combustion
1.	Sulfur dioxide	kg/h	1.4 / 34.0
2.	Nitrogen oxides converted to nitrogen dioxide	kg/h	6.0 / 16.0
3.	Particulate matter	kg/h	0.2 / 2
4.	Carbon monoxide	kg/h	4 / 4

Annual emission of gaseous and particulate pollutants from the grate-fired boiler has been calculated according to the following formula:

$$\text{hourly emission of pollutants [kg/h]} \times \text{annual boiler operation time [h/year]} \times 2 \text{ boilers}$$

Annual emissions of gaseous and particulate pollutants from the back-up peak load boiler house, resulting from emission standards, will amount to:

- sulfur dioxide - 8.4 / 204[Mg/year],
- nitrogen dioxide - 36.0 / 96 [Mg/year],
- particulate matter - 1.2 / 12[Mg/year].

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(.../...) - annual emission for gas combustion/annual emission for light fuel oil combustion

Annual carbon monoxide emission will amount to 12/12Mg.

Projected operation time of two gas- and oil-fired boilers – 3000h/year.

Emission of particulate matter from auxiliary processes

Ash tank

The average discharge of fly ash from the grate-fired boiler will amount to 5.5 thousand Mg/year. Emission of particulate matter from the ash tank will originate from venting thereof. It is assumed that the emission will amount to:

Table 36. Emission of particulate matter from the fly ash retention tank

Item	Type of tank	Pollutant emission (total particulate matter and suspended particulate matter)		
		mg/Nm ³	kg/h	Mg/year *)
1.	Fly ash tank V=300 m ³	20**	0.06	0.492

*) – annual emission specified for 8,200h of operation during a year,

***) – values covered by guarantees of manufacturers of the dedusting equipment.

The ash tank is marked in the land development plan with the number 10, appendix No. 3 to the Report.

Sorbent tank

Emission of particulate matter from the tank in which sorbent will be stored will originate from venting thereof.

It is assumed that the emission will amount to:

Table 37. Emission of particulate matter from the sorbent retention tank

Item	Type of tank	Pollutant emission (total particulate matter and suspended particulate matter)		
		mg/Nm ³	kg/h	Mg/year *)
1.	Sorbent tank V=150 m ³	20**	0.03	0.246

*) – annual emission specified for 8,200h of operation during a year

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**) – guarantees of manufacturers of the dedusting equipment

The sorbent tank is marked in the land development plan with the number 10, appendix No. 3 to the Report.

Activated carbon tank

The activated carbon tank will be located inside the stabilization hall. It will be tightly closed, which will prevent particulate matter penetration into the air. The tank venting outlet will be provided with a bag filter.

Light fuel oil tank

The light fuel oil tank will be the source of emissions of aliphatic and aromatic hydrocarbon vapors into the air. These substances will be emitted by the process equipment, i.e. breather valves of the storage tank. Capacity of the light fuel oil tank will amount to 1000m³.

The size of emissions when filling the tank chamber has been specified based on the dependencies:

$$E = V \times K$$

where:

E – emission of diesel oil vapors [g/s]

V – volume of the poured fuel [m³]

K – diesel oil vapor pressure [g/m³] assumed K = 0.875 g/m³, as for diesel oil

Single fuel collection – 1000 m³

Drain time – approx. 30 h

$$E = 1000 \text{ m}^3 \times 0.875 \text{ g / m}^3 = 875 \text{ g / 30 h} = 0.0081 \text{ g / s}$$

The light fuel oil tank is marked in the land development plan being appendix No. 3 to the Report under the number 23.

Parameters of the emission sources located on the premises of the plant, through which gaseous and particulate pollutants will be evacuated into the air, are summarized in table 13.2.3., chapter 13.2. of the Report. Appendix No. 3 to the Report includes location of the emission sources on the premises of the plant.

Ventilation system of the secondary waste stabilization hall

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The secondary waste stabilization process will be implemented in a specially prepared building - a hall - which will reduce the pollutant emission. The building ventilation system will be equipped with a bag filter to capture particulate matters formed during waste stabilization.

Emission from transport means

To calculate the pollutant emission from transport means, it is necessary to specify consumption of fuel by vehicles at the operation stage. It is forecast that the average vehicle traffic on the premises of ITPFP during a year (365 days) will amount to:

- travel of trucks - 40 pcs/day,
- travel of passenger cars - 10 pcs/day.

All vehicles will be provided with Diesel engines. To calculate the fuel volume per one weight unit, diesel oil density of $d = 0.86 \text{ kg/dm}^3$ has been assumed.

Table 38. Forecast daily fuel consumption by vehicles on the premises of the Combined Heat and Power Plant

Type of vehicle	Number of vehicles	Maximum consumption fuel		Travel distances on the premises of the Combined Heat and Power Plant [km]	Daily fuel consumption [kg/day]
		[l/km]	[kg/km]		
Passenger car	10	0.06	0.0516	0.2	$10 \times 0.0516 \times 0.22 = 0.114$
Truck	40	0.25	0.215	0.15	$40 \times 0.215 \times 0.15 = 1.29$
Total fuel consumption per day					1.4

According to the reference data (EMEP/CORINAIR Emission Inventory Guidebook – Road Transport of August 2007) the emission of pollutants from combustion of fuel in Diesel engines amounts to:

- carbon monoxide 6.73 g/kg of consumed fuel,
- nitrogen oxides 32.99 g/kg of consumed fuel,
- suspended particulate matter 0.86 g/kg of consumed fuel,
- sulfur dioxide 0.02 g/kg of consumed fuel,
- benzene 4.14 g/kg of consumed fuel.

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Daily emission of gas pollutants from vehicles traveling on the premises of the new Combined Heat and Power Plant may, in the case of the adopted assumptions, amount to:

- carbon monoxide 0,009442 kg,
- nitrogen oxides 0,046 kg,
- suspended particulate matter 0,0012 kg,
- sulfur dioxide 0,000028 kg,
- benzene 0,006 kg.

Fugitive emission

Fugitive emissions in the area of ITPFP are likely to originate from the waste collection hall and waste bunker. They can be the source of odors and fugitive emissions of pollutants (waste unloading). Negative pressure will be used in the hall and in the bunker to avoid spread of odors and pollutants to the outside. Air fed from the bunker and the hall simultaneously, will be used in the combustion process, thus making sure that odors and pollutants do not escape outside the plant.

Other rooms of the process line will be equipped with mechanical and gravity ventilation systems ensuring air exchange in line with the sanitary and fire protection regulations, including the required smoke dampers in case of fire.

Fugitive emissions are also likely to originate from transport of materials necessary for the plant's operation. Transport will take place in a manner eliminating the possibility of fugitive particulate matter emission to the air, by means of trucks protected with tarpaulins.

The surfaces of roads and yards during transport vehicles passing through may be a potential source of fugitive particulate matter emission from the area of ITPFP, especially in the prolonged dry periods. Roads and yards will be sprinkled with water and kept clean in order to prevent secondary particulate matter emission.

The storage yard for slag and products can be another source of fugitive particulate matter emissions. It will be secured with a roof to prevent secondary particulate matter emissions and impacts of weather conditions – rain, snow.

Emission of odors

Emission of odors is one of the major reasons for complaints of population about air pollution. The sources of emission of odors are common in varied industry sectors, municipal service management (headers, wastewater treatment plants, waste landfills, composting plants) and services. Odor nuisance is mainly linked to microorganisms (present in wastewater, sewage sludges and waste) taking part in the cycle of carbon, nitrogen and sulfur compounds. Odorants may be created during these

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transformations **(PROBLEMY UCIAŻLIWOŚCI ZAPACHOWEJ WYBRANYCH OBIEKTÓW GOSPODARKI KOMUNALNEJ [PROBLEMS OF ODOR IMPACT OF SELECTED MUNICIPAL SERVICES MANAGEMENT FACILITIES] – I.Sówka, P. Zwoździak, A. Zwoździak, J. Zwoździak, IIOŚ, Wrocław).**

Currently, in Poland there are no legal regulations and technical recommendations determining admissible odor levels in the air and the methods of their assessments. The main and only threat of odor nuisance (odors) in the entire waste-to-energy process is the transport to facilities, unloading and storage in the waste bunker before feeding them to the grate of the boiler combustion chamber. Municipal waste transported to ITPFP will go through the waste collection hall to the waste bunker and, next, to the boiler. The bunker hall will be the source of odors. In order to protect against the spread of odors from the hall to the surrounding area it is planned to block the spread of odors to the outside. This will be done by proper closing of the hall each time a vehicle delivering municipal waste enters the hall and by use of adequately selected negative pressure causing the air from the area of the unloading hall and the bunker itself to be sucked in. This air will be directed to the process line of waste combustion – combustion chamber of the boiler. All rooms will be equipped with mechanical and gravity ventilation systems ensuring air exchange in line with the sanitary and fire protection regulations (including the required smoke dampers in case of fire). Moreover, the flue gas discharge system, starting from the boiler to the ID fan placed downstream the last stage of flue gas treatment, will operate in negative pressure, to make it possible, in case of leakage, to prevent flue gas from escaping outside of the plant. In case of downtime of the plant the bunker for waste intended for the waste-to-energy process will be equipped with hermetic sealing (gate valve) preventing odors from escaping outside of the plant. Combustion of fuel from waste generates slag and dust from flue gas dedusting. The waste and raw materials used for their processing (stabilization, valorization) will not cause odor nuisance due to their composition because all the substances that could make odor threat will be subjected to the waste-to-energy process (combustion) in the combustion chamber of the boiler. As a result of the design solutions used, there will be no emission of odors on the site of the planned Investment Project.

Emissions of pollutants during abnormal conditions

The term abnormal conditions stands for failures of equipment and processes of boiler firing and shutting down.

Failure of equipment

Running any industrial activity involves the risk of failure of process equipment or failures caused by fortuitous events. In emergency situations the plant will be brought to a standstill to eliminate the failure in line with the procedure set for emergency situation.

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On the premises of the ITPFP there will be a device in operation which ensures safe working conditions in the plant in case of emergency situation, i.e.:

- Diesel generator set with thermal power input in fuel of approx. 0.85 MW_t, powered by diesel oil and used to enable emergency start-up or safe shutdown of the unit equipment in total blackout conditions. Flue gas from the engine shall be evacuated to the air through an emission source with a height of approx. $h = 5.0$ m and diameter of $d = 125$ mm.

The Ordinance of the Minister of the Environment of November 4, 2014 concerning emissions standards of certain plants, fuel combustion sources and other waste incineration or co-incineration facilities (Journal of Laws of November 7, 2014, item 1546) does not set forth emission standards for devices of the Diesel engine type (§5 section 1 point 10 of the Ordinance). The emission values for engines powered by diesel oil were calculated based on the nominal amount of combusted fuel and the recommended emission factors for polluting substances introduced into the air from fuel combustion for energy generation purposes determined in information and instruction materials issued by the Ministry of Environmental Protection, Natural Resources and Forestry of April 1996.

The Table below presents the maximum value of emission of pollutants to the air from a Diesel engine, determined on the basis of theoretical calculations.

Table 39. Value of emission of pollutants to the air from a Diesel generator set

Emission source	Emitted substances	Pollutant emission value
		kg/h
Generator with Diesel engine 0,85 MW _t powered by diesel oil	Particulate matter	0.112
	Sulfur dioxide	0.0022
	Nitrogen dioxide	0.56
	Carbon monoxide	0.045

CONCLUSIONS

- The new emission source – grate-fired boiler, fired with fuel from waste, equipped with systems reducing emissions of gaseous and particulate pollutants to the air, will meet the requirements of the following documents:
- Directive 2000/76/EC of December 4, 2000 (OJ EC L 332 of December 28, 2000, p. 91) on the incineration of waste.

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- Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control),
- and compliant with the Ordinance of the Minister of Environment of November 4, 2014 concerning emissions standards of certain plants, fuel combustion sources and other waste incineration or co-incineration facilities (Journal of Laws of 2014, item 1546);
- BAT (Best Available Techniques) Reference Document.
- Two gas- and oil-fired boilers will meet the requirements of the Ordinance of the Minister of Environment of November 4, 2014 concerning emissions standards of certain plants, fuel combustion sources and other waste incineration or co-incineration facilities (Journal of Laws of 2014, item 1546);
- Emissions of such pollutants as arsenic, cadmium, mercury, lead, nickel, benzene, dioxins and furans from the natural gas and light fuel oil combustion process will be negligibly small.
- Flue gas from the grate-fired boiler will be evacuated to the air through an emission source with a height of $h \geq 60$ m and outlet diameter $d \leq 2$ m. Dry flue gas stream under contractual conditions converted into 11% O₂ will be 107,000 m³/h.
- Flue gas from each of the two gas- and oil-fired boilers will be evacuated to the air through a separate emission source (two ducts) with a height of $h \geq 25$ m and outlet diameter $d \leq 0.9$ m each.
- Keeping standards for emissions of gaseous and particulate pollutants to the air from the grate-fired boiler and peak load back-up boiler house will be covered by contract guarantees with selected Contractors.
- Handover for operation of the planned Investment Project will be possible upon obtaining relevant administrative permits and demonstrating that the plant meets the contract requirements.
- Protection against escape of odors from the bunker hall to the surroundings will be done by proper closing of the hall each time a vehicle delivering municipal waste enters the hall and by use of adequately selected negative pressure causing the air from the area of the unloading hall and the bunker itself to be sucked in. This air will be directed to the process line of waste combustion – combustion chamber.
- The secondary waste stabilization process will be carried out in a specially prepared building – a hall – thus reducing pollutant emission. The building ventilation system will be equipped with a bag filter to capture dusts formed during waste stabilization.
- Dust tanks and sorbent tanks will be equipped with filters enabling dust emission to the air at the height of 20mg/Nm³.
- Keeping the emission values from the furnace waste storage tanks, sorbent tanks and other sources of dust emissions will be covered by contract guarantees with selected Contractors.

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8.2. Wastewater

Implementation phase

Grey and black water generated during the construction phase will be discharged to a holding tank or the site back-up facilities will be equipped with toi-toi type portable toilets. Construction site (back-up facilities) development plan is one of the primary parts of the works method statement. It is developed in the final phase of detailed engineering, i.e. after agreeing works method statement, determination of the number of employed persons and construction equipment. Therefore, detailed solutions and needs will be presented at later stages of the design process. It was assumed that the amount of generated gray and black water during the construction phase will be equal to the amount of water taken for the purpose.

Operation phase

During operation of the Waste-to-Energy plant processing combustible fraction the following types of wastewater will be generated:

- industrial,
- gray and black water,
- rain and thaw water.

Just like in the case of supply with water, the system of wastewater discharge from the Waste-to-Energy plant processing combustible fraction will be based on cooperation and use of the networks belonging to (Przedsiębiorstwo Wodociągów i Kanalizacji (Water Supply and Sewerage Company) in Olsztyn. All conditions for discharge of industrial wastewater will be regulated by:

- Ordinance of the Ministry of Construction of July 14, 2006 regarding the manner of performing the obligation of industrial wastewater supplier and on conditions of discharging wastewater to drainage systems (Journal of Laws 2006 No. 136, item 964),
- Contract between MPEC in Olsztyn and PWiK for discharge of industrial wastewater and gray and black water.
- Ordinance of the Minister of Environment of November 18, 2014 on conditions to be fulfilled while discharging wastewater to the water or ground, and on substances particularly harmful to the water environment (Journal of Laws 2014.1800).

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Wastewater generated in the area of the incineration plant will be characterized by the following pollutants:

- industrial wastewater:
 - polluted with chemicals (wastewater from the water demineralization and softening station),
 - polluted mainly with chlorides and sulfates (surface and bottom blowdown from the boiler),
 - polluted with suspended matter (wastewater from washing the facilities),
- rain water:
 - wastewater polluted with suspended matter and sand,
 - wastewater polluted with oil derivative hydrocarbons,
- gray and black water:
 - wastewater polluted with detergents and other surface-active agents with biological sludge content.

Methods of removing pollutants from the generated wastewater:

- wastewater polluted with suspended matter:
 - in separators for preliminary removal of sludges installed in industrial wastewater drainage system in areas, where wastewater was characterized by high content of suspended matter,
 - in the suspended matter sedimentation station of the rain water treatment system,
- wastewater polluted with oil derivative hydrocarbons:
 - in the initial oil separators in which oil is separated from water (oil accumulated in the separator chamber will be periodically collected into barrels and as waste transferred to authorized entities),
- wastewater polluted with detergents and other surface-active agents with biological sludge content:
 - treated in the "Łyna" municipal wastewater treatment plant.

In connection to operation of the planned Investment Project, it is expected that industrial wastewater after pre-treatment and gray and black water will be discharged to Ø600 mm sanitary drainage system of PWiK. Rain water can be managed by discharge to the existing irrigation and drainage system of the city of Olsztyn (Struga Szczęsne) and/or to the soil of the plot area to which the

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investor has a legal title. The decision on rain water management method will be known at the stage of obtaining a building permit. The planned ITPFP will have complete water supply and sewerage systems, e.g. sanitary drainage system, rain water drainage system and industrial drainage system.

The general wastewater management diagram has been included in Appendix No. 8 to the Report.

The table below presents in detail the types and quantities of respective types of wastewater discharged from ITPFP.

Table 40. Type and quantity of wastewater discharged from ITPFP

Item	Wastewater type	Wastewater quantity	Discharge location
Industrial wastewater, including:		$Q_{\max} \approx 3.3 \text{ m}^3/\text{h}$	
1.	Wastewater from the water demineralization and softening station	$1.2 \text{ m}^3/\text{h}$	After pre-treatment it will be directed to a wastewater equalizing tank and to the slag and ash management system.
2.	Surface and bottom blowdown from the boiler	$1.1 \text{ m}^3/\text{h}$	
3.	Other wastewater (e.g. washing wastewater)	$\sim 1.00 \text{ m}^3/\text{h}$	
Gray and black water		$0.4 \text{ m}^3/\text{h}$	It will be discharged via sanitary drainage system of ITPFP to the drainage system of PWiK.
Rain water		$187 \text{ m}^3/15 \text{ min}$	It is possible to discharge to the existing irrigation and drainage system (Struga Szczęsne) and/or to the soil of the area of the planned Investment Project. Rain water, before discharging to selected consumer, will be treated in the rain water treatment system.

1. INDUSTRIAL WASTEWATER

Industrial wastewater from the area of the planned Plant, which will not be managed in the slug and ash management system, will be discharged to PWiK based on a contract with the operator of the system.

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1.1. Wastewater from the water demineralization and softening station and surface and bottom blowdown from the boiler.

Aggressive wastewater from regeneration of ion exchangers at the water treatment plant will be collected and neutralized in a neutralizer situated by the water treatment plant. Next, it will be directed to the industrial wastewater pre-treatment plant and, then, to the slag quenching system or/and PWiK drainage system.

1.2. Wastewater from exhaust gas treatment

Water added to the reactor being the component of semi-dry flue gas treatment system will vaporize and it will be evacuated to the atmosphere in the form of steam mixed with clean flue gas. Thus, there will be no wastewater from the flue gas treatment system in ITPFP.

1.3. Leachate from the waste storage facility

The amount of leachate from the waste storage facility will be negligibly small. The leachate from the bunker will be directed via leachate draining and discharge system to the internal industrial wastewater drainage system, the final block of which will be the industrial wastewater pre-treatment plant. Afterwards, upon treatment the water will be used in the slag quenching process or directed to PWiK drainage system.

1.4. Leachate from the slag/ash storage facility

Slag from the grate-fired boiler will be transported from the slag removal equipment with a water seal using belt conveyors to the place of its seasoning. Slag will be stored on a concrete surface under a shelter, equipped with a system of discharge and collection of potential leachate water. Slag can be seasoned for a period from 6 to 20 weeks, at that time slag will undergo hydration during which no significant amounts of leachate are expected to actually accumulate. Due to the used technology of slag valorization, there practically will be no leachate. Hot slag going through the tank with water seal will soak in water and then vaporize. It is estimated that in case of slag there will be leachate from the storage hall amounting to e.g. 0.2 m³/h, which will be pre-treated before discharge to the equalizing tank. The planned solution introduces a condition to secure the slag receipt and seasoning yard against penetration of possible leachate to the groundwater environment.

1.5. Washing wastewater

Washing is expected to take place in the following facilities:

- boiler house,
- peak load boiler house,

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- turbine hall,
- oil unloading station,
- light oil pump station,
- unloading hall.

Washing wastewater will be directed to the industrial wastewater pre-treatment plant, where separation of oil derivative substances and sand will be performed. The water will be pumped to the slag quenching system or/and drainage system.

2. Rain water

Rain and thaw water will be discharged based on the conditions set with the Land Drainage and Water Facilities Authority in Olsztyn, Municipal Services and Urban Investments Department and/or Environment Department of the Municipal Office of Olsztyn. Rain water from roads, paved and green areas before discharge to the irrigation and drainage system (Struga Szczęsne) and/or to the soil of the site of the planned Investment Project will be treated in the rain water treatment plant. The expected amount of rain water will be e.g. 186.66 m³/15min. In order to protect the groundwater environment, pre-treatment and protection equipment will be installed (sedimentation tanks, oil separators). Rain water treatment system will be composed of a sedimentation tank integrated with coalescent oil separator and retention tank, dimensioned for the maximum rainfall, with the size of 200 m³. It is planned to hold rain water in case of heavy rainfall in the area of ITPFP in the retention tank and their discharge to the irrigation and drainage system after the end of torrential rain.

3. Gray and black water

Gray and black water from the area of the ITPFP will be directed to the communal drainage system based on a separate contract with the operator of the system. It was assumed that the amount of gray and black water equals the amount of water taken for the purpose. Maximum amount will equal e.g. 0.4 m³/h.

Conclusions

- *Water and wastewater management at ITPFP will be based on water intake and wastewater discharge from PWiK in Olsztyn.*
- *Water in the process circulations will circulate in a closed circuit, yet for correct operation of the equipment it will be necessary to perform circulation desalination by discharging part of water*

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from the circuit. Wastewater from water and steam circulation desalination will be mainly discharged for the purposes of furnace waste management.

- *The planned Investment Project will be equipped with full water supply and sewerage system, the kind and parameters of which will be defined in technical conditions of connection.*
- *The quality of treated wastewater produced during operation of ITPFP will comply with the requirements specified in the Ordinance of the Minister of Construction of July 14, 2006 on the manner of performing the obligations of industrial wastewater suppliers and conditions for discharging wastewater into drainage facilities and in the contract between the entity discharging the wastewater and Przedsiębiorstwo Wodociągów i Kanalizacji (PWiK) in Olsztyn.*
- *Industrial wastewater (from the water treatment plant, washing wastewater, leachate from the bunker), before discharge to the slag quenching process and/or the drainage system of PWiK in Olsztyn will be treated in the industrial wastewater pre-treatment system.*
- *The pre-treated industrial wastewater discharged to PWiK drainage facilities will not affect the quality of surface and groundwater in area of potential impact of the planned Investment Project.*
- *The method of discharging industrial wastewater, rain and thaw water discharged from ITPFP will not cause any damage to the water environment and will not be hinder water use by other users.*
- *The water for domestic and process purposes will be supplied based on the contract with the system operator.*
- *ITPFP will be equipped with full water supply and sewerage system which will have metering system, fire protection, protections against failures. All rooms (e.g. bunker, waste pit, waste storage) will be tight and covered with concrete. The surfaces of yards will be paved and tight, equipped with a system of internal rain water drainage system. Slag yard will be roofed.*

8.3. Waste

Waste from operation phase

During the operation of ITPFP, the waste belonging to the following categories will be generated:

- **process waste** – generated in the production processes in the fuel combustion plant and in auxiliary systems,
- **operation and maintenance waste** – produced during operation, overhauls (also during construction and overhauls of civil structures) and maintenance of equipment operated in the CHPP,
- **packaging waste** – generated as a result of unpacking materials and raw materials,

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- **personnel work-related waste (including office waste)** – generated as a result of operating personnel work and the waste generated during maintaining cleanliness and order (municipal waste).

Prevention of waste production and minimization of their quantity makes the waste producer responsible for application of such methods and forms of production which shall keep the quantity of produced waste at the lowest possible level. The character and quantity of generated waste depend primarily on the access to raw materials and production technology and technical progress and ecological awareness. As a result, each unmanaged product and each product that does not have a specific purpose (raw material, material or final product) starts to be recognized as waste. Qualification of respective substances as waste or raw materials is determined by production technology. The list below presents specification of hazardous and non-hazardous waste which will be generated at the stage of operation of the new combined heat and power plant.

In line with point 24 of the Waste Act (consolidated text, Journal of Laws of 2013, item 21): "Waste, except for waste intended for storage, may be stored if the need for storage results from the technological or organizational processes and does not exceed the timeliness justified by the application of the said processes, for a period not longer than 3 years." And "Waste meant for storage may be stored only for the purposes of gathering an adequate amount of waste for transport to the landfill site, not longer than for a period of 1 year."

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Table 41. Estimated types and volumes of hazardous waste and manner of waste management

Waste code	Waste type	Estimated volume of waste generated [Mg/year]	Waste characteristic	Waste storage method and place on the plant premises	Manner of waste handling Recovery or neutralization method
1	2	3	4	5	6
08 01 11*	Waste paint and varnish containing organic solvents or other dangerous substances	0.1	Remains of paints and paints with past expiry date applied in repair and maintenance works on the premises for repainting equipment and facilities in the form of non-reusable oil-based paints produced on the basis of synthetic oils and dyes. They comprise a mix of aromatic and aliphatic hydrocarbons, dyes in the form of titanium white, ultramarine, yellow and orange dyes	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons	Handed to recipients holding relevant permits for R2 recovery or D5 neutralization

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08 03 17*	Waste printing toner containing dangerous substances	0.1	Used cartridges applied in office equipment, e.g. printers, photocopiers. Waste composition: plastic case contaminated with used toner, containing dyeing substance: pigment, lacquer, dye, composition of oil or resin varnishes with addition of bulking agents: titanium white, ultramarine, yellow and orange dyes, plasticizers, oil drying agents including terpenes.	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons	Handed to recipients holding relevant permits for R5 recovery
13 01 10*	Mineral-based non-chlorinated hydraulic oils	0.02	Used hydraulic mineral oils which lost their properties and are contaminated with the plant elements and with substances migrating into the oils from outside and containing metals, i.e. steel, aluminum, copper, brass	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R9 recovery

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13 01 13*	Other hydraulic oils	0.2	Used hydraulic oils from vehicles and machines and stationary devices, comprising synthetic esters and combinations of improvers contaminated with water, heavy metal compounds: barium, lead, copper, cadmium, phosphorus and sulfur compounds.	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R9 recovery
13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	0.15	Used oils containing polycyclic aromatic and saturated hydrocarbons, improvers: S, P, N, Cl and heavy metal compounds as well as products of wear of elements of working equipment or products of incomplete combustion (particles of soot, exhaust carbon, lead compounds)	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R9 recovery

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13 02 08*	Other engine, gear and lubricating oils	2.0	<p>Waste machinery oils replaced in operated gears or engines which constitute a mixture of basic oils – aromatic and aliphatic hydrocarbons and various contaminants in the form of particulate matter or metals (iron, aluminum, copper and tin), products of wear of elements of the engine or products of incomplete combustion (particles of soot, exhaust carbon, lead compounds). These oils will also be contaminated with compounds of phosphorus, sulfur, calcium, zinc and barium created as a result of wear and decomposition of improvers</p>	<p>Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.</p>	<p>Handed to recipients holding relevant permits for R9 recovery</p>
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13 03 07*	Mineral-based non-chlorinated insulating and heat transmission oils other than mentioned in 13 03 01.	1.0	Used mineral transformer, condenser and compressor oils. They are subject to wear process as a result of chemical reactions occurring during operation, losing their technical properties by changing their density. They contain contaminants in the form of improvers of oils and products of their decomposition, mainly phosphorus, sulfur and arsenic compounds as well as hydrocarbon polymerization products	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R9 recovery
13 03 10*	Other insulating and heat transmission oils	0.5	Other used transformer, condenser and compressor oils containing phosphorus, sulfur and arsenic compounds	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R9 recovery

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13 05 01*	Solids from grit chambers and oil/water separators	1.0	Waste produced during periodical cleaning of the sedimentation part of the oil separators installed in the rain water drainage system. This will be mineral suspended matter in the form of sand, soil, small amounts of gravel and small stones as well as fine fractions of organic contaminants, i.e. leaves, grass, etc.	Waste will not be stored but handed to waste recipients immediately after the waste is generated	Handed to recipients holding relevant permits for D5 neutralization
13 05 02*	Sludges from oil/water separators	1.0	Mixture of oil sludges held in oil separators installed on the rain water drainage system. These sludges will contain oil derivative substances (aromatic and aliphatic hydrocarbons)	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R9 recovery
13 05 07*	Oily water from oil/water separators	0.1	Water contaminated with oil-derivative substances from cleaning oil separators installed in the rain water drainage system	Waste will not be stored but handed to waste recipients immediately after the waste is generated	Handed to recipients holding relevant permits for R9 recovery

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15 01 10*	Packaging containing residues of or contaminated by dangerous substances (e.g. plant protection products of toxicity class I and II – highly toxic and toxic)	0.2	Metal (steel, aluminum), plastic and glass packaging contaminated with residues of substances, hazardous agents used in the plant. Packaging contaminated with all types of oils and packaging of hazardous substances used in the plant laboratory.	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R5 recovery
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated with dangerous substances	1.0	Rags used for cleaning soiled instrumentation, soiled electrical equipment, cleaning cloths soaked with oil, petroleum, gasoline, soiled worker's protective clothing, protective gloves, dust mask cartridges. Waste composition: textiles made of natural raw materials (wool, cotton, linen) and artificial materials (polyester, PCV, aniline) soiled with hazardous substances, mainly oil derivative substances and heavy metals	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for D5, D10 neutralization

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16 01 07*	Oil filters	0.1	Used oil filters used in mechanical vehicles. The oil filter is composed of a perforated pipe, a filtration layer made of plastic, a steel disc with a rubber gasket, a steel back-up spring and a steel housing. The filtration layer of a waste filter soiled with hydrocarbons and heavy metals, such as barium, lead, zinc and nickel	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons	Handed to recipients holding relevant permits for D5 neutralization
16 01 13*	Brake fluids	0.1	Waste brake fluids including between 70 and 80% of alkyl ethers, alkylene glycols, between 20 and 30% of a lubricating agent in the form of ethylene polyglycols and boron glycols	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for D5 neutralization

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16 02 13*	Discarded equipment containing hazardous components (2) other than those mentioned in 16 02 09 to 16 02 12	1.0	Waste fluorescent lamps. They consist of aluminum elements, a small amount of mercury and luminophore soaked in mercury. Used monitors, emergency power unit, the so-called UPS. The composition of waste is a mixture of metal, glass and plastic elements containing heavy metals	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R4, R5 recovery
16 02 15*	Hazardous components removed from discarded equipment	0.1	Dangerous used parts of equipment, e.g. dangerous parts of industrial computers such as oscillating lamps, CRTs. These lamps consist of a glass casing inside which there is a metal cathode and anode (nickel, zinc, cadmium) covered with metal oxides, usually barium, strontium, calcium or thorium oxides, as well as a layer of luminophore in the form of sulfides or oxides or such metals as cadmium, calcium, beryl with addition of activators such as manganese, silver and copper	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R4, R5 recovery

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16 03 03*	Inorganic wastes containing dangerous substances	1.0	Waste generated during replacement of moisture absorbers in transformers, waste in the form of powder is silicon dioxide dyed with cobalt chloride	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R2 recovery or D5 neutralization
16 03 05*	Organic wastes containing dangerous substances	0.2	Waste of used and expired paints, adhesives, binders and resins	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R3 recovery or D5 neutralization
16 05 07*	Discarded inorganic chemicals consisting of or containing dangerous substances (e.g. expired chemical reagents)	0.2	Expired and discarded reagents used in laboratory for analyses: sulfanilic acid, tartaric acid, phosphate-molybdic acid, oxalic acid, acetic acid, potassium hydroxide, potassium chloride, potassium dichromate, potassium chromate, potassium iodide, potassium permanganate, potassium versenate, aluminum gas 1 flux, aluminum gas 2 flux, Austenit-lut flux, mercury iodide, mercury sulfate etc.	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R5 recovery or D5 neutralization

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16 05 08*	Discarded organic chemicals consisting of or containing dangerous substances (e.g. expired chemical reagents)	0.1	Expired and discarded reagents used in laboratory for analyses: 2.2-Bipyridine, Phenanthroline, chloroform, metol, pyrogallol, hydroxylamine 185 chloride.	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R5 recovery or D5 neutralization
16 06 01*	Lead batteries	2.0	Used, deteriorated batteries and rechargeable batteries from mechanical vehicles The used (deteriorated) rechargeable battery is built of a plastic housing, lead electrodes i.e. a lead anode and a cathode covered with lead dioxide and electrolyte in the form of sulfuric acid with a density of e.g. 1.15 g/cm ³ . The electrolyte is polluted with a suspension of lead compounds, such as metallic lead, lead oxide and lead sulfate	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R4 recovery or D5 neutralization

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16 06 02*	Ni-Cd batteries	1.0	Used Ni-Cd batteries. The used (deteriorated) rechargeable battery consists of a plastic casing, electrodes i.e. cadmium anode and a nickel cathode covered with insoluble NiOOH and electrolyte in the form of potassium hydroxide water solution. The plant uses them as part of UPS systems in computers	Waste will be stored in tight and marked containers on leak-proof paved surface in a storage facility that prevents access of third persons.	Handed to recipients holding relevant permits for R4 recovery
16 07 08*	Wastes containing oil	1.0	Remains and sediments from cleaning storage tanks, barrels and other oil containers	Waste will not be stored but handed to waste recipients immediately after the waste is generated	Handed to recipients holding relevant permits for R9 recovery
17 01 06*	Mixtures of, or separate fractions of concrete, bricks, tiles and ceramics containing dangerous substances	5.0	This type of waste will consist of concrete elements of different fractions contaminated with hazardous substances. This will include damaged bricks, tiles, sanitary elements, large concrete elements, large parts of crushed bricks	Waste will be stored in a container in the direct vicinity of the renovation works	Handed to recipients holding relevant permits for R5 recovery or D5 neutralization

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17 02 04*	Glass, plastic and wood containing or contaminated with dangerous substances	40.0	Waste generated as a result of overhauls held across the entire plant They consist of waste contaminated with hazardous substances, e.g. oils, lubricants	Waste will be stored in a container in the direct vicinity of the renovation works, on paved surface protected against penetration of pollutants to the water and ground.	Handed to recipients holding relevant permits for R1, R5 recovery
19 01 07*	Solid wastes from gas treatment	3,300	Activated carbon introduced as injection to the flue gas flow in dry conditions downstream the flue gas treatment plant, collected in the filter along with other ash	Waste collected in ash storage silos	Waste subject to stabilization (D15) during which it changes the code to 19 03 05 and, then, landfilled (D5) on the landfill in Wysieka. Detailed description of recovery/neutralization process below.
19 01 10*	Spent activated carbon from flue-gas treatment	100	Activated carbon used in the form of a deposit	Waste collected in ash storage silos	Waste subject to stabilization (D15) during which it changes the code to 19 03 05 and, then, landfilled (D5) on the landfill in Wysieka. Detailed description of recovery/neutralization process below.

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19 01 13*	Fly ash containing dangerous substances	5,500	Fine grain dust composed mainly of spherical, vitrified grains, produced during alternative fuel combustion, showing pozzolanic properties and containing primarily SiO ₂ and Al ₂ O ₃ . Produced by electrostatic or mechanical precipitation of dusty particles from exhaust gas from furnaces	Waste collected in ash storage silos	Waste subject to stabilization (D15) during which it changes the code to 19 03 05 and, then, landfilled (D5) on the landfill in Wysieka. Detailed description of recovery/neutralization process below.
19 01 15*	Boiler dust containing dangerous substances	2,200	Fine grain dust composed mainly of spherical, vitrified grains, produced during alternative fuel combustion, showing pozzolanic properties and containing primarily SiO ₂ and Al ₂ O ₃ . Produced as a result of cleaning boiler walls	Waste collected in ash storage silos	Waste subject to stabilization (D15) during which it changes the code to 19 03 05 and, then, landfilled (D5) on the landfill in Wysieka. Detailed description of recovery/neutralization process below.

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Table 42. Estimated types and volumes of waste other than hazardous waste and manner of waste management

Waste code	Waste type	Estimated volume of waste generated [Mg/year]	Waste characteristic	Waste storage method and place on the plant premises	Manner of waste handling Recovery or neutralization method
1	2	3	4	5	6
08 01 12	Waste paint and varnish other than those mentioned in 08 01 11	0.1	Remains of paints and paints with past expiry date for repainting equipment and facilities in the form of non-reusable oil-based paints produced on the basis of natural oils and dyes or other paints not containing hazardous substances	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R5 recovery or D5 neutralization

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08 03 18	Waste printing toner other than those mentioned in 08 03 17	0.1	Used cartridges applied in office equipment, e.g. printers, photocopiers. Waste composition: plastic case contaminated with used toner, containing dyeing substance: pigment, lacquer, dye, composition of oil or resin varnishes with addition of bulking agents: plasticizers and oil drying agents not containing hazardous substances	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R5 recovery
08 04 10	Waste adhesives and sealants other than those mentioned in 08 01 09	0.1	Wastes in the form of used or expired adhesives used in the plant premises not containing hazardous substances	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to a company holding relevant permits for recovery of R5 or neutralization of D5

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10 01 82	Mixtures of fly ash and solid waste from lime method for desulfurization of exhaust gases (dry and semi-dry flue gas desulfurization methods and combustion in fluidized bed)	2300.0	Bottom and fly ash mixture from fuel combustion in grate-fired boilers and products of flue gas desulfurization reaction taking place in the boiler as a result of hydrated lime dosing	Waste will be stored in ash and sorbent storage silos	Collection and transport by tanker lorries to recovery places by entrepreneurs holding relevant permits. Use (recycling) – as proppant in mining, to produce construction materials (R5), as material for earthworks and land reinstatement (R10) Detailed description of recovery under the table.
12 01 13	Welding wastes	0.1	Used electrodes or welding wire used for the welding process in a mechanical workshop or on the plant premises. Chemical composition of electrodes: Fe 40%, Mn 17%, F 10%, Ca 12%, Si 8%, Na 6%, Cr 4%, K 2%, Ti 1%. Chemical composition of welding wire: Fe 60%, Mn 12%, Si 5%, Cr 1% other elements Ni, Cu 22%	Waste collected in containers on a leak-proof surface in the workshop building	Handed to recipients holding relevant permits for R4 recovery

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12 01 17	Waste blasting material other than those mentioned in 12 01 16	0.1	Waste generated in the course of grinding works. Grinding dust containing the abrasive and grinding materials and handled materials	Waste collected in a tight and marked container on a leak-proof surface in the workshop buildings	Handed to recipients holding relevant permits for R4 recovery
12 01 21	Spent grinding bodies and grinding materials other than those mentioned under 12 01 20	0.1	Waste from used grinding materials applied in the process of equipment refurbishment. Waste may be composed of various types of materials such as artificial corundum grains, silicon carbide, flint and talc	Waste collected in containers on a leak-proof surface in the workshop building	Handed to recipients holding relevant permits for R4 recovery
15 01 01	Paper and cardboard packaging	1.0	Paper and cardboard packaging in which various raw materials, equipment elements and office materials are delivered. Chemical composition of this waste includes cellulose and lignin	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R1, R3 recovery

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15 01 02	Plastic packaging	0.5	Waste of damaged, non-contaminated burst polypropylene bags, stretch-type bags the main component of which is non-toxic synthetic plastic polymer. This group includes plastic containers in which liquid or bulk substances are delivered as well as protective measures applied inside cardboard packagings which protect the products against transportation damages.	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R5 recovery
15 01 03	Wooden packaging	1.0	Wooden containers in which various raw materials are delivered, wooden protective elements in other packaging and disposable and non-reusable pallets on which raw materials are supplied and stored. Chemical composition includes cellulose, hemicellulose and lignin	Waste will be stored in tight containers or in bulk in an organized manner in a separated location within the main warehouse	Handed to recipients holding relevant permits for R1, R3 recovery

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15 01 04	Metallic packaging	2.0	Metal packaging, barrels and cans containing residues of non-hazardous substances, e.g. paints containing natural oils and pigments. This also includes steel tapes and container fasteners	Waste will be stored in tight containers or in bulk in an organized manner in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery
15 01 05	Composite packaging	1.0	Packaging waste comprising at least two plastics which cannot be physically separated. This includes packaging for protection of equipment and raw materials during transport, containing plastic films with expanded polystyrene or wood	Waste will be stored in tight containers or in bulk in an organized manner in a separated location within the main warehouse	Handed to recipients holding relevant permits for R3, R5 recovery
15 01 07	Glass packaging	0.1	Glass bottles containing residues of various substances. Chemical composition of glass is silica with additives in the form of sodium carbonate and calcium carbonate and flux in the form of boron and lead oxides, as well as dyes which are typically cadmium and manganese oxides	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R5 recovery

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15 02 03	Absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02	2.0	Rags used for cleaning soiled instrumentation, soiled electrical equipment, soiled worker's protective clothing and protective gloves. Waste composition: textiles made of natural raw materials (wool, cotton linen) and artificial materials (polyester, PCV, aniline) soiled with non-hazardous substances	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R5 recovery or D5, D10 neutralization
16 01 03	End-of-life tires	0.5	Waste tires of forklift trucks. The basic components of the tires are: polymers (natural and synthetic), carbon black and plasticizers. The tires contain 75% of natural and synthetic rubber, up to 20% of stainless steel, up to 5% polyamide cords and up to 5% black	Waste will be collected in containers or in bulk in an organized manner on a leak-proof surface in the workshop building	Handed to recipients holding relevant permits for R5 recovery
16 01 99	Wastes not otherwise specified (rubber waste from used belt conveyors)	0.5	Waste comprises used rubber belts of belt conveyors	Waste will be stored in bulk in an organized manner on a leak-proof surface in a separated location within the main warehouse	Handed to recipients holding relevant permits for R5 recovery

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16 02 14	Discarded equipment other than those mentioned in 16 02 09 to 16 02 13 (electrical and electronic equipment not containing hazardous substances)	0.2	End-of-life electrical equipment and electronic equipment, damaged equipment like engines, rectifiers, keyboards, computer mice, printers, scanners, calculators, radio receivers, phones, which need to be replaced. This waste consists of metal, plastic and glass elements, but contains no hazardous substances.	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery
16 02 16	Components removed from discarded equipment other than those mentioned in 16 02 15	0.1	Waste from non-hazardous deteriorated components of equipment, e.g. contactors, sensors, relays, electrical apparatus, deteriorated industrial computer parts such as wires, cables, electric boards, resulting from replacement. This waste is composed of a mixture of different types of metals, plastics and glass elements without hazardous substances	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery

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16 06 04	Alkaline batteries (except 16 06 03)	0.05	Batteries where an alkaline (basic) solution is used as the electrolyte. Potassium hydroxide is the most frequently used type of electrolyte. This type of batteries does not include mercury or cadmium	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4, R6 recovery
16 06 05	Other batteries and accumulators	0.05	Used small batteries and accumulators for portable lighting and power supply of electronic equipment are classified as waste	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4, R6 recovery
16 80 01	Magnetic and optical data carriers	0.05	CDs and floppy disks used for data storage. CDs are polycarbonate discs with a thickness of 1.2 mm and a diameter of 12 cm, covered with a thin layer of aluminum. A floppy disk consists of a rigid plastic casing with an opening providing access to the data carrier with a movable plastic cover	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery or D5 neutralization

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17 01 01	Concrete	50.0	Large concrete elements or concrete debris. This is a mixture of sand, gravel, cement, lime and clay	Waste will be stored in a container in the direct vicinity of the renovation works	Handed to recipients holding relevant permits for D1, D5 neutralization
17 01 03	Tiles and ceramics	15.0	Waste generated as a result of renovation of rooms in the facilities. Waste of sanitary elements, damaged ceramic tiles. These elements can be made of stoneware or porcelain and contain various types of clay and sand, with glazing and ceramic paint coat	Waste will be stored in a container in the direct vicinity of the renovation works	Handed to recipients holding relevant permits for D1, D5 neutralization
17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	5.0	This waste will consist of concrete elements of different fractions contaminated with hazardous substances. They will include damaged bricks, roof tiles, sanitary elements, large concrete elements, brick debris	Waste will be stored in a container in the direct vicinity of the renovation works	Handed to recipients holding relevant permits for D1, D5 neutralization

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17 01 80	Removed plaster, wallpapers and veneers	0.2	Waste from removed plaster generated in the course of renovating buildings and rooms, which does not contain hazardous substances, the main elements of which are cement, lime or gypsum	Waste will be stored in a container in the direct vicinity of the renovation works	Handed to recipients holding relevant permits for D1, D5 neutralization
17 02 01	Wood	1.0	Window joinery or door joinery, construction boarding elements. The basic components are cellulose, hemicellulose and lignin	Waste will be stored in a container in the direct vicinity of the renovation works	Handed to recipients holding relevant permits for R1, R3 recovery
17 02 02	Glass	0.5	Cullet, replaced glazing from windows and doors. Waste composition: quartz sand, calcium carbonate, sodium carbonate, flux– boron compound	Waste will be stored in a container in the direct vicinity of the renovation works	Handed over to companies holding relevant permits for R5 recovery
17 02 03	Plastic	1.0	Pipe ends, gaskets, scraps of sealing foils. This waste consists of polymers with additives in the form of fillers, plasticizers, fixing agents and dyes	Waste will be stored in containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R3 recovery

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17 03 80	Waste membrane tar	1.0	Damaged fragments of the roof plane produced during renovations of the roof in the plant's facilities. This waste consists of bituminous tar membrane that is composed of a cardboard base, glass fiber or polyester soaked with a bitumen or tar compound (i.e. a mixture of macromolecular hydrocarbons)	Waste will be stored in a container in the direct vicinity of the renovation works.	Handed over to companies holding relevant permits for R5 recovery
17 04 01	Copper, bronze, brass	1.0	Used (deteriorated) elements of automatic control systems of control equipment made of copper, bronze or brass	Waste will be stored in tight containers in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery
17 04 02	Aluminum	0.15	Used aluminum elements of facilities' cladding	Waste will be stored in tight containers or in bulk in an orderly manner in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery
17 04 05	Iron and steel	60.0	Melted-through steel pipes that require replacement and destroyed, used elements and auxiliary components such as: nails, screws, discs	Waste will be stored in tight containers or in bulk in an orderly manner in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery

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17 04 07	Mixed metals	1.0	Parts of machines and devices composed of different metals that cannot be separated	Waste will be stored in tight containers or in bulk in an orderly manner in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery
17 04 11	Cables other than those listed in 17 04 10 (cables containing crude oil and other hazardous substances)	2.0	Waste cables generated in the course of current repairs, replacement of cabling. These will include damaged insulated wires e.g. made of copper, single- or multi-core, encased in a common plastic sheath (PE, PVC).	Waste will be stored in tight containers or in bulk in an orderly manner in a separated location within the main warehouse	Handed to recipients holding relevant permits for R4 recovery
17 05 04	Soil and stones other than those mentioned in 17 05 03	10.0	Earth from excavations, stones, other waste from earthworks	Waste will be stored in bulk in an organized manner in the direct vicinity of renovation works	Handed to recipients holding relevant permits for R10 recovery

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17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	5.0	Mineral wool or expanded polystyrene waste generated periodically in the course of renovations of systems and facilities. Mineral wool consists of glass fibers impregnated with an organic binder (mixture of hide glue, latex and thermosetting resins). Expanded polystyrene is a porous plastic made of polystyrene	Waste will be stored in a container in the direct vicinity of the renovation works	Handed to recipients holding relevant permits for D5 neutralization
19 01 12	Bottom ash and slag other than those mentioned in 19 01 11	18,700	Non-combustible fractions of alternative fuel from waste, thicker fractions of ash from power boilers. Chemical composition depends on the type of combusted waste and is naturally varied; usually the main part consists of: silicon, aluminum, iron, calcium, magnesium, sodium, potassium and oxygen. Slags also contain trace amounts of other elements such as copper, nickel, lead, zinc, chromium, cobalt, manganese	Waste will be stored in a slag and product warehouse shelter	Collection and transport by tanker lorries to recovery places by entrepreneurs holding relevant permits. Use (recycling) – as an additive to bitumen, to produce construction materials (R5), as material for earthworks and land reinstatement (R10). Detailed description of recovery under the table.

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19 03 05	Stabilized wastes other than those mentioned in 19 03 04	7400.0	Fly ash stabilization product and flue gas treatment plant waste of lowered leachability of elements and compounds through closing of chemical compound chains.	Waste will be stored in a secondary waste stabilization hall	Collection and transport by tanker lorries to the neutralization places by entrepreneurs holding relevant permits. Landfilling of D5 in landfills in a purposefully planned manner. Detailed description of recovery under the table.
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19 09 05	Saturated or spent ion exchange resins	0.6	<p>Ion-exchange resin from ion exchangers of the water demineralization station. Used ion exchange compounds are generated in the course of replacing the ion-exchange resin which is done, depending on the parameters of the ion-exchange resin, once every more or less ten years. Ion-exchange resins are organic polymers which receive ion-exchange groups in the course of polymerization reaction: an acidic (H⁺ group) or alkaline (OH⁻ group). These groups are introduced during polymerization of: styrene, formaldehyde, copolymer, styrene-divinylbenzene. These are solids insoluble in water with porous structure, large active area</p>	Waste will be stored in bags in a separated location of the water preparation station building	Handed to a company holding relevant permits for R1 recovery or D5 neutralization
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19 09 06	Solutions and sludges from regeneration of ion exchangers	0.1	Solutions generated as a result of regeneration of ion exchangers for water treatment for process purposes conducted with the use of HCl and NaOH	Waste will be stored in tight containers in a separated location of the water preparation station building	Handed to a company holding relevant permits for R5 recovery or D5 neutralization
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Transport of waste shall be commissioned to companies that have the required permits for transport, including transport of hazardous waste (ADR).

Detailed description of slag management

Slag considered as non-hazardous waste shall be collected by specialist companies after the seasoning process (it is allowed to have slag collected by a specialist company having appropriate licenses, without seasoning). Slag that is created as a result of municipal waste-to-energy process shall be transported from the slag removal equipment with a water seal using belt conveyors, it is crushed and metals are separated. Seasoning is aimed at improvement of slag properties, mainly at reduction of metal leachability and stabilization of the waste. Slag shall be stored on a concrete surface in a shelter, equipped with a system of discharge and collection of eluate water. The main substances reacting with compounds contained in the waste are carbon dioxide contained in the air and water (air humidity, rain). As a result of seasoning, reduction of metal leachability and slag stabilization occurs. Slag should be regularly raked to ensure similar seasoning conditions for all particles. In practice, the time of slag seasoning is from 6 to 20 weeks. After this period, slag can be used as an additive for bitumen. As a result of seasoning, eluate water is generated, which must be cleaned before evacuation to the drainage system. Slag shall be raked and loaded on trucks by means of a wheel loader. Protection against secondary dusting shall be provided by an appropriate structure of the seasoning shelter. Seasoning shall be performed in separated areas, divided with appropriately high walls and roofed. A 16 x 20 m shelter is to be provided for the need of slag seasoning.

Detailed description of dust and fly ash management

Fly ash, dust from boilers and waste from the flue gas treatment plant shall be stabilized within the combined heat and power plant and then collected (it shall also be possible to have non-stabilized waste collected and managed by specialist companies with appropriate licenses. Ash and waste from the flue gas treatment plant, prior to feeding to the stabilizing line, will be stored together. Retention of the storage tank shall amount to approx. 7 days.

Hazardous waste in the form of ash and waste from the flue gas treatment plant shall undergo the stabilization process during which the physical and chemical properties of waste will be altered. The post-stabilization product is not hazardous and, depending on the applied stabilization technology, can be stored on landfills for non-hazardous waste. Waste stabilization is aimed at reduction of washing out of elements and compounds through closing chemical compound chains. Stabilization results in chemical binding of pollutants washed out from waste (mainly metals), and the leachability of these pollutants from the stabilized material will be within the range allowed under Polish and European Union regulations. Stabilization is carried out with: a binding agent, a hydraulic binder — mostly cement, water,

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chemicals or alternatively solid additives such as slag, lime, sand. The technology mainly involves activation of the binding properties of the hydraulic binder (cement) by monomeric and polymeric substances through a change of the surface tension. The components of the binding agent together with impurities contained in waste form crystalline structures and direct molecular links, successfully binding these impurities and preventing them from being leached. Stabilization results in chemical binding of pollutants washed out from waste (mainly metals), and the leachability of these pollutants from the stabilized material will be within the range allowed under Polish and European Union regulations.

For the needs of the stabilization plant, it is planned to install a hall with dimensions of approx. 12x20 m. It is not assumed to produce construction materials on the premises of the ITPFP. It is assumed that the solidification and chemical stabilization plant will operate 60 hours per week (i.e. 12 hours per day, 5 days per week) - 2 shifts. Employees: 4 persons per shift.

Table 43. Estimated amount of post-stabilization product

Furnace waste	Unit	Amount
Estimated amount of post-stabilization product	thousand t/a	8.14

The product of the stabilization process is non-hazardous waste with the following codes:

- 19 03 05 Stabilized non-hazardous waste.

The waste generated in the stabilization process may be deposited at the landfill in Wysieka which is planned to be extended. For the landfill, a decision on environmental constraints was issued on February 11, 2010 by the Head of the Municipality of Bartoszyce. ZGO Sp. z o.o. in Bartoszyce applied for a decision on environmental constraints for the project involving the extension of Zakład Gospodarki Odpadami Sp. z o.o. in Wysieka, Bartoszyce on October 27, 2009. In accordance with the statement of grounds, the landfill in Wysieka will act as the regional landfill where mainly the waste remaining after the processes of recovery and neutralization of waste will be stored. One of the tasks involved in the Investment Project is the construction of a landfill basin for the area IV for stabilized waste after treatment in ZGOK in Olsztyn.

CONCLUSIONS

- *Waste from combustion of fuel from waste shall be managed in compliance with the Journal of Laws of 2001 No. 62 item 627 of the Environmental Protection Law of April 27, 2001.*
- *Waste from combustion of fuel from waste shall be managed in compliance with the Journal of Laws of 2013 item 21 of the Waste Act of December 14, 2012.*

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- Ash and waste from the flue gas treatment plant, prior to feeding to the stabilization line, will be stored together. For the needs of the stabilization plant, it is planned to install a hall with dimensions of approx. 12x20 m. Waste produced in connection with the plant operation should be stored in special, appropriately labeled containers in designated places. The storage place should be accessible only for authorized persons. It should be equipped with a concrete floor and sorbents to neutralize possible leakages from the waste. The total waste storage time cannot exceed the time indicated in the applicable detailed provisions.
- Waste produced during the plant operation should be given to specialist external companies having appropriate licenses.
- It is acceptable to use residues left after the waste-to-energy process for production of construction materials used to construct civil engineering structures other than those intended for permanent stay of people, road construction, provided that the special requirements set forth by the applicable detailed provisions covering the waste-to-energy process are met. Such a solution is acceptable only for proven and approved technologies, where the approval procedures are strictly followed, only for products with a thoroughly tested composition.
- The seasoning/valorization of slag shall be carried out in separated areas, divided with walls of appropriate height and roofed. Protection against secondary dusting shall be provided by an appropriate structure of the seasoning shelter. The shed shall be equipped with a system for discharge and collection of drainage water. A 16 x 20 m shelter is to be provided for the need of slag seasoning.
- Once the seasoning process has been completed, the slag should be transferred to appropriate entities for recovery. It is also possible to transfer waste to specialist companies having appropriate licensed without seasoning.
- Before slag is transferred for use, a technical approval should be obtained from an authorized entity in accordance with Ordinance of the Minister of Infrastructure of November 8, 2004 on technical approvals and organizational units authorized to issue such approvals.
- Post-process waste (waste from flue gas treatment, fly ashes containing hazardous substances, boiler dust containing hazardous waste) should be solidified and stabilized chemically in the post-process waste solidification and chemical stabilization plant located within the plant. As a result of the process waste with the code 19 03 07 (Solidified non-hazardous waste) or 19 03 05 (Stabilized non-hazardous waste) are produced.
- Waste produced after the stabilization process should be transferred to hazardous waste landfills or to waste landfills with an area intended for storage of hazardous waste. The waste can be stored on the waste landfills in Wysieka that is planned to be extended.
- If the waste-to-energy process line is damaged or the bunker is filled to the level which makes it impossible to receive other batches of municipal waste, waste deliveries should be stopped.

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- *Waste that is temporarily stored on the premises of other facilities as a result of a downtime of the ITPFP, should be treated thermally once the system has been restarted.*
- *Waste management should be reported within the scope of current quantitative and qualitative record of waste produced and transferred to next waste holders. The records should be made in accordance with the example documents indicated in the detailed provisions.*
- *Before the operation of the Investment Project starts, the formal and legal status should be regulated in terms of waste management by signing appropriate contracts for delivery of waste to the Municipal Waste Energy Use Plant.*
- *The efficiency of the used solutions (systems/plants) for waste management shall be covered with guarantees of contracts with selected Contractors.*
- *Handover for operation of the planned Investment Project will be possible upon obtaining relevant administrative permits and demonstrating that the plant meets the contract requirements.*

8.4. Noise

ITPFP will be a plant in constant operation. The noise level emitted to the surrounding environment by the machines and equipment operated during the process of energy generation will be similar in the daytime and nighttime, and it will strictly depend on the quantity of the noise sources operating simultaneously. Differences in the level of emitted noise during twenty four hours may arise, among others, from the road transport which takes place during the daytime only.

Due to the applicable acoustic requirements, the selection of technical solutions for individual facilities and equipment is of great importance for solutions applied in ITPFP. The right selection of construction solutions for appropriate acoustic insulation properties of space dividers and other safety devices - which will also be very important devices reducing noise emission to the environment - is also important.

8.4.1. Environmental constraints

The acceptable noise standards result from the provisions of Ordinance of the Minister of Environment on acceptable noise levels in the environment (consolidated text announced with Notice of the Minister of Environment of October 15, 2013 and published on January 22, 2014).

In accordance with the above Ordinance, the acceptable level of noise from a plant or facility generating noise depends on the function of the areas adjacent to the project site. The normative noise levels on areas with residential developments and other protected areas are shown in Table 43.

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Table 44. Normative noise levels on areas with residential developments and other protected areas

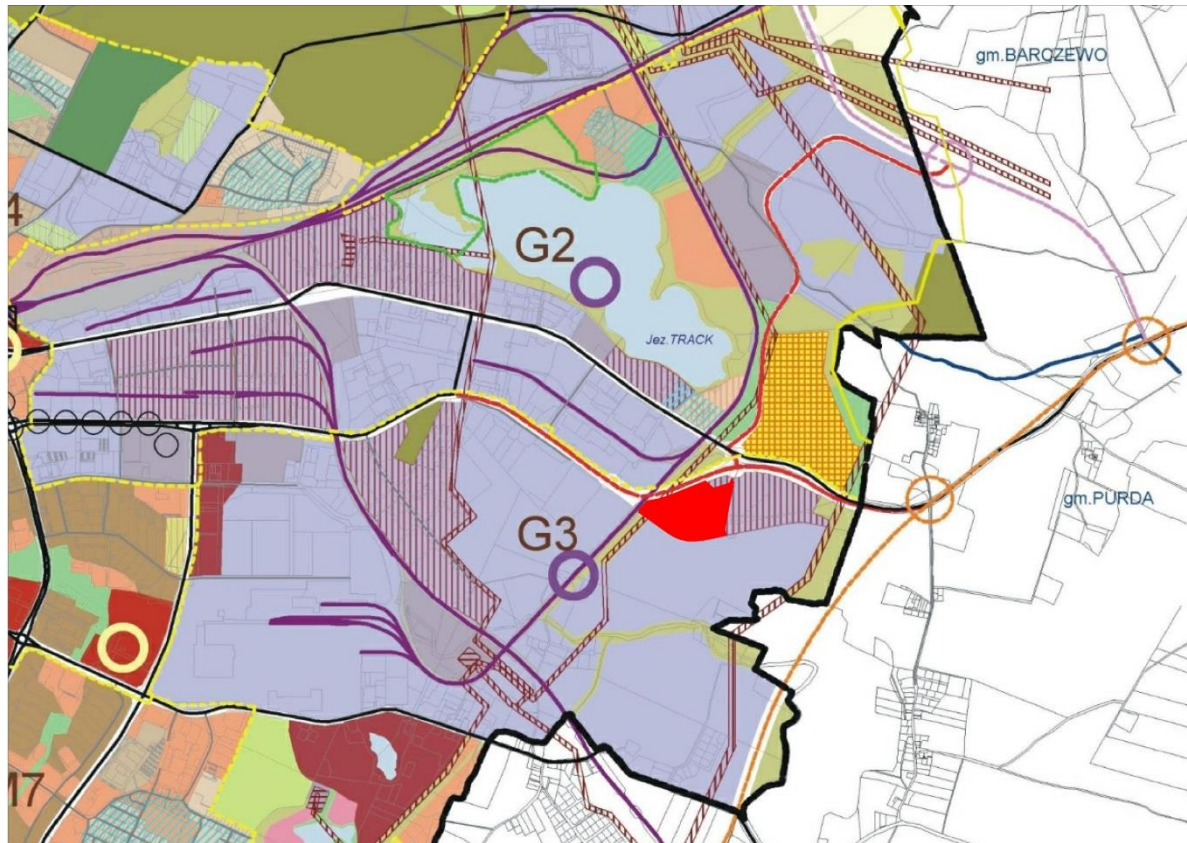
Land function	Acceptable noise level expressed by the equivalent weighted sound level in dB	
	Systems and other facilities and sources of noise	
	Reference period of 8 consecutive least comfortable hours during a day	Reference period equal to 1 the least favorable hour in the night
a) Single-family residential areas b) Residential areas associated with permanent or temporary presence of children and youth c) Areas on which social care houses are located d) Hospital areas in towns	50	40
a) Multi-family and boarding house residential areas b) Farmstead areas c) Recreation and leisure areas d) Residential and service areas	55	45
Areas in the center zone of towns with a population exceeding 100 thousand	55	45

In accordance with the table above, single-family residential areas have the most strict acceptable levels of noise in the environment. The location of areas with residential developments and other areas with acoustic protections is determined based on local land development plans. For the planned Investment Project site and the adjacent areas there is a binding local land development plan for the City of Olsztyn for the land located between ul. Lubelska, the railway siding and the boundary of the City of Olsztyn (Resolution No. LIII/866/14 of the Council of the City of Olsztyn of May 28, 2014).

According to the local land development plan, the planned project site is classified as an area for services, industry and storage yards. The adjacent areas are mainly areas for industry, services and storage areas, developments of service and sport areas.

The figure below shows the function of the planned project site and adjacent areas based on the study of land use conditions and directions for the City of Olsztyn.

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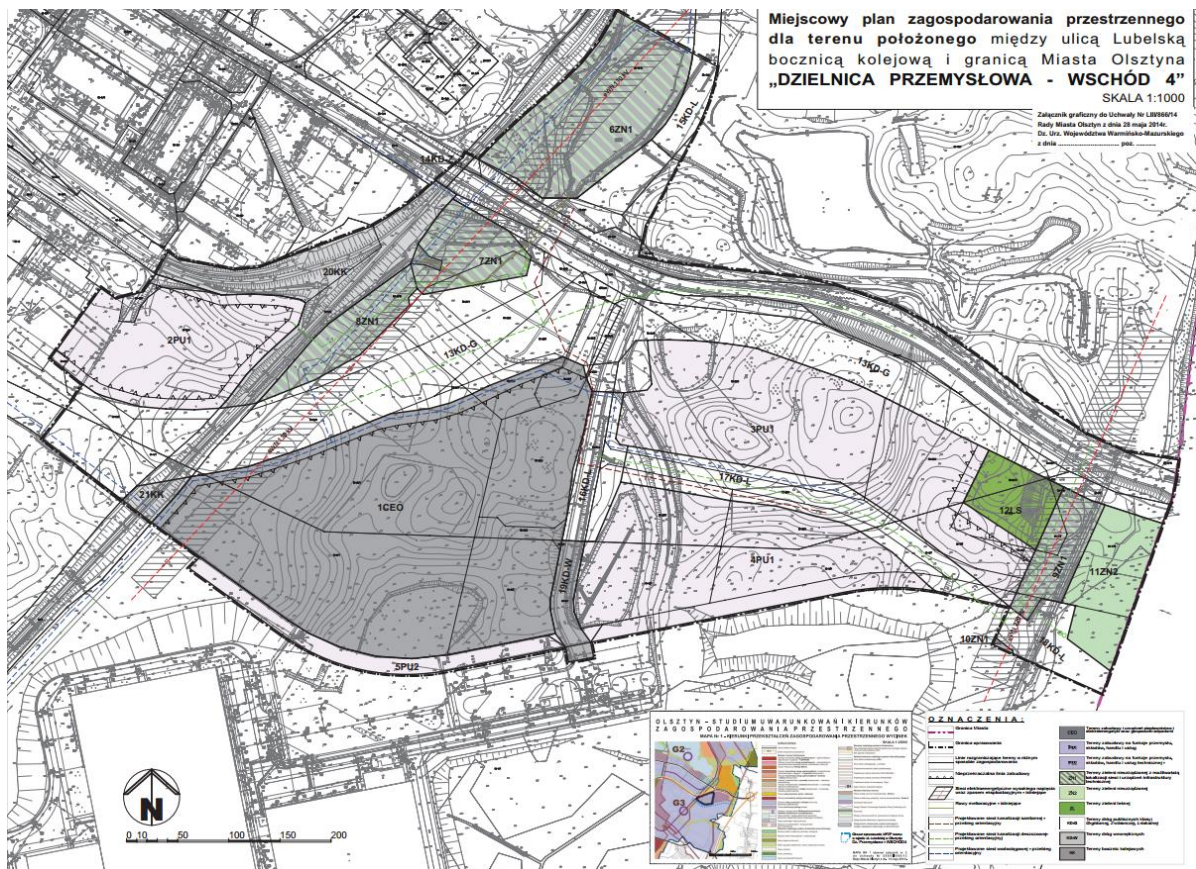
	Investment Project site		Area for transformations — function, areas of concentration of commercial services
	Areas of services, industry and storage yards and other economic activity		Areas of concentration of commercial services
	Sports and recreation service areas		Areas of concentration of general city medium and low-intensity services
	High-intensity residential areas — multi-family residential areas		Medium-intensity residential areas — multi-family residential areas

Figure 21 Functions of Investment Project site and adjacent areas in accordance with study of land use conditions and directions for the City of Olsztyn

Suitable acoustic conditions specified in standard No. PN-87/B-02151/02, “Acceptable A-weighted sound level on the premises designed for human occupancy,” shall be ensured inside the residential buildings located in areas not subject to noise protection, in accordance with Article 114 of the Act of April 27, 2001 – Environmental Protection Law (consolidated text, Journal of Laws of 2008, No. 25, item 150, as amended). Areas not covered with acoustic protection and located within the nearest vicinity of the location of the new power plant with residential buildings, in accordance with the

- G3 - areas of services, industry and storage yards and other economic activity;
- G2 - selected part of the area for transformation with the function of areas of concentration of general city medium and low-intensity services

The function of the planned Investment Project site and the adjacent areas on the basis of the local land development plan is presented in the drawing below.



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Miejscowy plan zagospodarowania przestrzennego dla terenu położonego między ulicą Lubelską bocznica kolejową i granicą Miasta Olsztyna „DZIELNICA PRZEMYSŁOWA – WSCHÓD 4”	Local land development plan for the area located between ul. Lubelska, the railway siding and the boundary of the City of Olsztyn "INDUSTRIAL QUARTER – EAST 4"
skala	scale

Figure 22 Functions of the Investment Project site and adjacent areas in accordance with the local land development plan

The closest **existing residential developments** that is not covered by the local land development plan is within:

- approx. 270 m to the north-east of the Investment Project borders, at ul. Lubelska 47b
- approx. 870 m to the west of the Investment Project borders, at ul. Towarowa 18
- approx. 570 m to the south of the Investment Project borders, at ul. Al. Marszałka Józefa Piłsudskiego
- approx. 800 m to the east of the Investment Project borders, in Klebark Mały 24a
- approx. 800 m to the north-east of the Investment Project borders in Klebark Mały 37a.

8.4.2. Noise emission sources

The operation of the planned Investment Project will involve the emission of noise from equipment and systems and from the transport of fuel, waste, sorbents or chemicals. The main noise sources within ITPFP will be the turbine hall building and the cooling system - subcoolers or dry condenser (depending on what is selected). Additional noise sources: additional heat source equipment and systems - peak load back-up boiler house. Noise generated due to shipment of waste (linear noise sources) is also important as far as noise emission is concerned.

It is expected that max. 8 waste trucks per hour will be coming for the purposes of the ITPFP. Additionally, it is expected that sorbents will be delivered and waste will be exported. The operation of the combined heat and power plant can cause additional traffic of max. 40 trucks per day in total, provided that shipments are made 5 days per week (Monday to Friday). Below there is a transport road between the combined heat and power plant and the Waste Treatment Plant. It is expected that waste will be transported with vehicles using the existing and a new road network. Delivery routes:

- access road from the Waste Treatment Plant to the crossing from ul. Lubelska approx. 1,400 m
- ul. Lubelska to the crossing with the road from the Logistics Center of Michelin Polska approx. 50 m
- access road to the Center of Michelin Polska approx. 150 m

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- In total approx. 1,600 m

Below, you can find the main sources of noise in the new combined heat and power plant:

1. Waste bunker – volumetric source – $L_i=85$ dBA day and night
2. Flue gas fan – point source – $L_w = 85$ dBA day and night
3. Dry mechanical draft cooling tower – volumetric source – $L_i = 85$ dBA day and night
 - 3.1. Cooler inlet ports – surface source – $L_i = 80$ dBA/m² day and night
 - 3.2. 6 cooler cells – surface source – $L_w = 85$ dBA day and night
4. Turbine hall – volumetric source – $L_i = 85$ dBA day and night
5. Transformer – point source – $L_w = 80$ dBA day and night
6. Building for solidification of ash and solid waste from the flue gas treatment system — volumetric source: $L_i = 92.0$ dB(A) day and night
7. Waste collection hall – volumetric source – $L_i=85$ dBA day and night
8. Workshop hall, storage facility – volumetric source – $L_i=85$ dBA day and night
9. Stack outlet – point source – $L_w = 85$ dBA day and night
10. Boiler house from the FGDP – volumetric source – $L_i = 85$ dBA day and night
11. Peak load boiler house – volumetric source – $L_i = 85$ dBA day and night
12. Turbine hall – volumetric source – $L_i = 85$ dBA day and night
13. Shipment of waste – linear source – operation by day.

- 13.1. Waste shall be transported with heavy goods vehicles. According to the Institute of Environmental Protection, the levels of sound power for automotive vehicles are as follows:

Table 45. Sound power levels for automotive vehicles

Operation	Sound power L_m , dB	Operation time, s
Start	105	5
Braking	100	3
Field drive, including maneuvers	100	(depending on the length of the road and the speed of the vehicle)

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- 13.2. The level of sound power for a single heavy goods vehicle moving from ZGOK to ITPFP with 50 km/h is: $L_w' = 53 \text{ dBA/1 m}$
- 13.3. The level of sound power for a single heavy goods vehicle moving around the plant with 20 km/h is: $L_w' = 57 \text{ dBA/1 m}$
- 13.4. Number of vehicles from ZGOK to ITPFP – 36 vehicles in 12 h of day, 1 vehicle collecting recyclable waste, 3 vehicles delivering sorbent, meal, oil and other products and materials. 40 vehicles a day in total.
- 13.5. Trucks shall be waiting for a truck weighing station for approx. 15 minutes – the parking place is a surface source with a sound power level of $L_w = 68.2 \text{ dBA}$
- 13.6. A single vehicle shall be within the plant for approx. 30 minutes.

The detailed description of noise sources, along with locations, altitude, time of operation and noise spectrum, were presented in Appendix No. 10 "Description of sources of noise".

Apart from the equipment and facilities described above, other facilities and equipment will be used – potential sources of noise without such an important influence in the matter of noise emission to the environment. However, their operation can also affect in some way the impact of ITPFP on the acoustic climate of the areas adjacent to the plant. For all remaining devices (potential noise sources) located within the facility, it is expected that their sound level (in free field) does not influence the equivalent level of noise in the environment significantly. The technical and technological solutions offered within the planned investment project are not allowed to cause any deterioration of the acoustic climate in the areas subject to acoustic protection located within the area of the potential impact of ITPFP. Equipment – potential sources of noise shall be compliant with the acceptable level of noise in their direct vicinity. Suppliers of new equipment shall be obliged to meet the acoustic requirements already at the stage of the proposal. On the current phase of design works no final decisions have been made as it comes to the selection of individual devices and construction and architectural solutions for individual facilities. The influence of the planned investment project on the environment for noise emission has been completed using knowledge and data matching the values of levels of sound power in similar devices in other designed facilities with similar technical and technological specifications. Based on the data, levels of sound power and levels of sound indoors were given, which allowed to calculate propagation of noise in the environment.

Average noise level A on the measurement surface 1 m from new equipment — noise sources that will be located in the area of the combined heat and power plant, measured during standard operation, shall not exceed 85 dB/8h.

CONCLUSIONS

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- *Emission of noise generated in ITPFP shall be in compliance with the Journal of Laws of 2001 No. 62 item 627 of the Environmental Protection Law of April 27, 2001.*
- *Emission of noise generated in ITPFP shall be in compliance with the Journal of Laws of 2007 No. 120 item 826 of Ordinance of the Minister of Environment of June 14, 2007 on acceptable levels of noise in the environment*
- *Emission of noise generated in ITPFP shall be in compliance with the Journal of Laws of 2005 No. 263 item 2202 of Ordinance of the Minister of Economy of December 21, 2005 on basic requirements for equipment used outdoors in terms of emission of noise to the environment*
- *Emission of noise generated in ITPFP shall be in compliance with the Journal of Laws of 2005 No. 157 item 1318 of Ordinance of the Minister of Economy and Labor of August 5, 2005 on occupational health and safety for works with exposure to noise or mechanical vibrations*
- *Walls and roofs shall be equipped with thermal and acoustic insulation.*
- *Acoustic parameters of all process equipment shall be maintained at the declared level.*
- *Defective equipment which may cause an increased level of noise or pollution emissions into the environment should be immediately repaired or eliminated.*
- *Acoustic protections should be used. Their location, solutions and parameters should be described in detail based on the precise acoustic calculations at the phase of selection of specific machines, devices and systems. The acoustic influence cannot cause that the acceptable noise level of 55 dB(A) by day and 45 dB(A) by night are exceeded on the nearest areas subject to acoustic protection.*
- *In order to minimize the emission of noise from the facilities and equipment of ITPFP to the environment nearby, the following solutions related to walls and roofs are to be used:*
 - *Waste bunker – volumetric source – minimum composite sound reduction index $R=26$ dB*
 - *Dry mechanical draft cooling tower – volumetric source – minimum insulation power of masonry part $R = 26$ dB*
 - *Turbine hall – volumetric source – minimum resultant insulation power $R = 26$ dB*
 - *Building for solidification of ash and solid waste from the flue gas treatment system – volumetric source: – minimum resultant insulation power $R = 26$ dB*
 - *Waste collection hall – volumetric source – minimum resultant insulation power $R = 26$ dB*
 - *Workshop hall, storage facility – volumetric source – minimum resultant insulation power $R = 26$ dB*

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- *Boiler house from FGDP – volumetric source – minimum resultant insulation power $R = 26$ dB*
- *Peak load boiler house – volumetric source – minimum resultant insulation power $R = 26$ dB*
- *If the emission of noise from fan cooler inlet ports (determined by the specific supplier of the cooler) is more than 80 dBA, use an acoustic protection to limit the emission down to 80 dBA.*
- *The efficiency of the used solutions (systems) for noise emission shall be covered with guarantees of contracts with selected Contractors.*
- *Handover for operation of the planned Investment Project will be possible upon obtaining relevant administrative permits and demonstrating that the plant meets the contract requirements.*
- *Keeping of the quantity of noise emission from all sources of noise shall be covered with guarantees of contracts with selected Contractors.*

8.5. Electromagnetic radiation

Power equipment components under operating voltage and conducting operational currents are source of electromagnetic field of 50 Hz frequency. This field as a physical factor is not neutral for human and other organisms, as it induces voltages and electric currents that may interfere with their physiological processes. This hazard depends on the value of the field intensity and time of exposure in the impact zone of the field. 50 Hz electromagnetic field, due to its low frequency may be treated separately as an impact of electric field and separately as an impact of magnetic field, because in this case only the induction zone occurs without radiation zone.

Ordinance of the Minister of Environment of October 30, 2003 on admissible electromagnetic fields levels in the environment and examinations methods for maintaining these levels (Journal of Laws of 2003, No. 192 item 1883) determine the limit values of electric and magnetic power field intensity, 50 Hz, that can occur in the environment, in places available for people.

10 kV/m is an electric field limit value acceptable for places open for public. Within areas with residential developments, electric field cannot exceed 1 kV/m. In relation to magnetic field, for areas available for people, the ordinance determine the limit value 60 A/m, with no distinguishing of places open for public or areas with residential developments. Within the area where the electric power field intensity is lower than 1 kV/m and the magnetic field intensity is lower than 60 A/m, there are no limitations and such an area is seen as fully safe for people and the natural environment. If electric field intensity exceeds 1 kV/m, but is lower than 10 kV/m — such an area is seen as safe for people and the natural environment, but cannot be used for residential developments. 10 kV/m is an electric field limit value

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acceptable for places open for public. In relation to magnetic field, for areas available for people, the ordinance determine the limit value 60 A/m, with no distinguishing of places open for public or areas with residential developments.

50 Hz electromagnetic fields from electrical power devices are present in the work environment. Regarding the external environment protection, the plant such as ITPFP (facility generating electromagnetic field) should be treated as a fenced whole. The electromagnetic field generated here, being a physical factor occurring only in the place of its generation and permanently connected to it – is not subject to relocation and propagation. Regarding the people and environment protection the planned Investment Project will not cause a hazard to the surrounding environment as a result of the electromagnetic radiation. Equipment running after the start-up of the new unit, being source of the 50 Hz electromagnetic field, can be classified into three main groups differentiated in terms of construction, location and availability.

Group one - equipment used for power generation

This group consists in generators and auxiliary equipment located in the new plant. In the new unit the power output from the generator shall be led by bus ducts in the insulated and shielded sheathing, so the possibility of exceeding the acceptable intensity of the electromagnetic field does not occur. The incineration plant shall also generate electricity, thus it belongs to this category.

Group two - transmission equipment in the form of overhead or cable power lines with a voltage of at least 110 kV.

Power lines are usually situated in the public areas, so the regulations concerning environment in general are mostly applied to them. They may be sources of electric fields with significant intensities and as a rule magnetic fields with intensities much lower than the acceptable levels. The power output from the unit transformer of the new unit to the switching station shall be provided by an overhead line with a voltage of 110 kV. The highest value of the electric field occurs under the extreme conductors. The value of field intensity increases with the decrease of the conductor-to-ground distance. Therefore, in the horizontal span the highest value is found in the middle of the span, in the point of the largest sag. During determining the protection zone for the given span, the range of span variation depending on the temperature shall be taken into account.

The Group 3 covers switching devices in the form of overhead or indoor switching stations of all voltages in power plant substations and transformer and switchgear substations in the buildings.

Only the distribution equipment with voltage of at least 110 kV may be a source of significant electric fields, therefore the problem in question concerns switching stations in the substations. However

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the distribution equipment of lower voltages are sources of magnetic fields, but their values rarely and only in large commercial power plants exceed the acceptable levels. The power supply of the new power unit auxiliaries shall be provided from its own tap transformer, which have shielded bus ducts of the HV side connected with the shielded bus ducts of generator power output and have the shielded bus ducts of the LV supply the auxiliary switchgear. Electromagnetic field with industrial frequency of 50 Hz is not a physical factor that causes visible and permanent deterioration of the environment. Its nuisance or harmfulness concerns people during the period of their presence in the zone of impact of this field and is a function of the field intensity and time of presence of people in the impact area.

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9. COMPARISON OF THE PROPOSED TECHNIQUE WITH THE BEST AVAILABLE TECHNIQUES

As defined in the Environmental Protection Law of April 27, 2001 (consolidated text.: Journal of Laws of 2008, No. 25, item 150, as amended), the best available technique (BAT) shall mean the most effective and advanced level of development of technology and methods of conducting a particular business activity used as a base for establishing the emission limit values, aimed at elimination of emission or, if it is practically not possible, reducing emission and environmental impact as a whole, provided that the technique refers to both the applied technology and the method applied for engineering, performance, operation and decommissioning of the plant. An available technique shall mean a technique developed so that it is possible to use it practically in a given branch of industry with consideration of technical and economical limitations and the cost-benefit analysis for the environment achievable by an entity that carry out a given activity. The best technique shall mean a technique most effective in obtaining a high general level of environmental protection as a whole.

BAT is a reference point for assessment of current parameters of the plant (either existing or designed). It is assumed that new plants should operate similarly with the main BAT levels presented in the reference documents. The existing plants should come to BAT — Best Available Technical and Economical Techniques. In accordance with Directive 96/61/EC concerning Integrated Pollution Prevention and Control (IPPC), the BAT standard is to be used to determine limit values of negative influence on the environment for large industrial plants. However, it is not necessary to indicate the type of the device or any specific technology. The aim is to offer emission limits that would reflect the right relationship between costs and advantages. The procedure of determination of the degree of compliance with the BAT requirements used in the Report has the following steps:

1. Identification of amount of emission of impurities to atmospheric air and water and soil.
2. Determination of the efficiency of the plant.
3. Analysis of offered methods of removing impurities from streams of media emitted to the environment.
4. Compilation of a BAT model for the plant — with consideration of technical and economical limitations.
5. Comparison of the designed state with the best available technique worked out for the local conditions.

Identification of BAT requirements is a process determined by:

- Local environment conditions in the area of operation of the plant,
- Plant economical operation conditions,

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- Technical and technological parameters specific for a given facility, such as:
 - quality and type of fuel,
 - method of combustion,
 - power of generating units of the combined heat and power plant,
 - existing technical conditions - e.g. the need to use the existing systems included in the plant,
 - time left to the end of operation,
 - cooling system (availability of cooling water),
 - availability of free space within the borders of the land,
 - availability of raw materials.

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COMPARISON OF THE PROPOSED TECHNIQUE WITH THE BEST AVAILABLE TECHNIQUES

The table below presents a comparison of the proposed solutions with the Best Available Techniques (BAT) Reference Document (BREF) for Waste Incineration (Reference Document on the Best Available Techniques for Waste Incineration, August 2006).

Table 46. Summary of the BAT analysis for the newly designed facility

	ANALYSIS OF FULFILMENT OF REFERENCE BAT			
Item	ISSUE	BAT REQUIREMENTS	METHOD OF FULFILLMENT OF BAT REQUIREMENTS BY THE PLANT	EVALUATION OF FULFILMENT OF THE REQUIREMENTS
	(1)	(2)	(3)	(4)
	INTRODUCTION			
1.	Construction of the Plant	select a design of the plant that is suited to the characteristics of the waste received, as described in 4.1.1* and 4.2.1 and 4.2.3:	The plant design is suitable for its designation. The plant shall be designed to meet, as far as possible, ecological requirements, recover maximum amount of generated energy, reduce dust content in flue gas and minimize effluent emissions with the use of semi-dry method for flue gas treatment along with a method of entrained-flow adsorption with active carbon injection. For the said plant the use of furnace with a grate has been assumed as an option that is most often used and is the most suitable for combustion of mixed municipal waste.	Compliance with the requirements of BAT
2.	Technical condition / cleanliness, activity	maintain general order at the plant site, as described in 4.1.2.	The plant site shall be fenced, properly arranged in consideration of greenery and maintenance of cleanliness. Relevant procedures and rules for service and operation of the plant shall be provided. The plant operation manual and operational procedures will include information concerning the type and frequency of inspections and maintenance necessary for the operation as well as the dates and duration of overhaul downtimes. The need to use radioactive material detectors is not foreseen.	Compliance with the requirements of BAT
3.		maintain all pieces of equipment in good working condition and carry out maintenance inspections and preventative maintenance		
4.		establish and maintain quality controls over the waste delivered, according to the types of waste that may be received by the plant, as described in: 4.1.3.1 Establishing installation input limitations and identifying key risks; 4.1.3.2 Communication with waste suppliers to improve incoming waste quality control; 4.1.3.3 Controlling waste feed quality on the incinerator site; 4.1.3.4 Checking, sampling and testing incoming wastes; 4.1.3.5 Detectors for radioactive materials.		
	FUEL MANAGEMENT			
5.	Waste storage and treatment	storage of wastes according to the risk assessment of their properties, such that a potential risk of contamination is minimized. In general it is BAT to store waste in areas that have sealed and resistant surfaces, with controlled and separated drainage systems, as described in 4.1.4.1.	The bunker shall be sealed and shall ensure possibility of sewage discharge.	Compliance with the requirements of BAT
6.		The use of techniques and procedures to restrict and manage waste storage times, as described in section 4.1.4.2, in order to generally reduce the risk of emission from the waste storage/container deterioration and of processing difficulties that may arise. In general, the BAT include: prevention of storage of waste volumes that are too large for the storage provided; in so far it is possible, control and management of deliveries by communication with waste suppliers, etc.	As the waste storage facilities, it is planned to construct a storage bunker for 5 days of reserve, which is the minimum retention of storage, guaranteeing the continuity of fuel deliveries to the plant in the course of the so-called long weekends.	Compliance with the requirements of BAT

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7.		Minimization of the release of odor (and other potential uncontrolled emissions) from bulk waste storage areas (including tanks and bunkers, but excluding small volume of wastes stored in containers) and waste pretreatment areas by passing combustion air to the furnace (see 4.1.4.4)	Negative pressure will be maintained in order to prevent odors from escaping. The hall shall be an enclosed building enabling the separation of unloading works from external environment and thus enabling also reduction of possible odor and noise releases during unloading of waste. The closing and opening of gates leading to the unloading hall should be automatically controlled with light signals installed accordingly at the gates to the unloading hall.	Compliance with the requirements of BAT
10.		Development of a plan for prevention, detection and control (described in 4.1.4.7) of fire hazards at the plant, in particular for: waste storage and pretreatment areas; furnace loading areas; electrical control systems; bag filters and static bed filters. The BAT also includes plans that cover the use of: a) automatic fire detection and warning systems; b) either manual or automatic fire prevention and control system as required according to the risk assessment carried out.	The waste bunker area shall include fire detection and alarm devices as well as devices for automatic extinguishing of fire spots.	Compliance with the requirements of BAT
11.		Mixing (e.g. using a mixing crane in the bunker) or further treatment (e.g. mixing some liquid and pasty waste, or shredding some solid waste) of heterogeneous waste to the degree required to meet the design specifications by the receiving plant (4.1.5.1). When considering the degree of use of mixing/treatment, it is of particular importance to consider the cross-media effects (e.g. energy consumption, noise, odor or other emissions) of the more extensive treatments (e.g. shredding). Pretreatment is most likely to be a requirement, if the plant has been designed for a narrow specification, homogeneous waste.	In order to unify the mix of waste supplied for combustion, the overhead traveling crane operator shall mix the waste in the bunker.	Compliance with the requirements of BAT
12.		Providing operators with means for visual monitoring, either directly or using television screens or similar, of waste storage and loading areas, as described in 4.1.6.1	The storage interior will be visible from the control room facilities which will be divided from one another with glazing.	Compliance with the requirements of BAT
13.		1. The use of the techniques described in 4.1.5.5 or 4.6.4, as far as practicably and economically viable, to remove ferrous and non-ferrous recyclable metals for their recovery either: a) after the combustion from furnace ash residues, or b) when waste is shredded (e.g. when used in specific combustion systems) from shredded waste before the combustion stage.	Separation of metals shall be performed at the fuel manufacturers' premises.	Compliance with the requirements of BAT
14.	Control of combustion process	Minimization of the uncontrolled ingress of air into the combustion chamber via waste loading or other routes, as described in 4.1.6.4	The methods for minimization of the ingress of air to the combustion chamber shall be applied according to BAT guidance.	Compliance with the requirements of BAT
PROCEDURES				
15.	The unit operating procedures	In order to reduce overall emissions, it is necessary to adopt systems for operational regimes and implementation of procedures (e.g. on continuous rather than periodic operation, preventative maintenance systems) in order to minimize, as far as practicable, either planned or unplanned shutdown and start-up operations, as described in section 4.2.5	The design foresees application of such solution.	Compliance with the requirements of BAT
16.		Identification of a combustion control philosophy and the use of key combustion criteria and a combustion control system to monitor and maintain these criteria within appropriate boundary conditions, in order to maintain effective combustion performance, as described in section 4.2.6. Techniques to consider for combustion control may include the use of infrared cameras (see 4.2.7), or other tools, such as ultra-sound measurement or differential temperature control.	The design foresees application of such solution.	Compliance with the requirements of BAT
17.		Optimization and control of combustion conditions by a combination of: a. the control of air (oxygen) supply, distribution and temperature, including gas and oxidant mixing; b. the control of combustion temperature level and distribution; c. the control of raw gas residence time. Appropriate techniques for securing these objectives are described in sections: 4.2.8 Optimization of air supply stoichiometry; 4.2.9 Primary air supply optimization and distribution; 4.2.11 Secondary air injection, optimization and distribution; 4.2.19 Optimization of time, temperature, turbulence of gases in the	The design foresees application of such solution.	Compliance with the requirements of BAT

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		combustion zone and oxygen concentrations; 4.2.4 Design to increase turbulence in the secondary combustion chamber;		
18.		In general it is BAT to use those operating conditions (i.e. temperatures, residence times and turbulence), as specified in Article 6 of Directive 2000/76. The use of operating conditions in excess of those that are required for efficient destruction of the waste should generally be avoided. The use of other operating conditions may also be BAT – if they provide for a similar or better level of overall environmental performance. For example, if the use of operational temperatures of below 1100°C (as specified for certain hazardous waste) have been demonstrated to provide for a similar or better level of overall environmental performance, the use of such lower temperatures is considered to be BAT.	The design foresees application of such solution.	Compliance with the requirements of BAT
WASTE COMBUSTION PROCESS				
19.	The use of combustion process control and monitoring system	Preheating of primary combustion air for low calorific value waste by using heat recovered within the plant, in conditions where this may lead to improved combustion performance (e.g. when low LCV/high moisture waste is burned), as described in 4.2.10. In general this technique is not applicable to hazardous waste combustion.	The technical solution applied shall meet BAT requirements.	Compliance with the requirements of BAT
20.		The use of auxiliary burners for start-up and shutdown and for maintaining the required operational combustion temperatures (according to the type of waste concerned) at all times when unburned waste is in the combustion chamber, as described in section 4.2.20.	Start-up burners fired with natural gas or light oil shall be installed in the combustion chamber.	Compliance with the requirements of BAT
21.	Furnace structure	The use of a combination of heat removal close to the furnace (e.g. the use of water walls in grate furnaces and/or secondary combustion chambers) and furnace insulation (e.g. refractory areas or other lined furnace walls) that, according to the NCV and corrosiveness of the waste combusted, provides for: a) adequate heat retention in the furnace (low NCV waste require longer residence time of heat in the furnace); b. additional heat to be transferred for energy recovery (higher NCV of waste may allow/require heat removal from earlier furnace stages). The conditions under which various techniques may be applied are described in 4.2.22 and 4.3.12	If necessary, membrane walls of the after-combustion chamber above the lined surfaces and the after-combustion chamber ceiling and the first radiant-type pass shall be protected against corrosive flue gas impact by build-up welding with corrosion resistant alloy.	Compliance with the requirements of BAT
22.		The use of furnace (including also secondary combustion chambers etc.) of dimensions large enough to provide for an effective combination of gas and temperature residence time, such that combustion reactions may approach completion and result in low and stable CO and VOC emissions, as described in section 4.2.23.	The boiler structure shall ensure relevant flue gas residence time (ca. 2 seconds) in required temperature (at least 850°C).	Compliance with the requirements of BAT
23.		In order to avoid operational problems that may be caused by hot sticky fly ash, it is necessary to use a boiler design that allows gas temperatures to reduce sufficiently before the convective heat exchange bundles (e.g. the provision of sufficient empty passes within the furnace/boiler and/or water walls or other techniques that aid cooling), as described in 4.2.23 and 4.3.11. The actual temperature above which contamination occurs depends strongly on waste type and boiler steam parameters. In general for MSW it is usually 600 – 750 °C, lower for HW and higher for SS. Radiative heat exchangers, such as superheaters, may be used at higher flue-gas temperatures than other designs (see 4.3.14).	The furnace chamber shall be constructed to prevent operational problems during the boiler operation.	Compliance with the requirements of BAT
FACILITY LOCATION, OPERATION OPTIMIZATION				
24.	Optimization of energy efficiency	Overall optimization of energy efficiency of the plant and of energy recovery, taking into account the technical-economic feasibility (with particular reference to the high corrosivity of flue gases that results from combustion of many wastes e.g. chlorinated waste), and the availability of users of the recovered energy, as described in 4.3.1, and in particular	The unit shall have technical solutions ensuring high availability and reliability.	Compliance with the requirements of BAT
25.	Organization of plant operation	To secure, where practicable, long-term base-load heat/steam supply contracts to large heat/steam users (see 4.3.1), so that a more regular demand for the recovered	The unit shall cover heat demand of the city of Olsztyn in summer as well as part of the demand in the heating season. In summer season the production shall be	Compliance with the requirements of BAT

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		energy exists and therefore a larger proportion of the energy value of the combusted waste may be used.	performed only in the new unit except for overhaul or the unit failure time (on average ca. 1000 hrs per year). It is assumed that in this period the heat will be produced in Kortowo Heat Generating Plant.	
26.	Organization of plant operation	Location of the plants, so that the use of the heat and/or steam generated in the boiler can be maximized through any combination of: a. electricity generation with heat or steam supply for users (i.e. use of CHP) b. the supply of heat or steam for use in district heating networks c. the supply of process steam for various, mainly industrial, applications (see examples in 4.3.18); d. the supply of heat or steam for use as the driving force for cooling/air conditioning systems. Selection of a location for a new plant is a complex process involving many local factors (e.g. waste transport, availability of energy users, etc.) which are addressed by IPPC Directive Article 9(4). Generation of electricity only may provide for reaching the most energy-efficient option for the recovery of the energy from the waste in specific cases where local factors prevent heat/steam recovery.	The location chosen so as to ensure the greatest efficiency of the facility	Compliance with the requirements of BAT
27.	Organization of plant operation	In cases when electricity is generated, the optimization of steam parameters (in accordance with user requirements for heat and steam produced), including consideration of (see 4.3.8): a. the use of higher steam parameters to increase electricity generation; b. the protection of boiler materials using materials of suitable resistance (e.g. lining or special materials for tubes). The optimal parameters for an individual plant are highly dependent upon the corrosivity of the flue gases and hence upon the waste composition.	The proper optimization conditions shall be fulfilled.	Compliance with the requirements of BAT
MACHINERY AND EQUIPMENT				
28.	Selection of a turbine	Selection of a turbine suited to: a. the electricity and heat supply system, as described in 4.3.7 b. high electrical efficiency.	In the turbine hall a back-pressure turbine will be installed, equipped with deaerator and two heat exchangers with a heating water subcooling system in the closed cooling circuit with dry mechanical draft cooling tower.	Compliance with the requirements of BAT
29.	Energy saving	General minimization of overall plant energy demand, including consideration of the following (see 4.3.6): a. for the performance level required, selection of techniques with lower overall energy demand in preference to those with higher energy demand; b. wherever possible, ordering flue gas treatment systems in such a way that flue gas reheating is avoided (i.e. those with the highest operational temperature before those with lower operational temperatures); c. where SCR is used; i. to use heat exchangers to heat the SCR outlet flue gas with the flue gas energy at the SCR outlet ii. to generally select the SCR system that, for the performance level required (including availability/contamination and reduction efficiency), has lower operating temperature; d. when flue gas reheating is necessary, the use of heat exchange systems to minimize flue gas reheating energy demand; e. avoiding the use of primary fuels by using self-produced energy in preference to imported sources.	The design foresees application of such solution.	Compliance with the requirements of BAT
30.	Cooling systems	Where cooling systems are required, select the steam condenser cooling system technical option that is best suited to the local environmental conditions, taking particular account of potential cross-media impacts, as described in 4.3.110.	The design foresees application of such solution.	Compliance with the requirements of BAT
31.	Reduction of dust quantities in the boiler	The use of a combination of on-line and off-line boiler cleaning techniques to reduce dust residence and accumulation in the boiler, as described in 4.3.19	The design foresees application of such solution.	Compliance with the requirements of BAT
FLUE GAS TREATMENT				
32.	Control of flue gas treatment process	The use of a general flue gas treatment system (FGT) that, when combined with the whole plant, generally provides for the operational emission levels listed in Table 5.2 for releases to air associated with the use of BAT.	The design foresees application of such solution.	Compliance with the requirements of BAT

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33.	Control of flue gas treatment process	When selecting the general FGT system, take into account: a. the general factors described in 4.4.1.1 and 4.4.1.3; b. the potential impacts on energy consumption of the plant, as described in section 4.4.1.2; c. additional problems related to compatibility of the entire system that may arise during modernization of the existing plants (see 4.4.1.4)	The design foresees application of such solution.	Compliance with the requirements of BAT
34.	Control of flue gas treatment process	When selecting between wet/ semi-wet/ and dry FGT systems, take into account the (non-exhaustive) general selection criteria given as an example in Table 5.3:	It will be implemented	Compliance with the requirements of BAT
35.	Control of flue gas treatment process	To prevent electrical consumption from increasing, generally (i.e. unless there is a specific local driver) avoid the use of two bag filters in one FGT line (as described in 4.4.2.2 and 4.4.2.3)	The filter will consist of several modules. A structure composed of several modules will enable inspections, replacements and maintenance of the bags without shutdown of the entire plant. The filter will guarantee dust emission level compliant with standards in all operating conditions for the whole range of fuel properties and environmental conditions.	Compliance with the requirements of BAT
36.	Control of flue gas treatment process	Reduction of FGT reagent consumption and of FGT residue production in dry, semi-wet, and intermediate FGT systems by a suitable combination of: a. adjustment and control of the quantity of reagent(s) injected in order to meet the requirements for flue-gas treatment, such that the target final operational emission levels are met; b. the use of the signal generated from fast response upstream and/or downstream monitors of raw HCl and/or SO ₂ levels (or other parameters that may prove useful for this purpose) for the optimization of FGT reagent dosing rates, as described in 4.4.3.9; c. the re-circulation of a proportion of the FGT residues collected, as described in 4.4.3.7.	The design foresees application of such solution.	Compliance with the requirements of BAT
37.	Control of flue gas treatment process	The use of primary (combustion related) NOX reduction measures to reduce NOX production, together with either SCR (4.4.4.1) or SNCR (4.4.4.2), according to the required efficiency of flue-gas reduction. In general SCR is considered BAT in case when higher NOX reduction efficiency is required (i.e. raw flue-gas NOX levels are high) and when low final flue-gas emission concentrations of NOX are desired.	Emission of nitrogen oxides from the grate-fired boiler will be reduced using the primary and secondary methods (SCR or SNCR):	Compliance with the requirements of BAT
38.	Control of flue gas treatment process	For the reduction of overall PCDD/F emissions to all environmental media, it is necessary to use: a. techniques for improving knowledge of waste control, including in particular its combustion characteristics, by suitable selection of techniques described in 4.1; b. primary (combustion related) techniques (summarized in 4.4.5.1) to destroy PCDD/F in the waste and possible PCDD/F precursors; c. the design of plant and operational controls that avoid the conditions (see 4.4.5.2) that may give rise to PCDD/F reformation or generation, and which in particular avoid the reduction of dust in the temperature range of 250 – 400°C. Some additional reduction of de-novo synthesis is reported, when the dust reducing operational temperature has been further lowered from 250 to below 200°C; d. the use of a suitable combination of one or more of the following additional PCDD/F reducing measures: i. adsorption by the injection of activated carbon or other reagents at a suitable reagent dose rate, with bag filtration, as described in 4.4.5.6; ii. adsorption using fixed beds with a suitable adsorbent replenishment rate, as described in 4.4.5.7; iii. multi-layer SCR, adequately sized to provide for PCDD/F control, as described in 4.4.5.3; iv. the use of catalytic bag filters (but only when other provisions are applied for effective metallic and elemental Hg control), as described in 4.4.5.4.	Between the reactor and the bag filter, activated carbon will be introduced to the plant. Dry activated carbon introduced to the plant adsorbs mercury, dioxins and furans.	Compliance with the requirements of BAT
39.	Control of flue gas treatment process	For the control of Hg emissions when semi-wet and dry FGT systems are applied, it is necessary to use activated carbon or other effective adsorptive reagents for the adsorption of PCDD/F and Hg, as described in 4.4.6.2, with the reagent dose rate controlled so that final air emissions are within the BAT emission ranges given for Hg	Between the reactor and the bag filter, activated carbon will be introduced to the plant. Dry activated carbon introduced to the plant adsorbs mercury, dioxins and furans.	Compliance with the requirements of BAT

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40.	Control of flue gas treatment process	<p>Waste-to-Energy process is organized so that the temperature of gases arising during the combustion, measured by the inner wall or in other representative point of the combustion chamber or after-combustion chamber, resulting from technical specification of the plant, after the last air supply, even in the most disadvantageous conditions, remains on the required level.</p> <p>Waste-to-Energy process shall ensure appropriate level of waste treatment, expressed as a maximum content of unoxidized organic compounds the measure of which can be defined as in the Polish standards:</p> <ol style="list-style-type: none"> 1) total organic carbon content in furnace slag and ash not exceeding 3% or 2) the share of combustible fractions in furnace slag and ash not exceeding 5% 	<p>The plant shall be equipped with devices that would ensure keeping the required temperature and flue gas residence time in combustion chamber and after-combustion chamber. The process is controlled by the exhaust gas control and monitoring system.</p> <p>The plant shall also be equipped with devices necessary to meet the required parameters. Mechanical grate with appropriate grating shape and controlled primary air supply shall ensure fulfillment of the required parameters.</p>	Compliance with the requirements of BAT
SEWAGE MANAGEMENT				
41.	Separate discharge of rainwater from roofs and other clean surfaces	The use of separate systems for the drainage, treatment and discharge of rainwater that falls on the site, including roof water, so that it does not mix with potential or actual contaminated waste water streams, as described in 4.5.9. Some of such waste water streams may require only little or no treatment prior to their discharge, depending on contamination risk and local discharge factors.	<p>The sections of roads at risk of contamination, e.g. oil derivative substance leakage, shall be provided with pavements resistant to such contaminations as well as a separate sewerage system with the system enabling their trapping e.g. oil separator shall be designated for this area. All the roofs shall be provided with the system to drain rainwater to the rainwater drainage system.</p> <p>Draining of rainwater from the roofs directly to the ground surface or to soakaway pits is not allowed. Rainwater, before introduction to the sewer system (Struga Szczesne) and/or ground on the planned project site, shall be treated in a rainwater treatment plant.</p>	Compliance with the requirements of BAT
WASTE MANAGEMENT – MANAGEMENT OF SOLID PROCESS RESIDUES				
42.	Ash arising during the fuel combustion process	The use of a suitable combination of techniques and principles described in 4.6.1 for improving waste burnout to the extent that is required so as to achieve a TOC value in the ash residues of below 3 wt % and typically between 1 and 2 wt %, including in particular: <ol style="list-style-type: none"> a. the use of a combination of furnace design (see combustion technology selection in 4.2.1), furnace operation (see 4.2.17) and waste throughput rate (see 4.2.18) that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures, including any ash burn-out areas; b. the use of furnace designs that, as far as possible, physically retain the waste within the combustion chamber (e.g. narrow grate bar spacings for grates, rotary or static kilns for appreciably liquid wastes) to allow its combustion. The return of early grate screenings to the combustion chamber for afterburn may provide a means to improve overall burnout where they contribute significantly to the deterioration of burnout (see 4.2.21); c. the use of techniques for mixing and pretreatment of the waste, as described in BAT 11, according to the types of waste received at the waste plant; d. the optimization and control of combustion conditions, including air (oxygen) supply and distribution, as described in BAT 18. 	The design foresees application of such solution.	Compliance with the requirements of BAT
43.	Ash arising during the fuel combustion process	Separate management of bottom ash fly ash and other FGT residues, so as to avoid contamination of the bottom ash and thereby improve the potential for bottom ash recovery, as described in 4.6.2. Boiler ash may exhibit similar or very different levels of contamination to those seen in bottom ash (according to local operational, design and waste specific factors) – it is therefore also BAT to assess the levels of contaminants in the boiler ash and to assess whether separation or mixing with bottom ash is appropriate. It is BAT to assess each separate solid waste stream that arises for its potential for recovery either alone or in combination.	The design foresees application of such solution.	Compliance with the requirements of BAT
44.	Ash arising during the fuel combustion process	The treatment of FGT residues (either on the site or outside of the plant) to the extent required to meet the acceptance requirements for the waste management option selected for them, including consideration of the use of the FGT residue treatment techniques described in 4.6.11.	Fly ash and waste from the flue gas treatment plant will be stabilized on the new CCHP site and then collected.	Compliance with the requirements of BAT

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ENVIRONMENTAL MANAGEMENT				
45.		Implementation of noise reduction measures to meet local noise requirements (techniques are described in 4.7 and 3.6).	The protection of environment from noise shall be implemented within the new unit with the use of the following solutions: average sound level A on measured surface at 1m from the device during normal operation shall not exceed 85 dB/8h; walls and roofs of buildings shall be equipped with minimum thermal and acoustic insulation ensuring that environmental standards are fulfilled; other protection measures are also compliant with BAT.	Compliance with the requirements of BAT
46.	Adjustment to the environmental management requirements	Application of environmental management. A number of environmental management techniques are determined as BAT. The scope (e.g. level of detail) and nature of the EMS (e.g. standardized or non-standardized) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have. BAT is to implement and adhere to an Environmental Management System (EMS) that incorporates, as appropriate to individual circumstances, the following features: (see: section 4.8):	The design foresees application of such solution.	Compliance with the requirements of BAT
SPECIFIC BAT FOR MUNICIPAL WASTE COMBUSTION				
47.	Waste storage	Storage of all waste (with the exception of waste specifically prepared for storage or bulk items with low contamination potential, e.g. furniture), on sealed surfaces with controlled drainage inside the roofed and walled buildings. 58. In the case when waste is stockpiled	As the waste storage facilities, it is planned to construct a storage bunker for 5 days of reserve, which is the minimum retention of storage, guaranteeing the continuity of fuel deliveries to the plant in the course of the so-called long weekends.	Compliance with the requirements of BAT
48.	Waste storage	When waste is stockpiled (typically for later combustion), it should generally be baled (see: section 4.1.4.3) or otherwise prepared for such storage, so that it may be stored in such a manner that risks of odor, vermin, litter, fire and leaching are effectively controlled.	The technology applied shall be compliant with the requirements of paragraph 4, section 4 of the Ordinance of the Minister of Environment of September 11, 2012 (Journal of Laws of 2012, item 1052) concerning mechanical and biological processing of mixed municipal waste. The waste generated in the process of biological drying of waste shall subsequently undergo further mechanical treatment in accordance with paragraph 5 and 6 of the Regulation.	Compliance with the requirements of BAT
49..	Waste treatment	Pretreatment of waste, in order to improve its homogeneity and therefore combustion and burn-out characteristics, by: a. mixing in the bunkers (see 4.1.5.1); b. shredding or crushing of bulky waste e.g. furniture (see 4.1.5.2) that are to undergo combustion,	The technology applied shall be compliant with the requirements of paragraph 4, section 4 of the Ordinance of the Minister of Environment of September 11, 2012 (Journal of Laws of 2012, item 1052) concerning mechanical and biological processing of mixed municipal waste. The waste generated in the process of biological drying of waste shall subsequently undergo further mechanical treatment in accordance with paragraph 5 and 6 of the Regulation.	Compliance with the requirements of BAT
50.		The use of a grate design that incorporates sufficient cooling of the grate, such that it allows for changing of the primary air supply mainly for the purpose of combustion control, rather than for cooling of the grate itself. Air-cooled grates with well distributed air cooling flow are generally suitable for wastes of average NCV of up to approx. 18 MJ/kg. Higher NCV waste may require cooling water (or other liquid) in order to prevent supplying excessive volumes of primary air (i.e. levels that result in a greater air supply than the optimum volume for the combustion control) to control grate temperature and length/position of fire on the grate (see: section 4.2.14)	The grate shall be designed to ensure the required cooling thereof.	Compliance with the requirements of BAT
51.	Facility location	The location of new plants so that the use of CHP and/or the heat and/or steam utilization can be maximized, so as to generally exceed an overall total energy export level of 1.9 MWh/tonne of MSW (ref. Table 3.42), based on an average NCV of 2.9 MWh/tonne (ref. Table 2.11).	The facility is designed due to heating demand from external users.	Compliance with the requirements of BAT
52.	Operating parameters	In situations where less than 1.9 MWh/tonne of MSW (based on an average NCV of 2.9 MWh /tonne) can be exported, the following criteria are increased: a. the generation of annual average of 0.4 – 0.65 MWh electricity/tonne of MSW (based on an average NCV of 2.9 MWh/tonne (ref. Table 2.11) processed (ref. Table 3.40), with additional heat/steam supply as far as practicable in the local circumstances ¹⁵ ; b. the generation of at least the same amount of electricity from the waste as the annual	The new unit shall operate according to the requirements.	Compliance with the requirements of BAT

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		average electricity demand of the entire installation, including (where applicable) on-site waste pretreatment and on-site residue treatment operations (ref. Table 3.48).		
53.	Energy saving	Reduction of electricity demand of the plant (excluding pretreatment or residue treatment) to the level generally below 0.15 MWh/tonne of MSW processed (ref. Table 3.47 and section 4.3.6) based on an average NCV of 2.9 MWh/tonne of MSW (ref. Table 2.11)	Own consumption (including the transformer losses) – 1.7 MW _e	Compliance with the requirements of BAT
SPECIAL BAT FOR COMBUSTION OF SEGREGATED OR PRETREATED WASTE				
54.	Waste storage	Storage of waste: a. in enclosed tanks; b. on sealed surfaces with controlled drainage inside the roofed and walled buildings.	The design foresees application of such solution.	Compliance with the requirements of BAT
55.	Waste storage	When waste is stockpiled (typically for later combustion), it should generally be baled (see: section 4.1.4.3) or otherwise prepared for such storage, so that it may be stored in such a manner that risks of odor, vermin, litter, fire and leaching are effectively controlled.	The technology applied shall be compliant with the requirements of paragraph 4, section 4 of the Ordinance of the Minister of Environment of September 11, 2012 (Journal of Laws of 2012, item 1052) concerning mechanical and biological processing of mixed municipal waste. The waste generated in the process of biological drying of waste shall subsequently undergo further mechanical treatment in accordance with paragraph 5 and 6 of the Regulation.	Compliance with the requirements of BAT
56.	Operating parameters	At new and existing systems, the generation of greater parameters, such as: a. annual average of generally at least 0.6 – 1.0 MWh electricity/tonne of waste (based on an average NCV of 4.2 MWh/tonne); b. the annual average electricity demand of the entire plant, including (if applicable) on-site waste pretreatment and on-site residue treatment operations.	The new unit shall operate according to the requirements.	Compliance with the requirements of BAT
57.	Facility location	Location of new systems, so that: a. at least 0.6 – 1.0 MW _{he} / tonne of generated electricity, heat and/or steam can also be utilized in cogeneration, so that, in general, an additional thermal export level of 0.5 – 1.25 MWh/tonne of waste (section 3.5.4.3) can be achieved (based on an average NCV of 4.2 MWh/tonne), or b. when electricity is not generated, a thermal export level of 3 MWh/tonne of waste can be achieved (based on an average NCV of 4.2 MWh/tonne).	The new unit shall be a CHP unit – generating both heat and electricity.	Compliance with the requirements of BAT
58.	Energy saving	Reduction of energy demand of the plant and achieving average electrical demand of the plant (excluding pretreatment or residue treatment) to the level below 0.2 MWh/tonne of waste processed (Table 3.47 and section 4.3.6) based on average NCV of 4.2 MWh/tonne of waste.	Own consumption (including the transformer losses) – 1.7 MW _e	Compliance with the requirements of BAT

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Table 47. Compliance of the proposed technology with the regulation concerning the requirements for the waste thermal treatment process

Requirements of the Ordinance of the Minister of Economy dated March 21, 2002	Fulfillment of the requirements
<p>§ 3. Waste-to-Energy process hereinafter referred to as “process” is organized to ensure that the temperature of gases arising during the combustion, measured by the inner wall or in other representative point of the combustion chamber or after-combustion chamber, resulting from technical specification of the plant, after the last air supply, even in the most disadvantageous conditions, shall be kept for at least 2 seconds on the level not lower than:</p> <ol style="list-style-type: none"> 1) 1100°C – for waste containing more than 1% of halogenated compounds recalculated into chlorine, 2) 850 °C – for waste containing up to 1% of halogenated compounds recalculated into chlorine. 	<p>An after-combustion chamber will be located in the grate boiler above the main grate combustion zone in order to ensure after-combustion of solid and gas residues arising during the combustion. Auxiliary burners shall be installed in the after-combustion chamber above the secondary air nozzles. Their task is to keep the exhaust gas temperature at an appropriate level resulting from the above mentioned regulation.</p>
<p>§ 4. The process is implemented in a manner ensuring that the exhaust gases remain in the combustion chamber for at least 2 seconds with the oxygen content at least 6%.</p>	<p>The structure of grate boiler, expected for combustion of fuel from municipal waste, shall ensure fulfillment of the requirement for the flue gas to remain in the combustion chamber for at least 2 seconds with the oxygen content at least 6%.</p>
<p>§ 5. Waste-to-Energy process shall ensure appropriate level of waste treatment expressed as a maximum content of unoxidized organic compounds the measure of which can be defined as in the Polish standards:</p> <ol style="list-style-type: none"> 1) total organic carbon content in furnace slag and ash not exceeding 3% or 2) the share of combustible fractions in furnace slag and ash not exceeding 5% 	<p>Thermal treatment of fuel from municipal waste in the grate boiler shall be conducted in a manner ensuring that the waste is processed to the degree resulting from the provisions of paragraph 5 of the Ordinance of the Minister of Economy of March 21, 2002 (Journal of Laws of 2002 No. 37 item 339).</p>
<p>§ 6. Plants or equipment for waste-to-energy processes shall be equipped with:</p>	<p>All required pieces of equipment have been foreseen.</p>

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Requirements of the Ordinance of the Minister of Economy dated March 21, 2002	Fulfillment of the requirements
<p>1) at least one automatically started auxiliary burner for continuous maintenance of the required process temperature and for supporting its start-up and stop; the burner supports the process as long as the unprocessed waste remains in the combustion chamber;</p> <p>2) automatic waste feeding system ensuring stoppage of waste feeding during:</p> <p>a) start-up until the required temperature is reached,</p> <p>b) process, in case the required temperature is not reached or permissible emission values are exceeded,</p> <p>3) technical equipment for discharge of exhaust gases, ensuring fulfillment of emission standards, determined in separate legislation,</p> <p>4) technical equipment for recovery of energy generated during the waste-to-energy process, if the type of plant or equipment used prevents such recovery,</p> <p>5) technical equipment for protection of soil and ground as well as surface and underground waters,</p> <p>6) technical equipment for collection of dry post-process residues.</p>	<p>1) The start-up burner(s) shall be applied in the boiler. They have to be selected and connected to the boiler automation system to ensure their use as burners supporting the combustion process.</p> <p>2) Fuel shall be delivered from the bunker by means of overhead traveling crane with a bucket to the near-boiler tank and the system shall be equipped in two automatic, overhead traveling cranes (one stand-by), working 24 hrs/day. The overhead traveling cranes can work automatically or be operated by an operator.</p> <p>3) The flue gas treatment system shall cover: a many-stage ammonia injection (<25%) - SNCR, semi-dry reactor for removal of acidic ingredients from flue gas, dry injection of activated carbon, bag filters.</p> <p>4) The energy arising in the course of the waste-to-energy process shall not be recovered within the analyzed technology.</p> <p>5) The contractor's scope of works consist of implementation of the waste water treatment system including: the use of neutralizers with auxiliary systems, rain water treatment plant with rain water retention system and treated waste water</p>

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Requirements of the Ordinance of the Minister of Economy dated March 21, 2002	Fulfillment of the requirements
	<p>pipelines to the sewer system.</p> <p>6) According to the information from ZGO Sp. z o.o. in Bartoszyce which operates the landfill in Wysieka near Bartoszyce, the plant obtained decision on environmental constraints and the building permit for an area for storing waste after neutralization, including waste from the thermal neutralization.</p>
<p>§ 7. 1. In the course of the process performance, in the combustion chamber or after-combustion chamber the continuous measurement is performed with respect to:</p> <ol style="list-style-type: none"> 1) exhaust gas temperature measured by the inner wall in a manner eliminating the impact of thermal radiation, 2) oxygen content in exhaust gases, 3) exhaust gas pressure. 4) continuous measurement of exhaust gas residence in the combustion chamber. <p>2. If the measuring techniques used for collection and analysis of the exhaust gas composition do not cover the drying of gases before their analysis, the process is also monitored with respect to the water steam content in exhaust gas.</p>	<p>Continuous measurements of the mentioned parameters shall be used.</p>
<p>§ 8. 1. For performance of the required measurements technical equipment shall be used for continuous measurement of process parameters.</p> <p>2. Equipment mentioned in section 1 shall be subject to annual technical inspection and to calibration not less frequently than once in 3 years.</p>	<p>The equipment for continuous measurement of the required parameters shall be used. The equipment shall be subject to inspections and calibration once in 3 years.</p>
<p>§ 9. Quantities of gas or particulate permissible for introduction into the air are determined in separate legislation.</p>	<p>The plant shall meet emission standards according to the Ordinance of the Minister of Environment of November 4, 2014 on the emission standards for certain</p>

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Requirements of the Ordinance of the Minister of Economy dated March 21, 2002	Fulfillment of the requirements
	plants, fuel combustion sources and other combustion and waste co-firing facilities.
<p>§ 10. Permissible quantities of substances contained in process waste water are determined by separate legislation.</p>	<p>Ordinance Discharge of waste water shall be compliant with the Ordinance of the Minister of Construction of July 14, 2006 on methods of fulfilling the duties of industrial wastewater suppliers and conditions for introducing wastewater to drainage facilities</p>
<p>§ 11. Requirements concerning performance of measurement of substance or energy quantities introduced to environment by the plant operator or equipment user are governed by separate legislation.</p>	<p>Measurements shall be performed according to the Ordinance of the Minister of Environment of October 30, 2014 on requirements for performance of measurements of emissions and quantities of water consumed</p>
<p>§ 12. 1. In the event of disturbance in waste-to-energy plants, including co-combustion of waste, involving non-fulfillment of the requirements for process performance determined in paragraph 3, or in operation of protection equipment reducing introduction of substances to the air:</p> <ol style="list-style-type: none"> 1) waste delivery to the plant is stopped, 2) not later than in the 4th hour of the disturbance occurrence, the procedures for stopping the plant is started in a manner provided for in the plant operation manual, 3) plant operation is stopped, if the total disturbance occurrence time during one calendar year exceeds 60 hours. <p>2. The requirement mentioned in section 1 point 3 is binding for each process line of the waste-to-energy plant including waste co-combustion, equipped with separate protection equipment reducing the substance introduction into the air.</p>	<p>Necessary procedures applicable to the plant operation shall be used.</p>
<p>§ 13. 1. The residues of waste-to-energy process are subject to recovery and, if not possible, - neutralization with particular consideration of the heavy metal fractions.</p> <p>2. It is permissible to use residues of waste-to-energy process for preparation of concrete mix for construction, except for buildings</p>	<p>Slag as non-hazardous waste shall be collected by specialist companies after being subject to seasoning.</p> <p>The time of slag seasoning is from 6 to 20 weeks. After</p>

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Requirements of the Ordinance of the Minister of Economy dated March 21, 2002	Fulfillment of the requirements
<p>intended for continuous residence of people or animals as well as for production or storage of food, except for sections 3 and 4.</p> <p>3. Heavy metal concentration in water extracts under the leaching test of these metals from concrete mix samples mentioned in section 2 shall not exceed in total 10 mg/dm³ recalculated into the element mass.</p> <p>4. The heavy metal leaching test from concrete products containing neutralized hazardous waste is performed by means of complete submersion of a tested material sample in water, where it is kept for 48 hours with continuous mixing. Water used for the test does not contain chlorine, has a temperature of 18°-22°C and hardness 3-6 mval/dm³. The weight ratio of water to the tested material shall be 10:1.</p>	<p>this period, slag can be used as an additive to bitumen.</p> <p>Hazardous waste in the form of ash and waste from the flue gas treatment plant shall undergo the stabilization process, during which the physical and chemical properties of waste will be altered. The post-stabilization product is not hazardous and, depending on the applied stabilization technology, can be stored on landfills for non-hazardous waste.</p>
<p>§ 14. The residues of waste-to-energy process are stored and transported in a manner preventing their spreading in the environment.</p>	<p>Slag shall be raked and loaded on trucks by means of a wheel loader. Protection against secondary dusting shall be provided by an appropriate structure of the seasoning shelter. Seasoning shall be performed in separated areas, divided with appropriately high walls and roofed.</p>
<p>§ 15. Neutralization of waste thermal treatment residues by means of storing on landfills is governed by separate legislation.</p>	<p>Waste remaining after the fly ash stabilization process can be deposited on the landfill in Wysieka which is planned for extension. The project in question has an environmental decision issued on February 11, 2010 by the Head of Bartoszyce Commune.</p>

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10. COMPARISON OF THE PROPOSED TECHNOLOGY WITH THE REQUIREMENTS SPECIFIED IN ARTICLE 143 OF ACT OF APRIL 27, 2001 - ENVIRONMENTAL PROTECTION LAW

Use of substances with low hazard potential

Raw materials and resources used in generation of heat and electricity in ITPFP may potentially be a source of hazard of explosion and fire. Fire hazard is connected with the use of the following substances:

- transformer, motor and gear oils,
- lubricants and lube oils.

To limit the risk connected with fire hazard the following protective measures will be adopted:

- lightning protection systems in all facilities,
- electric shock protection,
- fireman's switch in each planned facility,
- emergency lighting in the main building (turbine hall and boiler house),
- tight and fire resistant glands at passages of cables and conduits through fire partitions,
- automatic fire signaling in electric rooms, and sprinklers in cable tracks activated by fire detectors and manually.

All electric power systems and equipment will be designed to comply with the requirements of regulations in force and Polish standards.

Other fire protection measures will include:

- indoor fire hydrants in turbine hall and boiler house,
- portable fire-fighting equipment in all planned facilities,
- generally accessible alarm telephones in all planned facilities.

Various chemicals will be used for treatment of process water and will be stored on the premises of the Plant. Due to the use of closed cycles, the amount of industrial sewage generated will be very small. Hazardous substances will be stored on the premises of the Plant only in necessary amounts so the Plant is not classified as posing increased or high risk of a serious industrial failure. Hazardous substances will be handled and stored according to the information provided in Material Safety Data Sheets.

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Efficient generation and use of energy, rational consumption of water, raw materials, materials and fuels

Electricity will be generated in ITPFP with gross efficiency of approx. 23%. Consumption of materials, raw materials and fuels will be controlled. It will not exceed the needs of the production processes in a grate-fired boiler and auxiliary equipment Power consumption by the auxiliaries will be approx. 1.7 MW_e.

Use of waste-free and low waste technology and possibility of waste recovery

Environmental impact of the CHPP in terms of waste management will be reduced through:

- preventing waste generation and reduction of its amounts,
- co-generation of energy, reducing the amount of furnace waste generated,
- use of state of the art technologies,
- recovery of waste which production couldn't be prevented,
- collection of waste oils by specialist firms licensed in R9 recovery.

Other waste produced during operation of ITPFP will be managed in manner reducing its amount and negative environmental impact through the following organizational measures:

- personnel training in proper handling of waste,
- controlling the amounts of generated waste by keeping their qualitative and quantitative records,
- rational management of resources used by personnel.
- selective collection and storage of waste,
- handover for recycling of waste which presents properties allowing for its utilization with the current state of the art, state of technology and organization, in particular waste which can:

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- be alternative raw materials used for production to replace raw material and materials from natural resources,
- partly or wholly replace raw material or fuel used currently in a given production process,
- be applicable for increasing the quality or the efficiency of the production process or safety conditions,
- be applicable for reducing negative environmental impact of given production process,
- be a source of recyclable raw materials,
- be subject to regeneration or processing to become usable products,
- be used for construction purposes directly or after processing.

Such waste will be collected by properly licensed firms from storage facilities or directly from points of generation. In summary, waste volumes and their negative environmental impact will be reduced in ITPFP by using state of the art organizational and technological solutions.

Type, range and amount of emissions

In the course of operation of ITPFP, gaseous and particulate pollutants will be emitted into the air. The new Plant will meet all the legal emission standards and will not cause exceeding of legal reference values and admissible levels of pollution concentrations in the air. Maximum concentrations of analyzed pollutants (SO₂, NO₂, particulate matter, CO) will occur at approx. 500 m from the Plant's emission sources. Management of sewage and waste will be carried out according to the environmental regulations in force. Acoustic impact of ITPFP will not cause exceeding of admissible noise levels in the environment in neighboring protected (residential) areas.

Use of comparable processes and methods which have been effectively applied on industrial scale

Global trends show that structural investment projects have been implemented on mature West European markets since many years. Waste management in many EU states is based on a balanced approach to using various methods of waste handling through modern technologies capable of guaranteeing the safety of people and the environment. The essence of such a policy is maximization of the use of waste in recovery processes, including recycling, in order to minimize the volume of the landfilled waste. New national regulations take this direction and it may be expected, that by 2020 Polish waste management system will be coherent with the EU standards. This assumption will be realized if law is effectively implemented and enforced. Waste to Energy Plants operate since many years in West European countries, Scandinavia or the US. Of particular interest are incineration plants operating in

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Vienna and Prague, being located in city centers. Currently, a modern incineration plant is being constructed in the center of Copenhagen. Technologies selected for the planned Investment Project, flue gas treatment system, stabilization and solidification of post-process waste with valorization/seasoning of slag are used in the EU countries. In total, there are 400 plus municipal waste incineration plants operating in Europe and disposing close to 25 percent of waste.

Below are given examples of the Waste to Energy Plants with semi-dry flue gas treatment systems operating in Europe.

- Belgium (Oostende) capacity [Mg/h]- 18
- Czech Republic (Brno) capacity [Mg/h] - 45
- Denmark (Roskilde) capacity [Mg/h] - 34
- France (Lasse) capacity [Mg/h] - 12.5
- Great Britain (Sheffield) capacity [Mg/h] - 28
- Hungary (Budapest) capacity [Mg/h] - 60
- Italy (Verona) capacity [Mg/h] – 24
- Norway (Al.) capacity [Mg/h] – 3
- Portugal (Moreira da Maia) capacity [Mg/h] – 49.4
- Spain (Palma De Mallorca) capacity [Mg/h] – 37.5
- Germany (Schwandorf) capacity [Mg/h] – 98.

Plants differ greatly in their size across Europe. Such a differentiation may be seen both within given technology domains and between them. Top European municipal waste incineration plants have an annual capacity of more than 1 million tons. The following Table shows variety of incineration plant capacities in individual countries.

Table 48. Examples of municipal waste incineration plants in selected European countries

Item	Country	Average capacity of the incineration plant (Mg/year)
1.	Austria	178
2.	Belgium	141
3.	Denmark	114
4.	France	132
5.	Germany	257

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6.	Italy	91
7.	the Netherlands	488
8.	Portugal	390
9.	Spain	166
10.	Sweden	136
11.	Great Britain	246
12.	Norway	60
13.	Switzerland	110

source (BREF for waste combustion, August 2006).

The following Table shows differences in capacities of plants for thermal processing of municipal waste planned in Poland.

Table 49. Capacities of plants for thermal processing of municipal waste planned in Poland.

Item	City	Average capacity of the incineration plant (thousand Mg/year).
1.	Białystok	120
2.	Bydgoszcz	141
3.	Kraków	220
4.	Konin	94
5.	Poznań	210
6.	Szczecin	150

Incineration plants are commonly used for incineration of mixed municipal waste. In Europe, approx. 90 % of the municipal waste incineration plants are of a grate type. Other types of waste commonly processed in grate-fired incineration plants, often as a specific addition to municipal waste, include: commercial and industrial nonhazardous waste, sewage sludge and some types of medical waste" - source (BREF on waste incineration, August 2006)

Scientific and technical progress

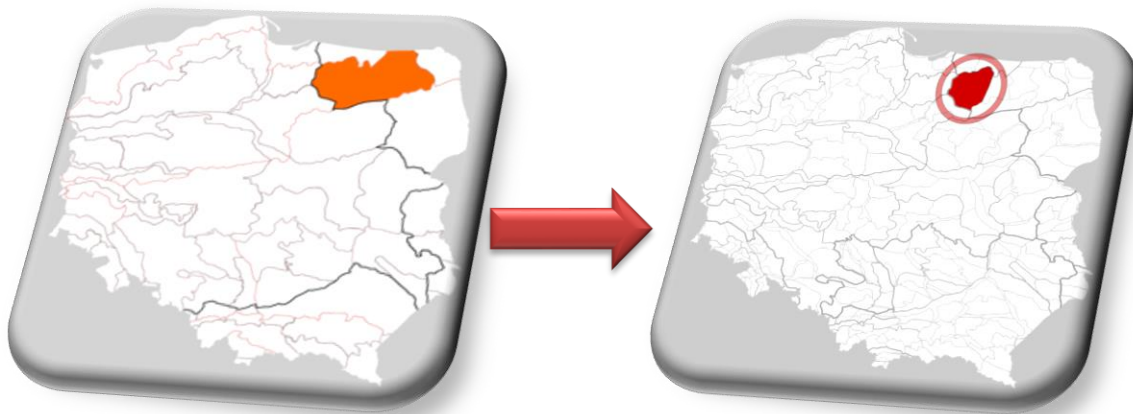
The state of the art and proven solutions for waste incineration, energy recovery, flue gas treatment and safe management of post-process residues will be applied in ITPFP. All such technologies will take into account scientific and technical progress.

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11. DESCRIPTION OF ENVIRONMENTAL COMPONENTS COVERED BY THE SCOPE OF EXPECTED ENVIRONMENTAL IMPACT, INCLUDING ENVIRONMENTAL COMPONENTS COVERED BY PROTECTION PURSUANT TO THE ACT OF APRIL 16, 2004 ON ENVIRONMENTAL PROTECTION

11.1. PHYSIOGRAPHIC LOCATION AND CLIMATIC CONDITIONS

The planned Investment Project site is located in the city of Olsztyn. Olsztyn is located in central part of the Warmińsko-Mazurskie Voivodeship by the Łyna River, within Olsztyn Lakeland being a part of Pojezierze Mazurskie macro-region and a sub-province of East Baltic Lake Districts. To the south the city is neighboring the Napiwoda-Ramuck Forest. Neighboring Municipalities include: Dywity, Barczewo, Purda, Stawiguda, Gietrzwałd and Jonkowo. Olsztyn is neighboring only one district - Olsztyn District (rural). Distances from Olsztyn are the following: 88 km to the border with Russia, 131 km to the city of Kaliningrad (Koenigsberg) and 408 km to capital of Lithuania - Vilnius.



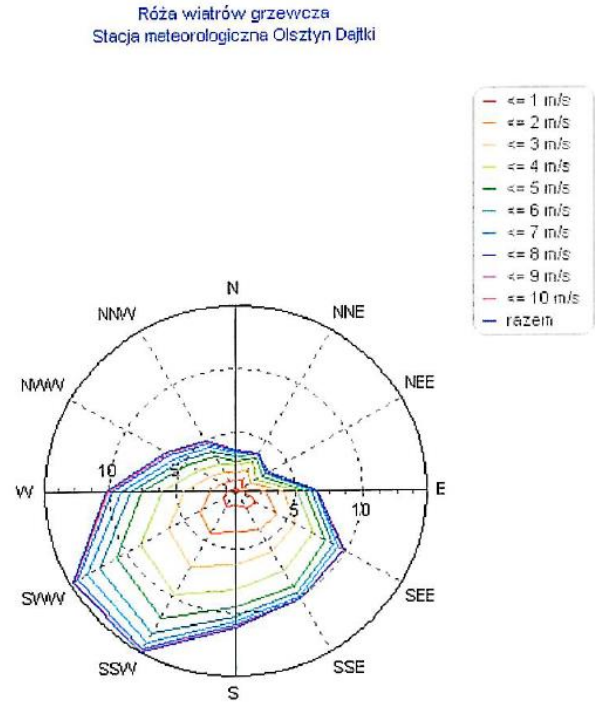
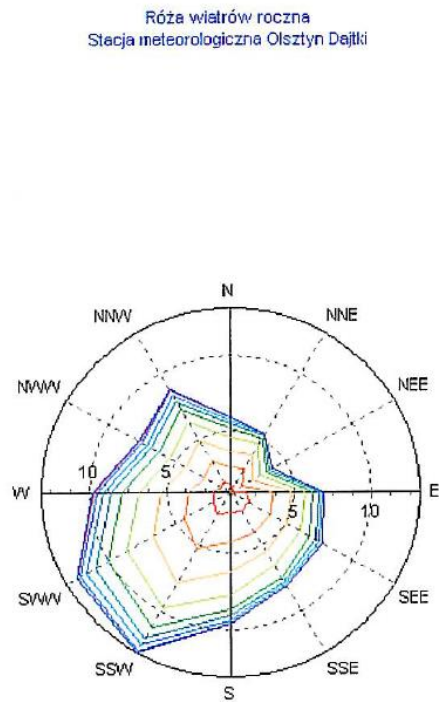
Pojezierze Mazurskie Olsztyn Lakeland

Climatic conditions

City of Olsztyn lies in temperate, transitionally warm climate zone. This climate is typical for the lake regions. It has been conditioned chiefly by local components of the environment (land contouring, forests, lakes). Local climate features annual precipitation of approx. 600 mm. Average annual temperature is approx. +7.2°C with maximum in July of approx. +17.3 °C and minimum in January of approx. -3.0 °C. Precipitation occurs on average for 160 days, frost for 140 days and snow cover for 83 days per year. SW and W winds dominate in the year. Autumn and winter sees more S winds and spring and summer NW winds.

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Following are figures showing wind rose at the weather station in Olsztyn-Dajtki.



PL	EN
Róża wiatrów roczna Stacja meteorologiczna Olsztyn Dajtki	Annual wind rose at Olsztyn-Dajtki Weather Station
Róża wiatrów grzewcza Stacja meteorologiczna Olsztyn Dajtki	Heating season wind rose at Olsztyn-Dajtki Weather Station
razem	total



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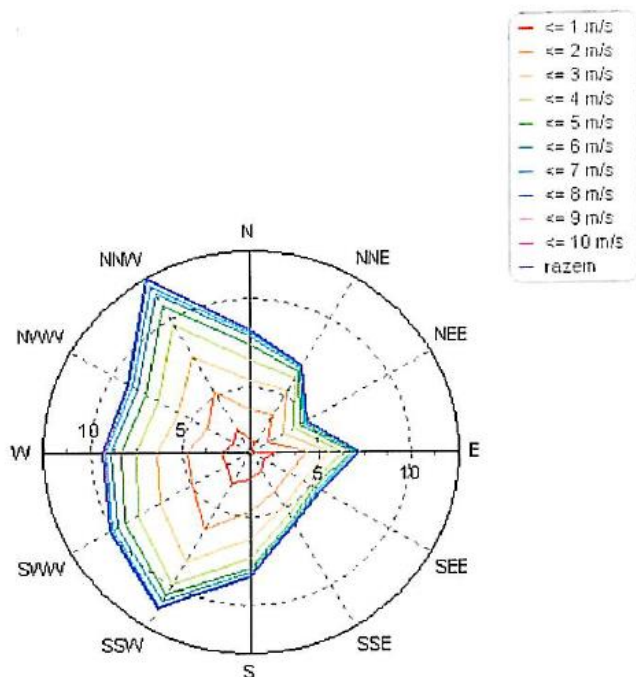
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Róża wiatrów letnia
Stacja meteorologiczna Olsztyn Dajtki



PL	EN
Róża wiatrów letnia Stacja meteorologiczna Olsztyn Dajtki	Summer wind rose at Olsztyn-Dajtki Weather Station
Razem	Total

Figure 23 Wind rose at Olsztyn-Dajtki Weather Station

Data on air temperatures, annual precipitation and average wind velocities in the following Table come from the Warmińsko-Mazurskie Voivodeship Statistical Yearbook 2013.

Table 50. Basic weather data at Olsztyn Weather Station

Years	Mean air temperature [°C]	Annual precipitation [mm/a]	Average wind speed [m/s]
1971-2000	7.3	625	
1991-2000	7.6	623	-

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2001-2010	7.9	646	-
2012	7.5	701	3.0

Source: Warmińsko-Mazurskie Voivodeship Statistical Yearbook 2013. Statistical Office, Olsztyn 2013
Environmental Protection 2013. Central Statistical Office (GUS), Warsaw 2013.

11.2. GEOLOGICAL AND HYDROGEOLOGICAL CONDITIONS

11.2.1. Surface waters

City of Olsztyn lies in the valley of the Łyna River on Olsztyn Lakeland which is a part of Pojezierze Mazurskie macro-region. Hydrographically, the city is located within the Pregoła catchment area. According to national water regions division, water management in the Pregoła Basin takes place within a single water region of Łyna and Węgorapa. The planned Investment Project consisting in the construction of the Waste-to-Energy Plant is located in the Łyna River valley within the Pregoła Basin. There is a number of lakes within the city limits, including: Wadąg, Linowskie Klebarskie, Umląg and Kiernoż, Skanda and Track. Nearest to the planned Investment Project is one big water body (Lake Track). None of the Olsztyn rivers flows in the vicinity of the planned Investment Project. Quality of surface waters is addressed in chapter 11.5.3 of this Report. In the area of the city of Olsztyn Homogeneous Surface Water Body (HSWB) - Łyna with an affluent from Jelguń Lake to Dywita Chanel was designated.

1. Determinations of water management plan for river basin area with conditions for use of water from the water region

– Water Management Plan for the Vistula Basin

A derogation of non-achievement of environmental goals 4(4) – 1 was designated for the analyzed Homogeneous Water Body – *(Anthropogenic activity impact on the condition of the Homogeneous Water Body makes it necessary to delay the achievement of environmental targets due to the lack of technical solutions capable of improving the state of the Homogeneous Water Body)*. Because of solutions used in the planned Plant there will be no impact on the environmental targets designated for the Homogeneous Surface Water Body in question, namely the Łyna on the section from a tributary from Lake Jelguń to Dywity Channel.

– Conditions for the use of water from the region

The conditions for the use of water from the Middle Vistula region are in public consultation and were not published.

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2. Determinations of flood risk management plan

As of today, maps of flood hazard and flood risk are sources of information on flood risk management for the analyzed area. Flood risk management plan for the Middle Vistula water region and Łyna and Węgorapa water region are currently in public consultations.

Maps of flood hazard and flood risk show that the planned Investment Project site is not located on:

- area of particular flood hazard,
- area subject to risk of flooding.

3. Determinations of drought prevention plan

The Regional Water Management Authority (RZGW) in Warsaw produced a study: "Indication of drought areas with assessment of range and severity within area administrated by the Regional Water Management Authority in Warsaw, with analysis of increasing water resources availability on selected areas". The Łyna and Węgorapa catchment area was included in the areas where significant changes in groundwater table level due to anthropogenic impacts were established. The planned Investment Project lies on an area subject to 3 types of drought in 3 or 4 class, with the threat of occurrence determined as high. The planned Investment Project will not have any impact on surface and groundwater resources, and therefore will not violate any determinations of a drought prevention plan.

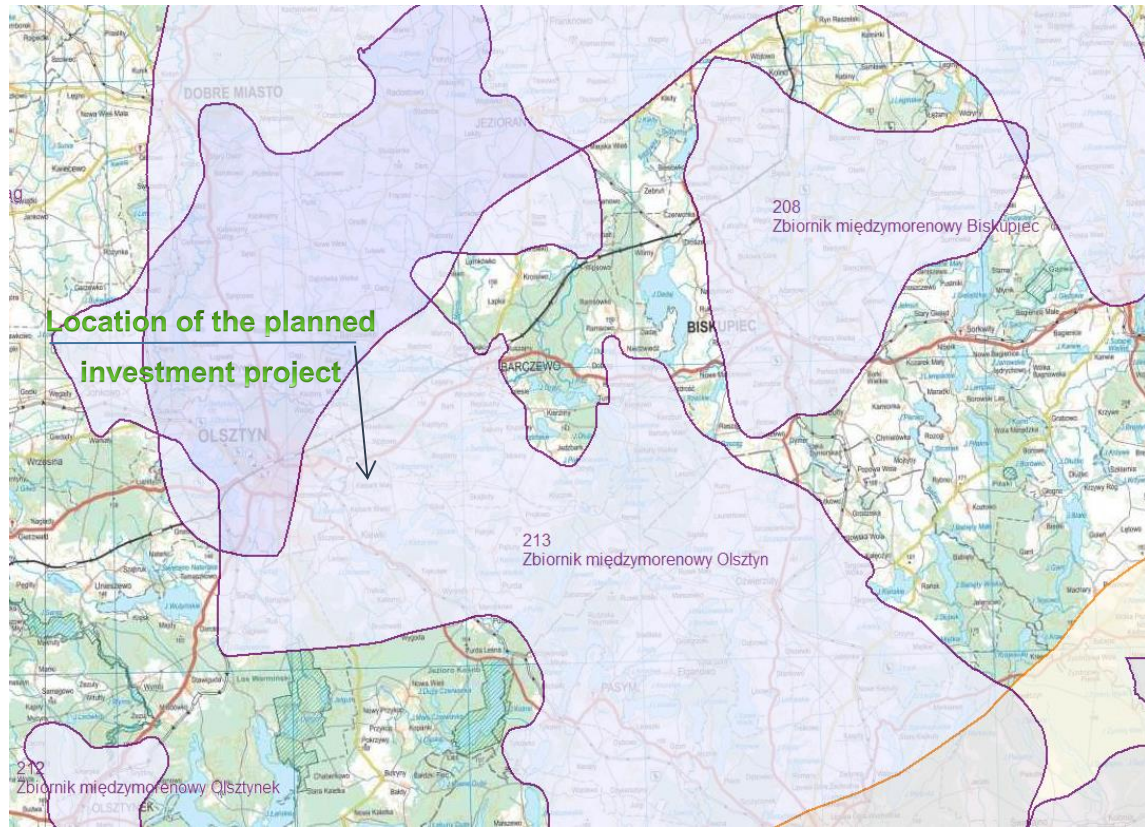
11.2.2. Groundwater

The Pregola catchment area within Olsztyn city area contains the Homogeneous Underground Water Body (HUWB) No. 20. Underground water is present on three water-bearing strata: Neogene, Neogene-Paleogene and Quaternary. The degree of utilization of groundwater resources in the Pregola River is not in excess of 10%. Within this basin there are located wholly or partly 8 Major Groundwater Reservoirs. Two out of these eight reservoirs, Major Groundwater Reservoir No. 213 and Major Groundwater Reservoir No. 206 have complete and approved documentation defining available groundwater resources and proposed limits of a protective zone. Except for south-west fragment, the city is within Major Groundwater Reservoir No. 213 (Olsztyn).

Major Groundwater Reservoirs

Land allocated for the planned Investment Project is within one of major initially explored groundwater reservoirs in Poland (Major Groundwater Reservoir No. 213). The described Major Groundwater Reservoir No. 213 lies within homogeneous underground water body not in danger of non-achieving the environmental targets, so in the current state of development no protective zone was established in its case.

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PL	EN
Lokalizacja planowanej inwestycji	Location of the planned investment project
Zbiornik międzymorenowy Olsztyn	Intermoraine reservoir Olsztyn
Zbiornik międzymorenowy Olsztynek	Intermoraine reservoir Olsztynek
Zbiornik międzymorenowy Biskupiec	Intermoraine reservoir Biskupiec

Figure 24. Major Groundwater Reservoirs (GZWP) in the vicinity of the Investment Project

(source of information: Polish Geological Institute - National Research Institute)

Groundwater quality in Major Groundwater Reservoir No. 213 is presented in chapter 11.5.3 of this Report.

Groundwater intakes

Potable water for the city of Olsztyn is supplied amongst others from groundwater intakes. Groundwater is extracted from Tertiary and Quaternary strata of good water quality, except for elevated content of iron and manganese compounds. The city of Olsztyn is exploiting “Wadąg”, “Zachód” and “Kortowo” intakes. Reserve intake for Olsztyn is the existing “Wschód” and “Jaroty” intake. Wschód”. “Wadąg” intake is located in northeastern part of the city in Wójtowska Struga valley near its estuary

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into Lake Wadąg. Quaternary and Tertiary water-bearing strata are exploited there. Groundwater from this intake is of good quality, with minor symptoms of changes in natural chemical composition. A direct and indirect protection zone was designated for "Wadąg" intake. In "Zachód" intake near Lake Ukiel mainly the deep Quaternary-Tertiary stratum is exploited. A direct and indirect protection zone was designated for "Kortowo" intake in southern part of the city. Protection zones were established in order to safeguard potable water quality, however on March 18, 2011 the Act of January 5, 2011 on amendment to the Water Law and some other laws (Journal of Laws No. 32, item 159) came into force, whose Article 21 brings about important changes related to protection zones for water intakes:

- "Article 21. 1. Protection zones from water intakes established before January 1, 2002, expire as of December 31, 2012." Therefore, the above-mentioned protection zones for groundwater intakes have expired as of December 31, 2012. The list of protection zones for surface and groundwater intakes in the area administrated by the Regional Water Management Authority in Warsaw for the Warmińsko-Mazurskie Voivodeship is presented below:
 - one intake in Marksewo
 - two intakes in Giżycko
 - one intake in Gołdap
 - one intake in Elk

The planned Investment Project will not be located in the area of groundwater intake protection zones.

Homogeneous Underground Water Body

Underground water in the Pregola Basin is monitored according to ordinance on forms and ways of monitoring of Homogeneous Surface Water Body and Homogeneous Underground Water Body. A network of 24 points of underground water monitoring operates within the analyzed Pregola Basin.

The area of Homogeneous Underground Water Body (hereinafter HUWB) No. 20 encompasses catchment areas of the Łyna and other tributaries of the Pregola. Principal water-bearing strata occur in Pleistocene formations. Locally, groundwater exists also in Miocene/Paleogene formations. Water-bearing system in Pleistocene formations around Olsztyn is connected with a deep postglacial channel. Deeper water-bearing strata in Neogene and Paleogene formations are poorly identified, except for the western part of HUWB. Within HUWB there are 5 Major Groundwater Reservoirs: Nos 205: 208, 212, 213, 214.

Appendix 2 to the "Water Management Plan for the Pregola Basin" includes a list of Homogeneous Underground Water Bodies. The Table below presents the Homogeneous Underground Water Bodies located closest to the planned Investment Project site.

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Table 51. Homogeneous Underground Water Body within the area of the planned Investment Project.

Specification	Homogeneous Underground Water Body (HUWB)
European code of the HUWB	PLGW720020
Water region	The Łyna and Węgorapa/Świeża/ Jarfa water region
Code of the river basin	7000/3000/4000
Name of the river basin	The Pregola/Świeża/Jarft Basin
Regional Water Management Authority	Regional Water Management Authority in Warsaw
Ecoregion	Eastern Plains (16)
Quantity assessment	good
Chemical assessment	good
Evaluation of risk of failing to meet environmental targets	not at risk
Derogations*	-
Justification for derogation	-

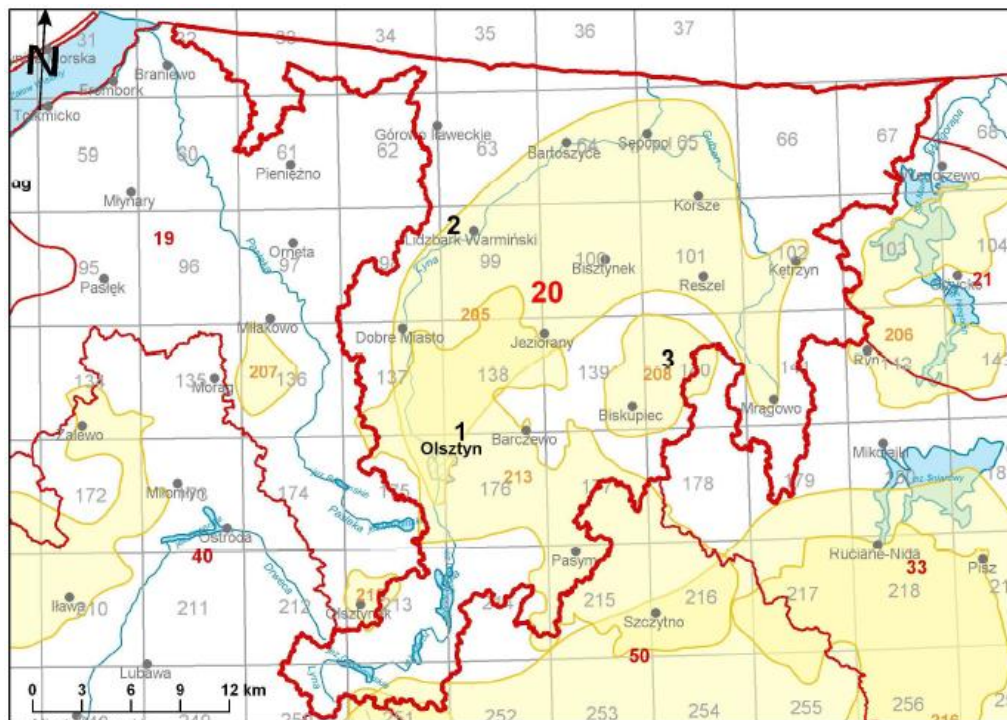


Figure 25. Location of the city of Olsztyn on Homogeneous Underground Water Body No. 20.

(source of information: Polish Geological Institute - National Research Institute)

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11.3. MORPHOLOGIC AND GEOMORPHOLOGIC CONDITIONS

11.3.1. Soil, ground, ground surface

(information taken from "The prognosis on environmental impact to the Amendment to the Study of Conditions and Directions of Spatial Development for the City of Olsztyn, aimed at enabling the construction of the Combined Heat and Power Plant using RES, within commercial-services zone G3"): Agricultural soil prevails within the land designated for the planned Investment Project and on adjacent areas. Amongst these decidedly dominate medium and poorly fertile arable lands of IVa, IVb and V soil quality class. Idle lands are in minority. Soils of IVa and IVb class present a rye-potato soil complex. It was formed from loamy sands formed on the bed of compact clays (geomorphologically morainic). A well developed humus stratum is present. Because of this they have a capability for retaining excess water in the near-surface layers. The biological activity depends to large extent on rainfall distribution during vegetative period. Organic origin soils (peat-bog) occur mainly in depressions in direct vicinity of a water hole. Shallow groundwater is present here. Soil is formed of mud and peat, carrying grasslands, sedges, reeds and gray willow bushes. Whole described land is not developed. The vegetation existing on the land was not altered by human activity. Soils on the described land are not used for agricultural activities. This has a consequence of a grassy land coverage with a high presence of weeds. Currently the area displays characteristics of a fallow land. On higher-elevated parts there are signs of slope erosion visible. Grassland is present on a limited area. Such area was designated as class IV pasture. Small part of the analyzed area forms class V meadows. They are present on waterlogged areas. Edges of a water hole are densely covered with gray willow vegetation. Also individual alder trees appear there. Majority of land is undulating and hilly. Numerous elevated points are present. In the eastern part of the area there is a point of elevation of approx. 131 m asl. Other elevations run along the western limit of the area. Common features of these hills are their relatively steep southern and south-eastern slopes. Other slopes are decidedly less steep. In south-eastern part, the slopes continue into ground depressions. This forms local undrained depression. The mentioned "water hole" is filled with peat, and water is present on the surface. Any surface runoff from the described area follows the natural falls of ground. Undrained land hollows accumulate run-off water. Such depressions are present also in the area subjected to the study amendment.

Geological conditions

Analysis of archive documentation and hydrological designs indicate, that basic subsoil on land planned for ITPFP is formed by Pleistocene moraine sediments represented by moraine loams and sands/loamy sands of a front moraine, formed during Pomeranian stage of the last Baltic glaciation.

The soil conditions are specified in the "Geotechnical opinion on suitability for development of areas located at ul. Lubelska in Olsztyn" of July 2010, prepared by Przedsiębiorstwo Techniczno-

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Usługowe "Geoprojekt - Olsztyn" Sp. z o.o. The document was based on the site inspection, results of drilling performed in July 2010 and historical drilling performed by Geoprojekt Olsztyn in 1979 and 2004. The surveys showed that the area is varied in terms of soil and water conditions. Due to the suitability for construction, the surveyed area was divided into two zones:

- Zone "A" favorable for the foundation of civil structures due to the soil and water conditions. There are moraine loams allowing for direct foundation. Groundwater occurs occasionally in the form of interloam filtrations. The topographic profile of the area in this zone is diversified and execution of the structures will require performance of significant earth works.
- Zone "B" unfavorable for the foundation of civil structures due to the soil and water conditions. This zone is present in terrain depressions, where there are low-bearing organic soils of various thickness (e.g. in the borehole 5 - 2.8 m). In part of this zone, surface water occurs or may occur periodically, whereas in the remaining part - groundwater occurs shallowly (mostly shallower than 1 m BGL). Use of this areas for construction purposes will require replacement of soil or other actions aimed at subsoil improvement.

In order to avoid the substantial costs of the foundation of the civil structures, the planned Investment Project will be located within Zone "A".



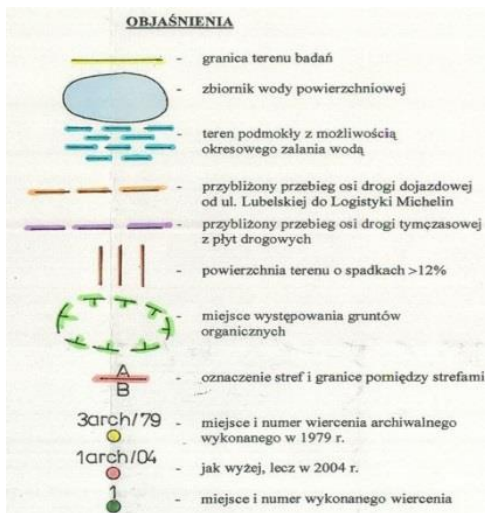
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PL	EN
Objaśnienia	Legend
Granica terenu badań	Survey site boundary
Zbiornik wody powierzchniowej	Surface water tank
Teren podmokły z możliwością okresowego zalania wodą	Waterlogged area, with the possibility of periodical flooding with water
Przybliżony przebieg osi drogi dojazdowej od ul. Lubelskiej do Loistyki Miechlin	Approximate route of the axis of the access road from ul. Lubelska to Logistics Center of Michelin

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Przybliżony przebieg osi drogi tymczasowej z płyt drogowych	Approximate route of the temporary road made of road slabs
Powierzchnia terenu o spadkach >12%	Area with slopes of >12%
Miejsce występowania gruntów organicznych	Place of occurrence of organic soil
Oznaczenie stref i granice pomiędzy strefami	Designation of zones and boundaries between zones
Miejsce i numer wiercenia archiwalnego wykonanego w 1979 r.	Location and number of historical drilling performed in 1979
Jak wyżej, locz. W 2004 r.	As above, but in March 2004
Miejsce i numer wykonanego wiercenia	Location and number of performed drilling

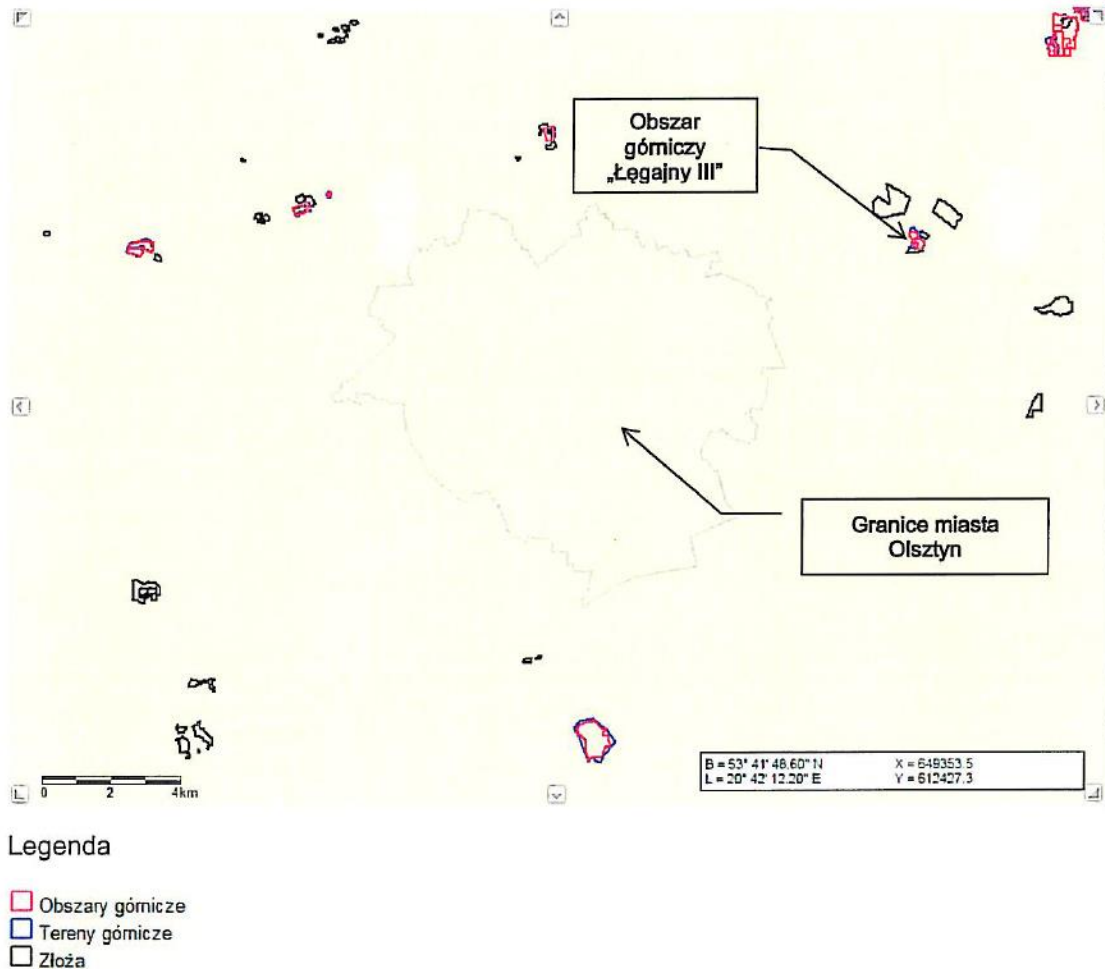
Figure 26. The map with favorable areas "A" and unfavorable "B" for the foundation of civil structures Source: Ramboll Documentation

A detailed hydrogeological and geological/engineering documentation will be elaborated in the course of preparation of a building permit design, when details of location and parameters of individual facilities of ITPFP will be known. This documentation will be a basis for setting locations of observation piezometer holes for monitoring of the groundwater environment. Excavations features, such as the depth and land leveling plan, will be a part of geotechnical design which will be prepared after obtaining a decision on environmental constraints.

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Mining conditions

Land assigned for location of the planned Investment Project lies within 5.5 km from mining area "Łęgajny III". Post-mining changes of the land surface will have no impact on civil structures built on the site of ITPFP.



PL	EN
Obszar górniczy „Łęgajny III”	Mining area “Łęgajny III”
Granice miasta Olsztyn	Olsztyn city limits
Legenda	Legend
Obszary górnicze	Mining areas
Tereny górnicze	Mining grounds
Złoże	Deposits

Figure 27. Map with mining areas

(source of information: Polish Geological Institute - National Research Institute)

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Seismic conditions

Land allocated for the planned Investment Project is not at risk of any seismic impacts or loads.

11.4. FAUNA, FLORA AND PROTECTED AREAS

11.4.1. Fauna

A survey of protected animal species was made for the land of the planned Investment Project, with an indication of protective and compensatory measures. Information in this chapter is based on the survey made by Krzysztof Lewandowski, M.Sc., (March-June, 2012).

– Birds

Presence of 31 species of birds was recorded during the observations, 9 of which were nesting in the area of the planned Investment Project, 23 were nesting in the buffer zone and 15 species were passing nearby the area or visiting the area to feed. Bird species found in the area of the planned Investment Project are listed in Table 50 below.

Table 52. Bird species found in the area of the planned Project

SPECIES	
1. Song thrush (<i>Turdus philomelos</i>)	a common species with 2 pairs nesting, one of which is nesting in the area of the Investment Project
2. Yellowhammer (<i>Emberiza citrinella</i>)	a very common species, 2 nesting pairs in the area, one of which is nesting in the area of the Investment Project
3. Gadwall (<i>Anas strepera</i>)	a common species, with 3 pairs reported (basins: 5,10,11), of which one pair is nesting in the area of the Investment Project. This species is also recorded as flying over the surveyed area.
4. Eurasian penduline tit (<i>Remiz pendulinus</i>)	a rare species, 2 nesting pairs, of which one in the area of the Investment Project.
5. European magpie (<i>Pica pica</i>)	a common species, 4 nesting pairs were reported, 2 of which in the area of the Investment Project. Also passing individuals were observed.

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SPECIES	
6. Eurasian coot (<i>Fulica atra</i>)	one of two most numerous nesting species reported in the surveyed area. In total 6 pairs of coots are nesting, of which one in the Investment Project area.
7. Great Tit (<i>Parus major</i>)	a very common species, with 3 pairs nesting, including 2 in the area of the Investment Project, 2 pairs nesting, including 1 in the area of the Investment iProject.
8. Willow warbler (<i>Phylloscopus trochilus</i>)	a common species. 4 nesting pairs were reported, 2 of which in the area of the Investment Project.
9. Mallard (<i>Anas platyrhynchos</i>)	a common species, with 3 pairs reported (basins: 5,10,11), of which one pair is nesting in the area of the Project. This species is also recorded as flying over the surveyed area.
10. Gadwall (<i>Anas strepera</i>)	a relatively rare species, 2 nesting pairs reported, of which one in the area of the Investment Project. Also passing or feeding individuals were observed.

– **Amphibians and reptiles**

In total, during observation the presence of breeding locations of 6 legally protected amphibian taxons were recorded. However, in the area of the Investment Project only 3 amphibian taxons were found: common frog, moor frog and water frog. Water basins No. 7 and 8 existing on the plot are of no significance for the local population. There were no amphibians found in basin No. 7. This basin was completely drained in springtime. Few individuals of one species (the common frog) were found in water basin No. 8. This water basin is also prone to drying out. Water basin No. 10 is important for the local population. Approx. 200 amphibians were reported in that basin.

– **Invertebrates**

On three spots within the area of the planned Investment Project the presence of beetles was reported.

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11.4.2. Flora

The tree and vegetation survey was made in the area of the planned Investment Project. The survey was meant to provide an analysis of the existing vegetation (tree stands) for the planned Investment Project, considering health and natural value of the trees. The scope of the survey was to define location of trees growing in the surveyed land, identify the species, number of individual trees or areas of clusters, while assaying the health conditions.

The area of the planned Investment Project is mostly covered with young stands of birch, mostly unattractive for birds. Part of the area is covered with depressions filled with water, around which dense gray willow patches and solitary alder trees are found. The edges of reservoirs are covered with willow bushes. Biological diversity in the area is represented mainly by meadow plants and habitats of the waterlogged areas with accompanying fauna. Because of the character of development and little diversified landscape, the area of the planned Investment Project, as well as of adjacent areas, does not constitute any valuable natural habitats. A detailed environmental survey has demonstrated, that the area is weakly populated by birds.

A detailed description of the environmental survey is provided in Appendix No. 6, while tree and vegetation survey in Appendix No. 7 to this Report.

11.4.3. Protected areas including Natura 2000 areas

Nature protection in Poland aims at maintaining ecological processes and ecosystems' stability, preserving biodiversity, preserve geological and paleontological heritage, ensuring continuity of the existence of plants, animals and fungi with their habitats, by keeping or reinstating their proper state of protection, protecting landscape value, green areas in towns and villages and tree-growing areas, as well as maintaining or reinstating the proper state of protection of natural habitats and other resources, formations and components of nature, shaping proper attitudes of people towards nature through education information and promotion of nature protection. The following chapters provide the description of the nature protection context in the area of planned ITPFP.

In Poland, nature protection is regulated by the Act on nature protection. Act of April 16, 2004 on nature protection (consolidated text, Journal of Laws No. 2009, No. 151, item 1220, as amended) defines forms of nature protection which include:

- 1) national parks,
- 2) nature reserves,
- 3) landscape parks,
- 4) protected landscape areas,
- 5) NATURA 2000 areas,

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- 6) natural monuments,
- 7) documentation sites,
- 8) ecological arables,
- 9) nature and landscape groups,
- 10) protected species of plants, animals and fungi.

The following Table presents the distances from the planned Investment Project to the legally protected areas.

Table 53. Compilation of NATURA 2000 areas and legally protected areas within 30 km from the area for construction of ITPFP.

Item	Name	Distance from the planned Investment Project
Special birds protection areas		
1.	Puszcza Napiwodzko-Ramucka PLB280007	5.99
2.	Dolina Pasłęki PLB280002	1762
Special areas of habitats conservation		
1.	Ostoja Napiwodzko-Ramucka PLH280052	8.81
2.	Jonkowo-Warkały PLH280039	13.88
3.	Warmińskie Buczyny PLH280033	14.15
4.	Rzeka Pasłęka PLH280006	17.41
5.	Swajnie PLH280046	23.55
6.	Dolina Drwęcy PLH280001	27.59
National parks		
1.	None	-
Nature reserves		
1.	Mszar	5.33
2.	Redykajny	8.15
3.	Las Warmiński im. prof. Benona Połakowskiego	10.52
4.	Jezioro Kośno	14.67
5.	Ostoja Bobrów na Rzece Pasłęce	1.80

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6.	Kamienna Góra	18.12
7.	Kwiecewo - buffer zone	22.17
8.	Kwiecewo	22.60
9.	Ustnik	25.45
10.	Sołtysek	27.31
11.	Zabrodzie	27.62
12.	Bagno Nadrowskie	29.52
13.	Mokradła Żegockie	29.64
Landscape parks		
1.	None	-
Protected landscape areas		
1.	Dolina Środkowej Łyny	3.60
2.	Puszcza Napiwodzko-Ramucka	4.21
3.	Protected Landscape Area of Pojezierze Olsztyńskie	4.28
4.	Dolina Pasłęki	10.77
5.	Doliny Dolnej Łyny	21.52
6.	Lasów Taborskich	21.92
7.	Dolina Symarny	23.12
8.	Narieński	28.65
Nature and landscape complexes		
a)	Jezioro Limajno and its surrounding	17.92
b)	Dolina Marózki	2.16
c)	Jezioro Rzeckie Nature and Landscape Park	23.48
d)	Kobuńskie Wzgórza	28.46

The map below shows the location of ITPFP in Olsztyn in relation to the legally protected nature areas.

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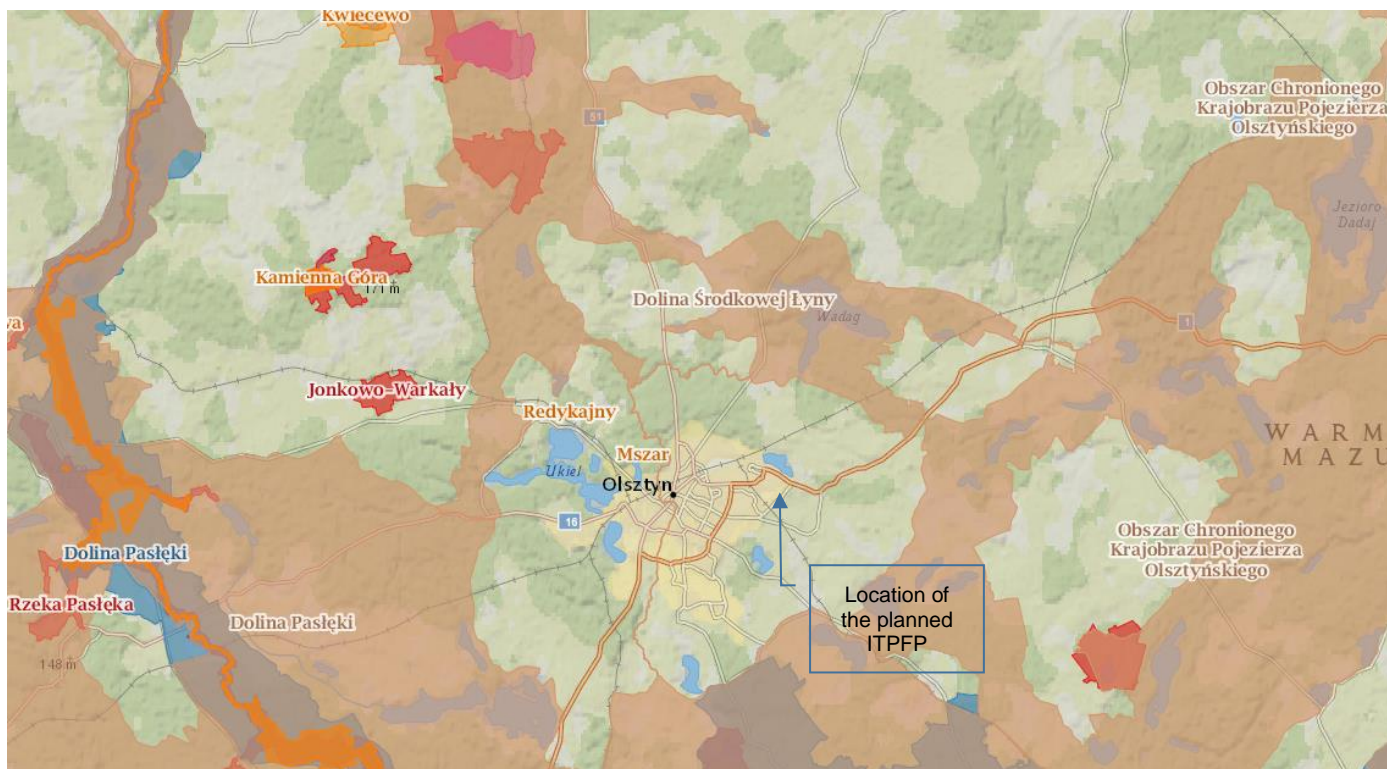


Figure 28. Location of ITPFP with indication of legally protected areas.

(source: <http://geoserwis.gdos.gov.pl/mapy/>)

Based on the above map and information taken from the Study of Conditions and Directions of Spatial Development for the City of Olsztyn from 2010, it is determined, that land for ITPFP is outside of:

- National parks,
- Landscape parks
- Protected landscape areas
- Natura 2000 areas
- Ecological arables
- Nature reserves with buffer zones and natural monuments
- Conservation areas
- Documentation sites
- Nature and landscape complexes

NATURA 2000 areas

A NATURA 2000 area is one of the forms of nature protection. According to Article 33 of the Act on nature protection, no activities are allowed in NATURA 2000 areas that might substantially worsen

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the conditions of nature habitats and plant and animal species habitats, and negatively impact the protected species in the area. This ban concerns also the planned NATURA 2000 areas, included in a list prepared by the Minister of Environment, until this list will be either accepted or rejected by the European Commission.

Network of NATURA 2000 include:

- Special Protection Areas (SPA) - designated according to Council Directive 79/409/EEC of April 2, 1979 on protection of wild birds, the so called "Bird" Directive.
- special areas of conservation (SAC) - designated according to Council Directive 92/43/EEC of May 21, 1992 on the conservation of natural habitats and of wild fauna and flora, the so-called "Habitats" Directive, for Annex I habitats and Annex II plant and animal species.

Within Olsztyn city limits there are no protected areas belonging to NATURA 2000 network.

At the distance of approx. 6 km from the location for ITPFP there is a Special Protection Areas (Bird Directive) - Puszcza Napiwodzko-Ramucka PLB280007. Basic threat to this area comes from:

- tourist/recreational pressure combined with growing settlements.
- eutrophication of waters.
- overgrowing of open spaces due to the natural succession.

The planned Investment Project will have no negative impact on the existing forms of nature protection in Puszcza Napiwodzko-Ramucka area nor will be the source of above listed threats.

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National parks

A national park includes an area of outstanding natural, scientific, social, cultural and educational value, of not less than 1,000 hectares size, in which all nature and landscape values are protected. A national park is established for preservation of biodiversity, resources, formations and components of inanimate nature and landscape beauty, for reinstating a proper conditions of resources and components of nature and restitution of deformed habitats of plants, animals or fungi. Within the distance of 30 km from land for development of ITPFP no national parks were identified. The planned Investment Project will not have any negative impact on the existing forms of nature protection in the areas of National Parks.

Landscape parks

A landscape park includes an area protected because of its natural, historic and cultural as well as landscape value in order to preserve and popularize these values in conditions of sustainable development. Within the distance of 30 km from land for development of ITPFP no landscape parks were identified. The planned Investment Project will not have any negative impact on the existing forms of nature protection in the areas of Landscape Parks.

Protected landscape areas

A protected landscape area includes areas which are protected because of a distinguishable landscape with various ecosystems, valuable due to its capability of meeting the needs of tourism and recreation or having the function of a wildlife corridor. To the south, east and north of land for development of ITPFP are the following protected landscape areas: Dolina Środkowej Łyny, Puszcza Napiwodzko-Ramucka and Obszar Chronionego Krajobrazu Pojezierza Olsztyńskiego. The nearest to the planned Project is Dolina Środkowej Łyny at the distance of approx. 3.60 km. Protected landscape area "Dolina Środkowej Łyny" has a size of 15,307.8 hectares and lies within Olsztyn District, in Municipalities of: Świątki, Dobrze Miasto, town of Dobrze Miasto, Dywity, Jonkowo, Barczewo, Gierzwald and city of Olsztyn. The planned Investment Project will not violate any rules of active protection of forest ecosystems in areas designated in Ordinance No. 159 of the Warmińsko-Mazurski Voivode of December 19, 2008, on protected landscape area of "Dolina Środkowej Łyny".

Nature reserves

According to Article 13, section 1 of Act of April 16, 2004 on nature protection (Journal of Laws of 2009, No. 151, item 1220, as amended), a nature reserve is a collection of areas including "preserved in natural or little altered state – ecosystems, refuges and habitats, also habitats of plants, animals and fungi, as well as components of inanimate nature, with outstanding natural, scientific, cultural or landscape value". Within Olsztyn city limits there are two valuable nature reserves – rare peat vegetation areas in Mszar and Radykajny, at the distance from the planned Investment Project of respectively 5 km and 8 km.

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The planned Investment Project will not have any negative impact on the existing forms of nature protection in the areas of Nature Reserves in Mszar and Radykajny.

Natural monuments

Natural monuments are individual formations of animate or inanimate nature or their collections, of special natural, scientific, cultural, historic or landscape value, and outstanding from other formations because of their individual features, such as monumental trees, native or foreign shrubs, springs, waterfalls, karst springs, rocks, gullies, boulders and caves. In the city of Olsztyn there are trees, shrubs and alleys protected as natural monuments.

According to the register of natural monuments, they include:

- Norway maple (reg. No. 381) Olsztyn ul. 1 Maja, in front of PKO SA Bank;
- pedunculate oak (reg. No. 382) Olsztyn, at ul. Radiowa on the verge of forest; a group of trees in Pozorty country house park: 6 -trunk weeping beech, column oak, 3 Canadian Tsuga pines and northern red oak with 2 trunks (reg. No. 437) Olsztyn Pozorty, former country house park;
- historic alley along ul. J.Tuwima: pedunculate oak 13 pcs, Norway maple 12 pcs, small-leaved linden 2 pcs (reg. No. 517), ul. J. Tuwima from Pozorty to Al. W. Sikorskiego;
- oak-beech alley (reg. No. 524) from ul. J. Tuwima to a family cemetery in Pozorty park;
- common beech (reg. No. 525) Olsztyn; Kortowo, at terminus and near the phytopathology building;
- common hawthorn (reg. No. 1224) Olsztyn; Kortowo; University of Warmia and Mazury, escarpment at ul. M. Oczapowskiego;
- Sycamore maple (reg. No. 1225) Olsztyn; Kortowo; University of Warmia and Mazury, on the verge of the avenue of mature trees, between student residences 4 and 6, ul. Cz. Kanafojskiego;
- Sycamore maple (reg. No. 1226) Olsztyn; Kortowo; University of Warmia and Mazury, within the avenue of mature trees, near the student residence 6, ul. Cz. Kanafojskiego;
- Sycamore maple (reg. No. 1227) Olsztyn; Kortowo; University of Warmia and Mazury, within the avenue of mature trees, near the student residence 6, ul. Cz. Kanafojskiego;
- pedunculate oak - 2 pcs (reg. No. 1228) Olsztyn; Kortowo; University of Warmia and Mazury, a common concrete flower pot near the entrance to the student residence 4;
- white four-day willow (reg. No. 1229) Olsztyn; Kortowo; University of Warmia and Mazury; in vicinity of Kortowo park, close to the student residence 6;
- white poplar (reg. No. 1230) Olsztyn; Kortowo; University of Warmia and Mazury; on the verge of Kortowo park, close to the student residence 9;

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- Norway maple (reg. No. 1231) Olsztyn; Kortowo; University of Warmia and Mazury; on the verge of lawn between two streets; to the south lies the student residence 2.
- common two-day juniper (reg. No. 1232) Olsztyn; Kortowo; University of Warmia and Mazury; in vicinity of the student residence 1, on a lawn adjacent to the street;
- 6-trunk common juniper (reg. No. 1233) Olsztyn; Kortowo; University of Warmia and Mazury; in vicinity of the student residence 1, on a lawn elevated from the street with poplars on two sides
- white willow (reg. No. 1234) Olsztyn; Kortowo; University of Warmia and Mazury; on the Kortowo Lake shore near jetty;

(source: *Study of Conditions and Directions of Spatial Development for the City of Olsztyn*)

The planned Investment Project will not have any negative impact on the existing natural monuments within Olsztyn city limits.

11.4.4. Protected areas established according to European Union Directives and European Nature Conservation Network

Within the framework of integration with the European Union, of increasing importance is Poland's participation in the European ecological programs EECONET, CORINE-biotopes and NATURA 2000. These programs aim at protecting natural heritage of Europe.

KRAJOWA SIEĆ EKOLOGICZNA ECONET - PL (NATIONAL ECOLOGICAL NETWORK ECONET - PL)

In the concept of the national ecological network ECONET-POLAND, the Lake District including the city of Olsztyn has a rank of the core area of international significance (designated as No. 13). Biocenters of the core areas of international significance are the areas of the highest rank in a hierarchy of the national ecological network - as relatively least ecologically transformed areas. Whereas the Łyna valley performs the function of an ecological corridor of national importance. Ecological corridors play an important role in functioning of nature as a migration route for animals, enabling the genetic exchange between individual populations. These areas are also essential elements of those areas which can be defined as biologically active and important to maintain balance of nature. These areas include predominantly post-lake and post-glacial depressions and (in particular those of high underground water level with ponds and overgrown with natural vegetation, not being exploited for human economic use), river valleys and forests. (source: *The Study of Conditions and Directions of Spatial Development for the City of Olsztyn*). The ecological corridors constituting the elements of EECONET are listed below.

Ecological corridor of the Łyna and Wda rivers

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The area of the river bed and adjacent ecologically valuable areas. In the southern part there are swamp pools and marshy meadows. In the northern part there are forest communities of Las Miejski [Municipal Forest]. The weak link in the corridor is the area of military barracks at ul. Artyleryjska and devastated and urbanized area between the Old Town and ul. Obrońców Tobruku.

Ecological corridor of Łyna – Lake Skanda

Areas of allotment gardens and uncontrolled forest areas are connected by Lake Skanda with the Łyna river. The weak link in the corridor are buildings near ul. Elbląska and Al. W. Sikorskiego.

Ecological corridor Lake Krzywe – Łyna

It runs through uncontrolled, waterlogged areas, forests and allotments. The weak link in the corridor is a railway embankment with buildings along ul. Szarych Szeregów and the area of crossing of streets Warszawska – A. Śliwy – K. Jagiellończyka. Ecological corridor Lake Kortowskie - Lake Krzywe. A large, compact forest complex belonging to Kudypy Forest District, connecting lakes along the western city boundary. An ecologically valuable peat bog located south of the built-up area of Dajtki estate. The weak link in the corridor is the railway embankment and national road No.16.

Ecological corridor Gutkowo – Łupstych

The complex of forest areas, waterlogged meadows and idle lands along the western city boundary.

Ecological corridor Redykajny

It connects lakes Żbik, Tyrsko and Radykajny by a strip of forests, meadows and idle lands, as well as Tyrsko and Krzywe lakes - by a small pond. The weak link in the corridor is the railway line and ul. Bałtycka, which separates the lakes.

11.5. QUALITY OF THE ENVIRONMENT IN THE IMPACT AREA OF THE PLANNED INVESTMENT PROJECT

11.5.1 Current air quality condition

(information from "Environmental Impact Forecast o amend the Study of Conditions and Directions of Spatial Development for the City of Olsztyn, aimed at enabling the development of CHPP using renewable energy sources within the commercial and service zone G3"):

City of Olsztyn is located in the Warmia and Mazury Zone in which quality of atmospheric air is monitored. Measurements of air quality are made by the Voivodship Inspectorate of Environmental Protection (WIOŚ) in Olsztyn. Measuring points are located at ul. Puszkina. Based on the measurements taken, the quality of air in the Voivodship is estimated as good, although there are spots which are more

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exposed to pollution. These are areas adjacent to major roads, settlements where stoves are used for heating and towns with more than 100 thousand residents. It has been determined that in the case of Olsztyn the permitted limits of average annual concentrations of sulfur dioxide, nitrogen dioxide and PM10 were not exceeded. However, the level of pollution with benzopyrene is high, though still within the permitted limit. This is a product of fossil fuels combustion in stoves and cars. The analyzed area is directly affected by a high pollution related to transport. Ul. Lubelska, running in the vicinity of the analyzed area, presents a large source of exhaust gases from cars. There are also various manufacturing facilities in the neighborhood.

(information from the document: Annual assessment of air quality in the Warmińsko-Mazurskie Voivodeship in 2013. Environment Monitoring Department of Voivodeship Inspectorate for Environmental Protection in Olsztyn):

In 2013, in the area of the city of Olsztyn the tests were continued, aiming at fulfilling the requirements stated in 2008/50/EC Directive. The assessment for 2013 was made in three zones, according to the Ordinance of the Minister of Environment of August 2, 2012, *on zones of air quality evaluation* (J. of Laws of 2012, item 914) and the Ordinance of the Minister of Environment of September 18, 2012, *on evaluation of substances concentrations in the air* (Journal of Laws of 2012, item 1032). **Concentrations of: SO₂, O₃, NO₂/NO_x, CO, PM_{2,5} particulate matter, lead, arsenic, cadmium, nickel in PM₁₀ particulate matter relative to protection of health of humans and plants have not exceeded the levels – respectively permitted and targeted** – as defined in the Ordinance of the Minister of Environment of August 24, 2012, on the levels of certain airborne substances (Journal of Laws of 2012, item 1031). There were cases of exceeding the values of long-term objective for ozone, identified both relative to the protection of health of humans and plants. For many years metal concentrations in particulate matter have been below the lower thresholds of estimation, defined in the Ordinance of the Minister of Environment of September 18, 2012, *on evaluation of substances concentrations in the air* (Journal of Laws of 2012, item 1032). In 2013, the target levels of benzo(a)pyrene concentration in PM₁₀ particulate matter were exceeded in each of the three zones. The main cause of this exceedence was an increase in emissions of pollutants from communal sources due to unfavorable climatic conditions in wintertime and combustion of the heating materials of poor quality in less efficient stoves. Due to the exceeded limits, actions are taken based on Article 91 of the Environmental Protection Law.

Due to the fact that the target levels of benzo(a)pyrene concentration in PM₁₀ particulate matter were exceeded in each of the three zones in 2013, an Air Protection Program was created due to the target levels of benzo(a)pyrene concentration being exceeded in the zone of the city of Olsztyn (RESOLUTION NO. XXXI/614/13 OF WARMIŃSKO-MAZURSKIE VOIVODESHIP ASSEMBLY). This Air Protection Program is a document describing key causes (sources) of air pollution with benzo(a)pyrene and

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defining effective and feasible actions, which, if implemented, will bring about lowering of the pollution level to at least the target value. The main purpose of preparing and implementing the Air Protection Program is reinstating the breached air quality standards and thereby improving the quality of life of residents, increasing civilizational standards and creating better quality of life in the city. Completion of tasks resulting from the Air Protection Program aims at reducing the concentrations of substances polluting the air in respective zones to the target level, and later maintaining that level.

(information from the document: *Environmental Protection Program for Warmińsko-Mazurskie Voivodeship for years 2011-2014*):

Due to the negative impact of air pollution on human health and condition of ecosystems, each year the air quality is evaluated for contents of pollutants: sulfur dioxide (SO₂), nitrogen dioxide/oxides (NO₂/NO_x), carbon monoxide (CO), benzene (C₆H₆), ozone (O₃), suspended particulate matter PM₁₀ and PM_{2,5} (since 2010) and pollutants determined in PM₁₀ particulate matter: lead (Pb), arsenic (As), cadmium (Cd), nickel (Ni) and benzo(a)pyrene (BaP). The air quality evaluation is made according to the criteria defined in the Ordinance of the Minister of Environment of March 3, 2008, on the levels of certain airborne substances (Journal of Laws No. 47, item. 281). In Warmińsko-Mazurskie Voivodeship there is a health resort protection area – Gołdap, characterized by more rigorous evaluation criteria for: SO₂, NO₂, CO and C₆ H₆. Data analysis for the last years indicates a generally good air quality in Warmińsko-Mazurskie Voivodeship. The results of evaluation for particulate matter PM₁₀, ozone and benzo(a)pyrene in relation to the protection of human health and for ozone in relation to the protection of plants (Kobus D. et al., 2010) were the least favorable during that period.

Current condition of air pollution (November 2014) for the area of ITPFP location were defined by WIOŚ - Voivodeship Inspectorate of Environmental Protection in Olsztyn. The average annual concentration values were defined on the basis of measurements made by WIOŚ (Appendix No. 9 to the Report). In the case of the new plant location, the average annual concentration values are the following:

Table 54. Current condition of air pollution in the city of Olsztyn, area of ul. Lubelska

Item	Type of pollutant	Annual average concentration		
		µg/m ³	Admissible average annual concentration (Da)	% of the admissible value
1.	suspended particulate matter PM ₁₀	26.0	40	65
2.	suspended particulate matter PM _{2.5}	20.0	25	80
	sulfur dioxide	3.5	20	17.5
	nitrogen dioxide	13.0	40	32.5

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	carbon monoxide	360	-	-
	benzene	1.5	5	30

The admissible values were defined according to the Ordinance of the Minister of Environment of August 24, 2012, on the levels of certain airborne substances (Journal of Laws No. 0, item. 1031). The concentration in air of each of the substances monitored by WIOŚ in the area of the planned Investment Project was within the limits defined in applicable regulations.

11.5.2 Current state of acoustic climate in the surroundings of the planned Investment Project

(information taken from Environmental Impact Forecast to amend the Study of Conditions and Directions of Spatial Development for the City of Olsztyn, aimed at enabling the development of CHPP using renewable energy sources in the commercial and service zone G3):

Noise occurring in the environment may be divided into two basic categories: traffic noise and industrial noise. Road transport is one of the key factors affecting acoustic climate. It is also the main source of nuisance for people and natural environment. Comprehensive studies of traffic noise in the city of Olsztyn were performed in 2001. Noise measurements were carried out in 68 measuring points. A set of factors has the major impact on the level of noise in the city, including the total number of passing vehicles, share of heavy vehicles, average velocity of vehicles, their technical condition, road inclination as well as type and condition of street pavements. All these factors, in conjunction with some other ones (natural topography, type of surrounding buildings, meteorological conditions) give some resultant level of noise. Many sections of the surveyed streets show noise levels that are higher threshold than the values of noise levels. The highest noise level was found along streets: Sielska - Armii Krajowej –Obrońców Tobruku – Sikorskiego – Pstrowskiego – Wyszyńskiego – Leonharda – Towarowa - Lubelska and at some sections of ul. Bałtycka. Lubelska street runs closest to the analyzed area of the above mentioned streets. However, it is not directly adjacent to the analyzed area. In the case of area subjected to the Study amendment, it is necessary to consider reduction of noise level while moving further away from its source. The second type of noise is of an industrial origin. Its source are all types of industrial facilities. Nuisance of this type of noise depends mainly on the type, arrangement and number of noise emitters and used acoustic protections. In the nearest vicinity, there are various manufacturing facilities of tire factory "Michelin" and others.

In brief, the current condition of acoustic climate in the surroundings of the planned Investment Project is determined by:

- Olsztyn motocross track,

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- tire factory “Michelin”,
- ul. Lubelska.

The noise level near the area of the Investment Project is already quite high, however, it is expected that noise emissions during construction and operation of ITPFP will not cause its increase.

11.5.3 Current quality of surface water and underground water

On December 22, 2000, Directive 2000/60/EC of the European Parliament and of the Council of October 23, 2000 came into force, establishing a framework of the Community action in the field of water policy, the so-called Water Framework Directive (WFD). The overarching goal of the Water Framework Directive is to achieve a good quality of all kinds of water by 2015, and in justified cases by a later deadline.

Surface water

Appendix 2 to the “*Water Management Plan for the Pregola Basin*” includes a list of homogeneous surface water bodies. The following Table presents characteristics of the homogeneous river water body (hswb) at the control-measurement point Radykajny within Olsztyn city limits.

Table 55. Homogeneous water bodies for the Łyna river - control-measurement point Radykajny (Olsztyn city area).

Item	Specification	Homogeneous surface water body (HSWB)
1.	European code of HSWB	PLRW700020584511
2.	Name of HSWB	Łyna – from a tributary from Lake Jelguń to Dywity Canal
3.	Integrated surface water body (ISWB)	SW2012
4.	Water region	The Łyna and Węgorapa water region
5.	Code of the river basin	7000
6.	Name of the river basin	The Pregola basin area
7.	Regional Water Management Authority (RZGW)	RZGW in Warsaw
8.	Ecoregion according to Kondracki	Eastern Plains (16)
9.	Ecoregion according to Illies	Eastern Plains (16)

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10.	Type of HSWB	Lowland gravel river (20)
11.	Status	Natural water body
12.	Condition evaluation:	Bad
13.	Evaluation of risk of failing to meet the environmental targets	At risk
14.	Derogations*	4(4) - 1
15.	Justification for derogation	Anthropogenic activity impact on the condition of the Homogeneous Water Body makes it necessary to delay the achievement of environmental targets due to the lack of technical solutions capable of improving the state of the Homogeneous Water Body.

* - derogations: exceptions from reaching the environmental targets; 4(4) – 1 temporary derogations – lack of technical solutions. Data taken from the Water Management Plan for the Pregola Basin.

Evaluation of water quality in 2011 made by WIOŚ in Olsztyn (based on the Ordinance of the Minister of Environment of November 9, 2011, on classification of the ecological state, ecological potential and chemical state of homogeneous bodies of surface waters), has demonstrated that in the case of homogeneous body of surface waters named: Łyna – from a tributary from Lake Jelguń to Dywity Canal, name of the control-measurement point: Łyna - Radykajny, all the physiochemical elements met class I standard. However, the evaluation of the ecological state of the homogeneous water body “the Łyna – from a tributary from Lake Jelguń to Dywity Canal” will be made only after adoption of classification methodology for benthic macroinvertebrates. Waters of Łyna in the tested homogeneous water bodies met the criteria for the protected areas.

Underground waters

Major Groundwater Reservoir No 213 is under the diagnostic monitoring in the framework of the State Environmental Monitoring carried by Polish Hydrogeological Survey (PIG-PIB). Characteristics of homogeneous underground water bodies No 20, provided in the water management plan in the Pregola Basin, have demonstrated that the underground water included in the scope of Major Groundwater Reservoirs (GZWP) No 213 are characterized by good condition in quantitative and chemical terms. Assessment of the risk of failing to meet environmental targets was classified as: “not at risk.” Concentrations of major constituents in underground water are within the limits for potable water. Only compounds of iron and manganese, the natural constituents of underground water, exceed the concentrations permitted for potable water.

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Underground water and surface water connections

Anthropogenic pressure in the basin is a factor that may affect water conditions. The scale of changes is very difficult to estimate because in many areas the anthropogenic factors have numerous impacts. Factors directly affecting water conditions on the analyzed area include: intake of water and discharge of the treated wastewater. The planned Investment Project will not involve any exploitation of underground and surface waters. The planned Investment Project will have no permanent impact on underground water and surface water conditions.

12. DESCRIPTION OF HISTORIC MONUMENTS, LOCATED WITHIN DIRECT IMPACT ZONE OF THE PLANNED INVESTMENT PROJECT, PROTECTED ON THE BASIS OF REGULATIONS ON PROTECTION AND CARE OF HISTORIC OBJECTS.

12.1. HISTORY OF THE CITY

The history of Olsztyn begins in the 14th century. The city was founded around 1334 by Jan of Łąjsy. In the beginning the city was functioning under a German name Allenstein, which derives from the Prussian name of the Łyna – Alna or Alle. City rights were granted in 1353. The most famous resident of Olsztyn was Nicolaus Copernicus, who carried out his astronomical observations also from the local castle. At the end of the 19th and at the beginning of the 20th century new public buildings were constructed, which included among others a New Town Hall in Dutch Renaissance style, a neo-Gothic St Joseph church, a seat of regency and modern residential areas. Olsztyn received the gas network, telephone line, electricity, water system, tramways on the streets and an airport. After WWI, by virtue of the plebiscite of July 11, 1920, Olsztyn was a part of the southern East Prussia. Poland regained the city after WWII. Population of Olsztyn in 1939 amounted to 46,513, in 2014 – 175,843 people. Currently, Olsztyn is the capital of the Warmińsko-Mazurskie Voivodeship.

12.2. MONUMENTS

Municipal register of historic monuments in Olsztyn includes currently 418 items. Some of them are technical monuments, sacral objects, residential houses.

The most important monuments of architecture in the city include:

The Gothic Castle of Warmian Bishops, Stefan Jaracz Theater, Old Town Hall, a Neo-Romanesque St Joseph Church, the Gazeta Olsztyńska House, the Jewish Cemetery, a Neo-Gothic Evangelical-Augsburg Church, St Jacob's Cathedral, the Arch-Presbyter Palace and sections of city walls with the Wysoka Brama [Tall Gate] dating from the 14th century. The Ordinance No 42 of the President of Olsztyn

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of February 7, 2013 lists the monuments in the city of Olsztyn. The planned Investment Project will have no negative impact on the monuments listed in this Ordinance.

No monuments subject to conservation officer's protection or modern cultural goods are present on the land allocated for ITPFP. No activities significantly affecting monuments subject to conservation officer's protection are foreseen during the execution and operation phase of the Plant.

13. ESTIMATED ENVIRONMENTAL IMPACT OF THE SELECTED VARIANT

13.1. USE OF ENVIRONMENTAL RESOURCES

Construction phase

It is expected that the construction site will be equipped with containers with various use purposes in order to secure sanitary and administrative needs. An anticipated number of staff working on the site may amount to about 300. Demand for process water on the site will be small due to the fact that concrete will be delivered in a ready-mixed state. It is expected that the water demand can be supplied from the existing water supply network of PWiK or transported in tank-vehicles to the construction site. It is assumed that concrete will be delivered in a ready-mixed state, which will decidedly reduce water consumption.

Water demand for production purposes

$$q_{prod} = 1,2 \frac{K \cdot \sum_{i=1}^n R_{bud}}{8 \cdot 3600} [dm^3 / s]$$

$$q_{prod} = 1,3 [dm^3 / s]$$

K- water consumption irregularity factor

$\sum_{i=1}^n R_{bud}$ - total water demand for individual types of processes on the site.

Water demand for economic purposes

$$q_{gosp} = 2,7 \frac{10 \cdot N + \sum p}{8 \cdot 3600} [dm^3 / s];$$

$$q_{gosp} = 0,7 [dm^3 / s]$$

N- average number of employees on the site (about 300 persons)

$\sum p$ - total consumption of water for sanitary needs of employees on the site.

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Estimated total water demand during the construction phase will be approx. 2 [dm³/s].

Operation phase

The following materials, resources and fuels will be used during operation of ITPFP:

- water,
- lime or hydrated lime,
- light fuel oil,
- Diesel oil

WATER

In connection to operation of the planned investment project it is expected that intake of water will be from a designed water supply main pipeline , mainly for the purposes of refilling the district heating system , refilling steam-water cycle , and semi-dry flue gas desulfurization plant. The Table below shows the balance of water demand for ITPFP.

Table 56. Balance of demand for water taken from the water supply main pipeline for the operation of ITPFP

	Type of demand	Volume of intake		
		Hourly maximum [m ³ /h]	24h Average [m ³ /d]	Annual maximum ^{*)} [m ³ /r]
	Raw water for the new unit, including the following:	ca. 13.7	ca. 530	ca. 112,500
1.	Raw water for production of softened water	7.6	170	62,400
1.1.	Softened water for municipal district heating system	5.0	112	41,000
1.2.	Water for production of demineralized water	2.1	47	17,300

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1.2.1.	Demineralized water used to make-up the steam-water cycle	1.4	32	11,500
1.2.2.	Demineralized water for the deNO _x system	0.6	14	4,950
1.2.3.	Losses from the demineralized water station	0.1	2	820
1.3.	Losses from the softening station	0.5	11	4,100
2.	Water for FGD plant	3	67	24,600
3.	Water for furnace waste management (slag quenching and stabilization)	1.7	38	13,940
4.	Water for other purposes (washing etc.)	1.0	22	8,200
5.	Water for domestic purposes	0.4	9	3,300

*Annual operation time of grate boiler – 8200h

Maximum water demand will amount to:

- $Q_{\max h} = \text{ca. } 13.7 \text{ m}^3/\text{h}$,
- $Q_{\max a} = \text{ca. } 112,500 \text{ m}^3/\text{a}$.

Water for production of demineralized water

Raw water will be delivered to the demineralization/softening station in order to produce demineralized and softened water. Softened water will be stored in a softened water tank and used for making up the district heating system. Demineralized water will be stored in a demineralized water tank and used for making up the steam-water cycle of steam boilers and for thinning the reacting substance in DENOX system. Water treatment process will be performed in a process line, involving preliminary softening, proper softening, reverse osmosis and electro-deionisation (EDI).

Steam-water cycle (boiler)

Water used for refilling of the steam-water cycle will be taken from water supply network of PWiK Olsztyn. Water for the closed steam-water cycle will be treated in Water Treatment Plant (DEMI). Chemicals used for treatment of water are characterized in Chapter 7.3 of the Report.

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Potable water demand

Water for employees working at operation of ITPFP will meet the permitted parameters defined in the Ordinance of the Minister of Health of March 29, 2007, on quality of water intended for human consumption (Journal of Laws 2007 No 61 item 417, as amended). Daily demand for potable water for the planned number of operational staff is estimated at 8 m³/d. The demand for potable water was estimated on the basis of total number of employees (administrative staff and operators) with consideration of the unitary water consumption and its daily (N_d) and hourly (N_h) irregularity factors.

Water for cleaning and washing purposes.

Water for cleaning purposes (floor washing) will be taken from the water supply main of PWiK in Olsztyn. Floor washing is expected to take place in the following facilities:

- Boiler House,
- Peak Load Boiler House,
- Turbine Hall,
- Oil unloading station,
- Light oil pump station,
- Unloading hall.

Conclusions

Water for industrial, sanitary and fire-fighting purposes, as well as potable water ought to be taken from water supply network upon agreeing on the conditions with the network administrator.

NATURAL GAS

Natural gas will be used as a fuel for peak load back-up boilers and for ignition of the grate boiler. Maximum gas consumption – 7.8 Nm³/h in both boilers. Maximum annual consumption of chemical energy from fuel – 44 TJ.

LIGHT FUEL OIL

Light fuel oil will be an alternative fuel in place of natural gas for the peak load back-up boilers. Estimated consumption of light fuel oil – ca. 6.6 Mg/h.

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DIESEL OIL

Diesel oil will be used in an emergency power generator set. Maximum consumption of Diesel oil, ensuring safe start-up and shut-down of unit equipment during the loss of external power supply will be 47l/h.

LIME/HYDRATED LIME

Lime or hydrated lime will be used as a sorbent for reducing the emissions of sulfur dioxide in flue gas in the FGD plant. Annual consumption of sorbent will be ca 1350 Mg.

13.2. IMPACT ON AIR QUALITY

Construction phase

During the execution of the planned investment project, construction works will be carried out involving mainly erection/installation of ready assemblies delivered to the site in a prepared and protected form. The need for welding and painting structural elements and resulting emissions of pollutants may arise only in special cases (painting of corroded spots – at connections, welds etc.). However, due to small sizes of treated surfaces and small volumes of used paints or electrodes, where majority of structures of the new unit will be assembled outdoors in the open air, the involved emissions will not be a nuisance beyond the ground of the CHPP.

During the construction of structures and systems of the CHPP there will be diffuse emissions into the air due to the use of mechanical construction machines and during transfer of earth masses. Dust emission may occur also as a result of secondary dusting of loose materials from uncovered storage of cement, sand, aggregate and from uncleaned internal roads.

In order to reduce the dust emissions from the construction site, the following rules shall be observed:

- protection against the wind at the storage yard for loose construction materials,
- systematic cleaning of the construction site during earthworks,
- sprinkling potential places of secondary dusting during dry and windy weather,
- cleaning vehicle wheels before the departure from the construction site,
- proper organization of construction material deliveries to ensure effective access to the construction site and to reduce hardship in road traffic,
- use of operational construction equipment.

Machines used for construction works will be driven by diesel engines and also will constitute a potential source of fugitive pollution emission to the air during the investment project implementation. Typical transport pollution will be emitted: dust, sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons.

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Approximate volumes of emissions were estimated on the basis of fuel consumption and emission indexes published in EMEP/CORINIAR Emission Inventory Guidebook – Road Transport, in August, 2007.

Emission indexes from heavy vehicles are presented in Table 55.

Table 57. Emission indexes for heavy vehicles in g/kg of combusted fuel

Category of vehicles	CO	NO ₂	Particulate matter PM10	SO ₂	Benzene
Trucks > 3.5 Mg Diesel oil	6.73	32.99	0.86	0.02	4.16

Emission of pollutants from trucks and construction machines was based on the following assumptions:

- average passage on the site: 1.5 km,
- average velocity of vehicles: 10 km/h,
- average fuel consumption: 0.215 kg/km,
- average density of Diesel oil: 0.86 kg/dm³.

The construction works will be carried throughout the year, about 14 hours a day from Monday to Friday, and 8 hours on Saturdays; it is assumed that seven vehicles can travel on the site within one hour and construction machines may work for approximately 4 hours a day, and the number of different types of machines can be about 10. Travel time through the site at the assumed velocity will be about 10 minutes.

Volumes of emissions from equipment during the implementation of the investment project are compiled in Table 64.

Table 58. Volumes of emissions from trucks and construction machines

Emission volume	Unit	CO	NO ₂	Particulate matter PM10	SO ₂	Benzene
Average emission from one equipment unit	g/equipment unit	2.2	11	0.3	0.001	1.34
Total hourly emission	kg/h	13.2	66	1.8	0.006	8.04

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Calculations indicate that construction of the CHPP will have minimal impact on the air quality. Pollutants will be introduced to the air by low emitters, which makes the range of impact very small and limited to the place of works, not exceeding the boundaries of the area to which the Investor holds a legal title. Considering the temporary nature of the construction works, it should be stated that the construction stage will not cause any negative impact on the environment.

Operation phase

The concentrations of pollutants in the air around ITPFP and generated by their emissions discharged in an organized manner into the air are one of the main criteria of assessment of the degree of the plant nuisance to the surrounding environment. This Chapter presents the impact of the newly planned plant fired with fuel from municipal waste on the air quality in the area of potential impact of the plant.

- **Admissible levels and reference values for substances in the air**

Emissions of pollutants cannot cause the exceeding of:

- admissible levels of substances in the air defined in the Ordinance of the Minister of Environment of August 24 , 2012, *on the levels of certain airborne substances* (Journal of Laws 2012 item 1031).
- reference values for substances in the air which are defined in the Ordinance of the Minister of Environment of January 26 , 2010 on reference values for certain substances in the air (Journal of Laws No 16, item. 87).

Admissible levels and reference values for individual substances in the air are compiled in Table 65.

Table 59. Admissible levels and reference values for individual substances in the air for the area of the country

Item	Name of substance	Limit values for substances in the air, differentiated for the protection of human health and vegetation [µg/m³]				Reference values of substances in the air [µg/m³]	
		1 h	8 h	24 h	Year	1 h	Year
For the area of the country, excluding the areas subject to health resorts protection							
	suspended particulate matter PM10	-	-	50 ¹	40 ¹	2280	40

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Item	Name of substance	Limit values for substances in the air, differentiated for the protection of human health and vegetation [$\mu\text{g}/\text{m}^3$]				Reference values of substances in the air [$\mu\text{g}/\text{m}^3$]	
		1 h	8 h	24 h	Year	1 h	Year
2.	sulfur dioxide	350 ¹	-	125 ¹	20 ²	350	20
3.	nitrogen dioxide	200 ¹	-	-	40 ¹	200	40
4.	carbon monoxide	-	10,000 ¹	-	-	30,000	-
5.	nitrogen oxides (sum of nitrogen dioxide and nitrogen oxide converted to nitrogen dioxide)	-	-	-	30 ²	-	-
6.	ammonia	-	-	-	-	400	50
7.	particulate matter PM _{2.5}				20 ¹	-	-
8.	thallium	-	-	-	-	1	0.13
9.	cadmium	-	-	-	0.005 ¹	0.52	0.005
10.	arsenic	-	-	-	0.006 ¹	0.2	0.006
11.	Fluorine (sum of fluorine and fluorides soluble in water)	-	-	-		30	2
12.	hydrogen chloride	-	-	-	-	200	25

1. limit value for the protection of human health.

2. limit value for the protection of vegetation

The Table below presents the air quality standards in the EU (Directive 2008/50/EC of the European Parliament and of the Council of May 21, 2008 on ambient air quality and cleaner air for Europe) and

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the regulations of World Health Organization (Air quality guidelines for Europe, 2 - nd edition, 2000) for the pollutants analyzed in this Report.

Table 60. Air quality standards of EU and WHO, limits and guidelines on SO₂, NO₂, PM₁₀

Name of substance	Adopted period of averaging	EU (standards or target values)	WHO (guidelines)
SO ₂	Maximum 24-hour average	125 (*) (µg/m ³)	20 (**) (µg/m ³)
	Maximum hourly average	350 (µg/m ³)	350 (µg/m ³)
NO ₂	Annual average	40 (µg/m ³)	40 (µg/m ³)
	Hourly average	200 (µg/m ³)	
	Maximum hourly average	-	200 (µg/m ³)
PM ₁₀	Annual average	40 (µg/m ³)	20 (µg/m ³)
	Maximum 24-hour value	50 (***) (µg/m ³)	50 (µg/m ³)

*: Values cannot be exceeded more than 3 times a year (99.2 percentile of 24-hour average)

**: Values cannot be exceeded more than 24 times a year (99.7 percentile of hourly average)

***: Values cannot be exceeded more than 35 times a year.

- Analysis and determination of aerodynamic terrain roughness**

One of the most important factors influencing the atmosphere equilibrium state is the topography of surroundings of the analyzed area. Natural topography, changes in type of land cover (low and high vegetation), forest areas, development (rural, urban), water bodies – all these change the flow of flue gas stream and therefore impact the process of pollution air dispersion. Impact of changes in aerodynamic terrain roughness on the distribution and concentrations of pollution is the following:

increase in the so called terrain roughness index increases concentrations of pollutants generated from a given source;

at the same time the radius of occurrence of the maximal concentrations from the source of emission decreases.

While comparing concentrations coming from the same sources located in city center and in rural areas, it is always to be expected that the concentrations will be definitely higher in the city than in the open areas. At the same time the highest concentrations in the city are present closer to the source of pollution

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propagation. With rising height of the emission point, the influence of terrain heterogeneity on spreading of pollutants becomes ever smaller.

The average aerodynamic terrain roughness coefficient assumed for calculations of pollutants spreading around emitters, which will take place on the premises of the new CHPP, is $z_0 = 1 \text{ m}$. It was designated according to the Ordinance of the Minister of Environment of January 26, 2010 on the reference values for certain substances in the air (Journal of Laws No 16, item 87).

- **Pollution background**

Pollution background – the current condition of air pollution expressed as the annual concentration of the pollutant in the air, is considered in calculations for defining the state of purity of atmospheric air in the plant impact zone. According to the Ordinance of the Minister of Environment of January 26, 2010 on the reference values for certain substances in the air (Journal of Laws No 16, item 87), the exceptions are sources, from which the pollutants are introduced to the air only by emitters of less than 100m in height. In the case of the new CHPP, flue gases from the grate boiler and the peak load back-up boiler house will be discharged into the air by a stack of height $< 100\text{m}$. In the light of the valid Ordinance, the calculations of the state of pollution of the atmospheric air around emitters of the new CHPP consider the existing background pollution (Annex No 9 to this Report).

- **Calculation method of propagation of pollutants in the air**

The Ordinance of the Minister of Environment of January 26, 2010 on the reference values for certain substances in the air (Journal of Laws No. 16, item 87) provides a reference methodology of modeling the substance concentration levels in the air, based on the Pasquill model. Provisions of the ordinance prevent using other models for calculations. In calculating thermodynamic elevation, the formulas used are either CONCAWE or Holland formulas or a combination of these two, depending on the temperature of the discharged gas.

Calculations in the full scope resulting from the above-mentioned Ordinance of the Minister of Environment were made for the case of simultaneous operation of the grate boiler and peak load boiler house fired with natural gas, but only for nitrogen oxides converted into nitrogen dioxide and for arsenic. Scope of calculations for other analyzed pollutants was shortened, because they meet the condition $S_{mm} < 0,1 \times D_1$. Calculations in the full scope resulting from the above-mentioned Ordinance of the Minister of Environment were made for the case of simultaneous operation of the grate boiler and peak load boiler house fired with light fuel oil, but only for sulfur dioxide and nitrogen oxides converted into nitrogen dioxide. Scope of calculations for other analyzed pollutants was shortened, because they meet the condition $S_{mm} < 0,1 \times D_1$.

Inputs for calculation of spreading of gaseous and particulate pollutants in the air

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Calculations of propagation of pollutants in the air around emitters of the new CHPP were made for the simultaneous operation of all newly designed sources of organized emission of pollutants: the grate boiler and emitters of auxiliary systems. Parameters characteristic for emitters of the new CHPP are compiled in Table 13.2.5.

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Table 61. Parameters of emitters planned in the area of ITPFP

Source	Parameters of emitters					Comments
	Gas temperature at the outlet from an emitter	Gas flow rate	Flue gas outflow velocity	Height	Outlet diameter	
	K	Nm ³ /h	m/s	m	m	
Grate boilers stack	413	107,000 (dry flue gas, O ₂ =11%)	16.73	≥60	≤2	operation time 8200h/a at nominal load
Peak load back-up boilers stack	393	40,000x2	24	≥25	1.273	operation time 1000h/a at nominal load and 2000h/a at 85% load
Fly ash tank	293	3,000	7	22	0.4	8200h/year
Sorbent tank	293	1,500	5.9	14	0.3	8200h/year

Hourly emissions of the analyzed pollutants assumed for the calculation of spreading of gaseous and particulate pollutants are compiled in Tables with numbers:

36 - emissions of pollutants from grate boiler;

38 - emissions of pollutants from peak load back-up boiler house;

39 - emissions from fly ash tank;

40 - emissions from sorbent tank.

Consideration of emission standards for the grate boiler burning fuel from waste in the Directive of the European Parliament and the Council of November 24, 2010, on industrial emissions, in calculations of spreading the pollutants to the air from the new CHPP, shows a maximal possible, permitted by the legislator, level of impact of the planned Investment Project on the quality of air in the

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area of possible impact. Consideration of emission standards for the gas- and oil-fired boilers in the Ordinance of the Minister of Environment of November 4, 2014, on emission standards of certain plants, fuel combustion sources and other waste incineration or co-incineration facilities (Journal of Laws of November 7, 2014, item 1546) in calculations of spreading pollutants from the new CHPP in the air, shows a maximal possible, permitted by the legislator, level of impact of the planned investment project on the quality of air in the area of possible impact. Emission standards will be the subject of a Contract between the Investor and the equipment supplier. It will be possible to maintain the emission standards due to the use of solutions described in Chapter 9 of this Report. Maximum dust emissions from retention tanks were based on the data from manufacturers of dedusting equipment, who declare concentrations at the outlet $\leq 20 \text{ mg/m}^3$ at 20°C , and data on capacity of draft fans. These values will also be the subject of a Contract between the Investor and the equipment suppliers. Emergency power generator set was not included in the calculations of pollutants propagation in the air. Emissions from the Diesel generator set will not influence the total level of concentration of pollutants in the air, due to the assumed very limited time of operation of this device throughout the year. Diesel generator set will be used only in emergency situations for a safe shut-down and start-up of the unit without external power supply.

Results of calculations of pollutants propagation in the air

Table 61 compiles the results of calculations of the analyzed pollutants propagation in the air generated by operation of the new ITPFP on the ground level,.

Table 62. Calculated concentrations of pollutants in the air, ground level

Type of emitted pollutant	Parameter	Unit	Concentrations of analyzed pollutants ground level
particulate matter PM10	99.7 percentile	$\mu\text{g/m}^3$	3.4
	average annual concentration	$\mu\text{g/m}^3$	0.167
sulfur dioxide	99.8 percentile	$\mu\text{g/m}^3$	18.8
	average annual concentration	$\mu\text{g/m}^3$	0.72
nitrogen oxides as NO_2	99.8 percentile	$\mu\text{g/m}^3$	82.9
	average annual concentration	$\mu\text{g/m}^3$	2.97
carbon monoxide	99.8 percentile	$\mu\text{g/m}^3$	86.3
	average annual concentration	$\mu\text{g/m}^3$	2.391

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elemental carbon	99.8 percentile	$\mu\text{g}/\text{m}^3$	0.9
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.045
ammonia	99.8 percentile	$\mu\text{g}/\text{m}^3$	1.8
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.091
arsenic ¹	99.8 percentile	$\mu\text{g}/\text{m}^3$	0.05
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.0002
fluorine ²	99.8 percentile	$\mu\text{g}/\text{m}^3$	0.18
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.0091
cadmium	99.8 percentile	$\mu\text{g}/\text{m}^3$	0.00
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.0001
hydrogen chloride	99.8 percentile	$\mu\text{g}/\text{m}^3$	1.8
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.091
mercury	99.8 percentile	$\mu\text{g}/\text{m}^3$	0.00
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.0002
particulate matter PM2.5	99.8 percentile	$\mu\text{g}/\text{m}^3$	3.4
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.167
thallium	99.8 percentile	$\mu\text{g}/\text{m}^3$	0.00
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.0001

Legend:

¹. as a reference value for the standard for the sum of metals: antimony+arsenic+lead+chromium+cobalt+copper+vanadium+manganese+nickel, the lowest reference value was assumed (for arsenic)

². a value for fluorine was assumed as a reference value for hydrogen fluoride (as a sum of fluorine and water-soluble fluorides)

sulfur dioxide

99.7 percentile of sulfur dioxide generated by operation of ITPFP may reach the value of ca. 19 $\mu\text{g}/\text{m}^3$ (5.4% of the reference value) and may be present at the distance of approx. 500 m from the new CHPP emitters. The highest annual average concentration of sulfur dioxide may be equal to 0.72 $\mu\text{g}/\text{m}^3$, that is 3.6% of the reference value for this substance. Together with the existing background, the annual average concentration may reach ca. 4.2 $\mu\text{g}/\text{m}^3$, that is 21% of the reference value for this substance. The share of the new CHPP in the background pollution may amount to ca. 17%.

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nitrogen dioxide

99.8 percentile of nitrogen dioxide generated by the operation of ITPFP may reach the value of approx. $83 \mu\text{g}/\text{m}^3$ (41.5% of the reference value) and may be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of nitrogen dioxide may amount to approx. $3 \mu\text{g}/\text{m}^3$, that is 7.5% of the reference value for this substance. Together with the existing background, the concentration may reach $16 \mu\text{g}/\text{m}^3$, that is 40% of the reference value for this substance. The share of the new CHPP in the average annual concentration of nitrogen dioxide may be approx. 19%.

PM10 particulate matter

99.8 percentile of PM10 particulate matter generated by ITPFP may reach $3.4 \mu\text{g}/\text{m}^3$ (1.2% of the reference value) and may be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of PM10 particulate matter may amount to $0.167 \mu\text{g}/\text{m}^3$, that is 0.421% of the reference value for this substance. Together with the existing background, the concentration may reach approx. $26.2 \mu\text{g}/\text{m}^3$, that is 65.5% of the reference value for this substance. The share of the new CHPP in the average annual concentration of PM10 particulate matter may be 0.64%.

carbon monoxide

99.8 percentile of carbon monoxide generated by ITPFP may amount to $86.3 \mu\text{g}/\text{m}^3$, that is approx. 0.3% of the reference value and may be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of CO may amount to approx. $2.4 \mu\text{g}/\text{m}^3$, and together with the existing background this concentration may amount to $362.4 \mu\text{g}/\text{m}^3$, while the share of the new CHPP in the average annual concentration of CO may amount to approx. 0.7%.

ammonia

99.8 percentile of ammonia generated by ITPFP may reach the value of approx. $1.8 \mu\text{g}/\text{m}^3$ (0.45% of the reference value) and be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of ammonia may amount to $0.091 \mu\text{g}/\text{m}^3$, that is 0.18% of the reference value for this substance.

elemental carbon

99.8 percentile of elemental carbon generated by ITPFP may reach the value of approx. $0.9 \mu\text{g}/\text{m}^3$ (0.6% of the reference value) and be present at a distance of approx. 500 m from the CHPP

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emission sources. The highest average annual concentration of elemental carbon may amount to 0.045 $\mu\text{g}/\text{m}^3$, that is 0.56% of the reference value for this substance.

Arsenic

99.8 percentile of the sum of metals: antimony + arsenic + lead + chromium + cobalt + copper + vanadium + manganese + nickel generated by ITPFP may reach the value of 0.05 $\mu\text{g}/\text{m}^3$ (25% of the reference value) and may be present at the distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of the sum of metals may amount to 0.0002 $\mu\text{g}/\text{m}^3$, that is 3% of the reference value for this substance.

Fluorine

99.8 percentile of hydrogen fluoride generated by ITPFP may reach the value of 0.18 $\mu\text{g}/\text{m}^3$ (0.6% of the reference value) and may be present at the distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of hydrogen fluoride may be 0.0091 $\mu\text{g}/\text{m}^3$, that is approx. 0.46% of the reference value for this substance.

Cadmium

99.8 percentile of the cadmium and thallium sum of metals generated by ITPFP is negligibly small. The highest average annual concentration of cadmium may be 0.0001 $\mu\text{g}/\text{m}^3$, that is 2% of the reference value for this substance.

Thallium

99.8 percentile of thallium generated by ITPFP is negligibly small. The highest average annual concentration of thallium may amount to 0.0001 $\mu\text{g}/\text{m}^3$, that is 0.08% of the reference value for this substance.

Hydrogen chloride

99.8 percentile of hydrogen chloride generated by ITPFP may reach 1.8 $\mu\text{g}/\text{m}^3$ (0.9% of the reference value) and may be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of hydrogen chloride may amount to 0.091 $\mu\text{g}/\text{m}^3$, that is approx. 0.36% of the reference value for this substance.

Mercury

99.8 percentile of mercury generated by ITPFP is negligibly small.

The highest average annual concentration of mercury may amount to 0.0002 $\mu\text{g}/\text{m}^3$, that is 0.5% of the reference value for this substance.

PM 2.5 particulate matter

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99.8 percentile of PM_{2.5} particulate matter generated by ITPFP may reach 2.6 µg/m³ and may be present at a distance of approx. 300 m from the new CHPP emission sources. The highest average annual concentration of PM_{2.5} particulate matter may amount to 0.127 µg/m³, that is 0.51% of the reference value for this substance. Together with the existing background, the concentration may amount to 22.6 µg/m³, that is approx. 90% of the reference value for this substance. The share of the new CHPP in the average annual concentration of PM_{2.5} particulate matter may be 0.56%.

- **Particulate matter precipitation**

Fulfillment of the particulate matter precipitation criterion was analyzed for the case of four emission sources that simultaneously operated in ITPFP area. The calculations for particulate matter precipitation criterion are presented below.

$$n \sum_{i=1}^n \leq 0.0667/n \times h^{3.15} = 7429 \text{ [mg/s]},$$

$$\text{total average annual particulate matter emission} = 335.9 < 7429 \text{ [mg/s]},$$

$$\text{total annual particulate matter emission from emission sources} = 10.592 \text{ [Mg]} < 10,000 \text{ [Mg]}.$$

Due to the fact that the criterion requirements are met, calculations of particulate matter precipitation from ITPFP area were omitted.

- **Cadmium precipitation**

The calculations for cadmium precipitation criterion are presented below.

$$0.0667 \times 0.005 / 100 / n \times \sum h^{3.15} = 0.708 \text{ [mg/s]},$$

$$\text{total average annual cadmium emission} = 0.6976 < 0.708 \text{ [mg/s]},$$

$$\text{total annual cadmium emission} = 0.02 \text{ [Mg]} < 10,000 \text{ [Mg]}.$$

Due to the fact that the criterion requirements are met, calculations of cadmium precipitation from ITPFP area were omitted.

Calculation of gaseous and particulate pollutants propagation at height of 3 m above ground level

According to the Ordinance of the Minister of Environment of January 26, 2010 on the reference value for some substances present in the air (Journal of Laws No 16, item 87), if the residential or office buildings, day nursery buildings, nursery schools, schools, hospitals or sanatorium buildings higher than single-story are located at the distance closer than 10 h (10 times its height) from a emission source, it is required to check whether these buildings are not exposed to exceeded reference values of substances in the air or the admissible concentration levels of substances in the air. Calculations of

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gaseous and particulate pollutants propagation in the air around ITPFP emission sources at height of 3 m above ground level are presented below. Input data for calculations of the pollutants propagation are the same as for the calculations on the ground level.

- Results of calculations of pollutants propagation in the air at height of 3 m above ground level**

Table 62 compiles the results of calculations of the analyzed pollutants propagation in the air at height of 3 m above ground level generated by ITPFP.

Table 63. Calculated concentrations of pollutants in the air, 3 m above ground level

Type of emitted pollutant	Parameter	Unit	Concentrations of analyzed pollutants height of 3 m above ground level
PM10 particulate matter	99.7 percentile	µg/m ³	4.5
	average annual concentration	µg/m ³	0.215
sulfur dioxide	99.8 percentile	µg/m ³	18.8
	average annual concentration	µg/m ³	0.723
nitrogen oxides as NO ₂	99.8 percentile	µg/m ³	83
	average annual concentration	µg/m ³	2.982
carbon monoxide	99.8 percentile	µg/m ³	86.4
	average annual concentration	µg/m ³	2.4
elemental carbon	99.8 percentile	µg/m ³	1.0
	average annual concentration	µg/m ³	0.049
ammonia	99.8 percentile	µg/m ³	1.8
	average annual concentration	µg/m ³	0.091
arsenic ¹	99.8 percentile	µg/m ³	0.05
	average annual concentration	µg/m ³	0.0002
fluorine ²	99.8 percentile	µg/m ³	0.18
	average annual concentration	µg/m ³	0.0091
cadmium	99.8 percentile	µg/m ³	0.00
	average annual concentration	µg/m ³	0.0001
hydrogen chloride	99.8 percentile	µg/m ³	1.8

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	average annual concentration	$\mu\text{g}/\text{m}^3$	0.091
mercury	99.8 percentile	$\mu\text{g}/\text{m}^3$	0.00
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.0002
PM2.5 particulate matter	99.8 percentile	$\mu\text{g}/\text{m}^3$	4.5
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.215
thallium	99.8 percentile	$\mu\text{g}/\text{m}^3$	0.00
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.0001

Legend:

¹. reference value for the standard for the sum of metals: antimony + arsenic + lead + chromium + cobalt + copper + vanadium + manganese + nickel, the lowest reference value was assumed (for arsenic)

². as a reference value for hydrogen fluoride, a value for fluorine was assumed (as a sum of fluorine and water-soluble fluorides)

sulfur dioxide

99.7 percentile of sulfur dioxide generated by the operation of ITPFP may reach value of approx. $19 \mu\text{g}/\text{m}^3$ (5.4% of the reference value) and be present at the distance of approx. 500 m from the new CHPP emission sources. The highest average annual concentration of sulfur dioxide may be $0.723 \mu\text{g}/\text{m}^3$, that is 3.62% of the reference value for this substance. Together with the existing background, the average annual concentration may reach approx. $4.22 \mu\text{g}/\text{m}^3$, that is 21% of the reference value for this substance. The share of the new CHPP in the background pollution may be approx. 17%.

nitrogen dioxide

99.8 percentile of nitrogen dioxide generated by the operation of ITPFP may reach the value of approx. $83 \mu\text{g}/\text{m}^3$ (41.5% of the reference value) and may be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of nitrogen dioxide may amount to approx. $3 \mu\text{g}/\text{m}^3$, that is 7.5% of the reference value for this substance. Together with the existing background, the concentration may reach $16 \mu\text{g}/\text{m}^3$, that is 40% of the reference value for this substance. The share of the new CHPP in the average annual concentration of nitrogen dioxide may be approx. 19%.

PM10 particulate matter

99.8 percentile of PM10 particulate matter generated by ITPFP may reach $4.5 \mu\text{g}/\text{m}^3$ (1.6% of the reference value) and may be present at the distance of approx. 500 m from CHPP emission sources. The highest average annual concentration of PM10 particulate matter may amount to $0.215 \mu\text{g}/\text{m}^3$, that

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is 0.54% of the reference value for this substance. Together with the existing background, the concentration may reach 26.22 $\mu\text{g}/\text{m}^3$, that is approx. 65.5% of the reference value for this substance. The share of the new CHPP in the average annual concentration of PM10 particulate matter may amount to 0.82%.

carbon monoxide

99.8 percentile of carbon monoxide generated by ITPFP may amount to 86.4 $\mu\text{g}/\text{m}^3$, that is approx. 0.3% of the reference value and may be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of CO may amount to 2.4 $\mu\text{g}/\text{m}^3$, and together with the existing background this concentration may amount to 362.4 $\mu\text{g}/\text{m}^3$, while the share of the new CHPP in the average annual concentration of CO may amount to approx. 0.7%.

ammonia

99.8 percentile of ammonia generated by ITPFP may reach the value of approx. 1.8 $\mu\text{g}/\text{m}^3$ (0.45% of the reference value) and be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of ammonia may amount to 0.091 $\mu\text{g}/\text{m}^3$, that is 0.18% of the reference value for this substance.

elemental carbon

99.8 percentile of elemental carbon generated by ITPFP may reach the value of approx. 1.0 $\mu\text{g}/\text{m}^3$ (0.67% of the reference value) and be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of elemental carbon may amount to 0.049 $\mu\text{g}/\text{m}^3$, that is 0.61% of the reference value for this substance.

Arsenic

99.8 percentile of the sum of metals: antimony + arsenic + lead + chromium + cobalt + copper + vanadium + manganese + nickel generated by the operation of ITPFP may reach a value of 0.05 $\mu\text{g}/\text{m}^3$ (25% of the reference value) and may be present at the distance of approx. 500 m from CHPP emission sources. The highest average annual concentration of the sum of metals may amount to 0.0002 $\mu\text{g}/\text{m}^3$, that is 3% of the reference value for this substance.

Fluorine

99.8 percentile of hydrogen fluoride generated by ITPFP may reach the value of 0.18 $\mu\text{g}/\text{m}^3$ (0.6% of the reference value) and may be present at the distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of hydrogen fluoride may be 0.0091 $\mu\text{g}/\text{m}^3$, that is approx. 0.46% of the reference value for this substance.

Cadmium

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99.8 percentile of cadmium generated by ITPFP is negligibly small. The highest average annual concentration of cadmium may be $0.0001 \mu\text{g}/\text{m}^3$, that is 2% of the reference value for this substance.

Thallium

99.8 percentile of thallium generated by ITPFP is negligibly small. The highest average annual concentration of thallium may amount to $0.0001 \mu\text{g}/\text{m}^3$, that is 0.08% of the reference value for this substance.

Hydrogen chloride

99.8 percentile of hydrogen chloride generated by ITPFP may reach $1.8 \mu\text{g}/\text{m}^3$ (0.9% of the reference value) and may be present at a distance of approx. 500 m from the CHPP emission sources. The highest average annual concentration of hydrogen chloride may amount to $0.091 \mu\text{g}/\text{m}^3$, that is approx. 0.36% of the reference value for this substance.

Mercury

99.8 percentile of mercury generated by ITPFP is negligibly small. The highest average annual concentration of mercury may amount to $0.0002 \mu\text{g}/\text{m}^3$, that is 0.5% of the reference value for this substance.

PM 2.5 particulate matter

99.8 percentile of PM2.5 particulate matter generated by the operation of ITPFP may reach $2.6 \mu\text{g}/\text{m}^3$ and be present at the distance of approx. 300 m from CHPP emission sources. The highest average annual concentration of PM2.5 particulate matter may amount to $0.127 \mu\text{g}/\text{m}^3$, that is 0.51% of the reference value for this substance. Together with the existing background, the concentration may amount to $22.6 \mu\text{g}/\text{m}^3$, that is approx. 90% of the reference value for this substance. The share of the new CHPP in the average annual concentration of PM2.5 particulate matter may amount to 0.56%.

Calculation of gaseous and particulate pollutants propagation in the case of light fuel oil combustion in the peak load back-up boiler house

In the case of unavailability of gas supply, light fuel oil will be combusted in boilers of the peak load back-up boiler house. These boilers will be equipped with dual-fuel burners. Due to this fact gaseous and particulate pollutants propagation was calculated for the case of the boilers operating on light fuel oil.

- **Results of calculations of pollutants propagation in the air**

Table 62 compiles the results of calculations of analyzed pollutants propagation in the air generated by ITPFP during light fuel oil combustion in the peak load back-up boiler house. The calculations were

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made only for concentrations of SO₂, NO₂ and particulate because only for these pollutants the standards are different due to light fuel oil combustion.

Table 64. Calculated concentrations of pollutants in the air, ground level

Type of emitted pollutant	Parameter	Unit	Concentrations of analyzed pollutants
PM10 particulate matter	99.7 percentile	µg/m ³	11.4
	average annual concentration	µg/m ³	0.375
sulfur dioxide	99.8 percentile	µg/m ³	342
	average annual concentration	µg/m ³	9.332
nitrogen oxides as NO ₂	99.8 percentile	µg/m ³	181.7
	average annual concentration	µg/m ³	5.384

sulfur dioxide

99.7 percentile of sulfur dioxide generated by the operation of ITPFP during light fuel oil combustion in the peak load back-up boiler house may reach the value of 342 µg/m³ (approx. 98% of the reference value) and may be present at the distance of approx. 500 m from the plant emission sources. The highest average annual concentration of sulfur dioxide may amount to approx. 9 µg/m³, that is 45% of the reference value for this substance. Together with the existing background, the average annual concentration may reach 12.5 µg/m³, that is 63% of the reference value for this substance.

nitrogen dioxide

99.8 percentile of nitrogen dioxide generated by the operation of ITPFP during light fuel oil combustion in the peak load back-up boiler house may reach the value of 182 µg/m³ (91% of the reference value) and may be present at the distance of approx. 500 m from the plant emission sources. The highest average annual concentration of nitrogen dioxide may amount to 5.4 µg/m³, that is 13.5% of the reference value for this substance. Together with the existing background, the concentration may reach 18.4 µg/m³, that is 46% of the reference value for this substance.

PM10 particulate matter

99.8 percentile of PM10 particulate matter generated by the operation of ITPFP may reach the value of 11.4 µg/m³ (4% of the reference value) and may be present at the distance of approx. 500 m

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from CHPP emission sources. The highest average annual concentration of PM10 particulate matter may amount to $0.375 \mu\text{g}/\text{m}^3$, that is 0.94% of the reference value for this substance. Together with the existing background, the concentration may amount to $26.375 \mu\text{g}/\text{m}^3$, that is approx. 66% of the reference value for this substance.

Calculation of gaseous and particulate pollutants propagation in the case of light fuel oil combustion in the peak load back-up-boilers house at height 3 m above ground level

- **Results of calculations of pollutants propagation in the air, height of 3 m above ground level**

In Table 13.2.9 there are presented the results of calculations of the analyzed pollutants propagation in the air generated by ITPFP during light fuel oil combustion in the peak load back-up boiler house, at the height of 5 m above ground level. The calculations were made only for concentrations of SO_2 , NO_2 and particulate because only for these pollutants the standards are different due to light fuel oil combustion.

Table 65. Calculated concentrations of pollutants in the air, 3 m above ground level

Type of emitted pollutant	Parameter	Unit	Concentrations of analyzed pollutants
PM10 particulate matter	99.7 percentile	$\mu\text{g}/\text{m}^3$	12.9
	average annual concentration	$\mu\text{g}/\text{m}^3$	0.441
sulfur dioxide	99.8 percentile	$\mu\text{g}/\text{m}^3$	342.7
	average annual concentration	$\mu\text{g}/\text{m}^3$	9.4
nitrogen oxides as NO_2	99.8 percentile	$\mu\text{g}/\text{m}^3$	181.8
	average annual concentration	$\mu\text{g}/\text{m}^3$	5.42

sulfur dioxide

99.7 percentile of sulfur dioxide generated by the operation of ITPFP during light fuel oil combustion in the peak load back-up boiler house may reach the value of approx. $343 \mu\text{g}/\text{m}^3$ (98% of the reference value) and may be present at the distance of approx. 500 m from the plant emission sources. The highest average annual concentration of sulfur dioxide may amount to approx. $9 \mu\text{g}/\text{m}^3$, that is 45% of the reference value for this substance. Together with the existing background, the average annual concentration may reach $12.5 \mu\text{g}/\text{m}^3$, that is 63% of the reference value for this substance.

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nitrogen dioxide

99.8 percentile of nitrogen dioxide generated by the operation of ITPFP during light fuel oil combustion in the peak load back-up boiler house may reach the value of 182 µg/m³ (91% of the reference value) and may be present at the distance of approx. 500 m from the plant emission sources. The highest average annual concentration of nitrogen dioxide may amount to 5.42 µg/m³, that is 13.6% of the reference value for this substance. Together with the existing background, the concentration may reach 18.42 µg/m³, that is 46% of the reference value for this substance.

PM10 particulate matter

99.8 percentile of PM10 particulate matter generated by the operation of ITPFP may reach the value of approx. 13 µg/m³ (4.6% of the reference value) and may be present at the distance of approx. 500 m from CHPP emission sources. The highest average annual concentration of PM10 particulate matter may amount to 0.44 µg/m³, that is 1.1% of the reference value for this substance. Together with the existing background, the concentration may amount to 26.44 µg/m³, that is approx. 66% of the reference value for this substance.

Conclusions

- Values of the concentrations of the analyzed air pollutants in the air, generated by the operation of ITPFP, were calculated for the standard (resulting from the emission standards) emission values of gases and particulate matter released to the air from emission sources and based on the data of the manufacturers of the dedusting equipment for retention tanks, which will be operated on the premises of the plant.
- Such approach shows the maximum possible, under the law, impact of the planned Investment Project on the air quality in the area of potential impact of the plant.
- Twelve pollutants have been analyzed for compliance with the air quality standards. For only two of these, namely nitrogen oxides expressed as NO₂ and arsenic (a sum of metals: antimony+arsenic+lead+chromium+cobalt+copper+vanadium+manganese+nickel), the full scope of calculations was made (for the case of gas combustion in the peak load back-up boiler house), the reason for this being that their concentrations in the air do not comply with the requirement from calculation method defined in the Ordinance of Minister of Environment of January 26, 2010 on the reference values for certain substances present in the air (Journal of Laws No. 16, item 87):

$$S_{mm} \leq 0,1 \times D_1, \text{ where:}$$

S_{mm} – the highest of maximum concentrations of substances in the air

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D₁ – the reference levels of substances in the air or a admissible level of this substance in the air, averaged for one hour, meaning that they are higher than 10% of the reference value or the admissible level of the substance in the air, but do not cause exceeding of these.

- *As for the other ten pollutants, their concentrations in the air in the area of a potential impact of ITPFP are lower than 10% of the reference value or the admissible level of the substance in the air averaged to one hour.*
- *When gas supply will be unavailable and light fuel oil will be combusted in the peak load, back-up boiler house, an increase in concentrations of sulfur dioxide, nitrogen oxides and dust in the air will occur within the potential impact zone of ITPFP.*
- *Calculations of pollutants propagation in the air conducted for this case indicate that nine out of twelve concentrations of the analyzed pollutants meet a narrow scope of calculation criterion meaning that the concentrations are below 10% of the reference value or admissible level of the substance in the air averaged to one hour. Concentrations higher than 10% will occur for SO₂, NO₂ and arsenic.*
- *The results of the calculations show that during operation of ITPFP the admissible values of concentration of pollutants in the air will be met both on the ground and at the height of 3 m above ground level.*
- *This indicates compliance with reference values being in force in Poland, admissible concentrations of pollutants in the air in terms of protection of health of people and of plants, as well as target values in force in the EU and requirements of World Health Organization (WHO) for the quality of the air.*
- *Moreover, it can be mentioned that operational experience with this type of installations shows lower emissions of gaseous and particulate pollutants than defined in the emission standards. Therefore, it is expected that an impact of ITPFP on the air quality in the area of possible impact of the plant will be lower than one presented in this Report.*

Assumptions applied for model calculations, and the results of calculations together with isolines of equal concentrations of pollutants in the air are presented in this Chapter and in Appendix No. 13 to this Report.

13.3. IMPACT ON THE ACOUSTIC CLIMATE

Construction phase

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Noise related to the construction process of ITPFP shall occur on the construction site, site back-up facilities, and on access roads. The following works on the construction site shall emit most of the noise:

- heavy equipment work during site preparation,
- heavy equipment work during erection of structure components
- civil works, such as concrete works, operation of cranes,
- works connected with transport of individual elements.

Loudness of equipment such as a digger or a bulldozer may be assumed at approx. 93 dB (A), self-unloading trucks ca 90 dB (A), pneumatic hammers ca 100 dB (A), compressors – 90 ÷ 100 dB (A)

All above mentioned works will be carried out on the site during daytime (from 6:00 a.m. to 10:00 p.m.).

The Polish environmental protection regulations do not define any specific requirements regarding nuisance during the construction of new industrial facilities. Emissions of pollutants arising from operation of combustion engines or admissible noise levels from motor vehicles or heavy construction equipment are not regulated, however the Construction Law states that during construction of civil structures the legitimate interest of third parties should be protected. Under this provision, the Construction Law understands protection against nuisance caused by noise and protection against air, water and soil pollution. Noise arising during the construction of ITPFP will be discontinuous and its energy will fluctuate during observation periods. Such differences will be caused by variable course of construction operations even within a single shift (8h) and by the associated variable inputs of different construction equipment and machinery used in the construction process. According to the principle of origination of noise, during construction process noise may come from aerodynamic sources (generating sound as a result of flow of air or other gas, e.g. in compressors or combustion engines exhaust), noise from mechanical sources (generating sound due to friction and impact of solid objects, e.g. all kinds of machines), as well as from mixed sources (being a combination of aerodynamic and mechanical type). In Table 70 below there is a compilation of equipment being potential sources of noise, which will be operated on the construction site of ITPFP.

Table 66. List of potential noise emission sources – construction equipment

Item	Type of equipment	Sound power level A for equipment L _{AWeq} [dB]	Effective operation time [%]
1.	Single bucket excavator	96	30
2.	Dragline excavator	96	30

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Item	Type of equipment	Sound power level A for equipment L _{AWeq} [dB]	Effective operation time [%]
3.	Loader-excavator	104	30
4.	Self-propelled crane	96	30
5.	Stationary tower crane	104	30
6.	Poker vibrator	108	30
7.	Trucks	104	30

Noise parameters of construction machines are specified in the Ordinance of the Minister of Economy dated December 21, 2005 *on essential requirements for equipment used outside buildings, concerning noise emissions into the environment* (Journal of Laws No. 263, item 2202, as amended). At the current stage of design works it is very difficult to estimate the number of construction machines operating at the same time on the construction site.

Conclusions

- *Construction works are to be carried out only in daytime, that is between 6:00 a.m. and 10:00 p.m.), except for the specific works that need to be made during nighttime.*
- *Construction machinery and vehicles should circulate in the course of construction works on the strictly designated access roads.*
- *In order to reduce negative impact on the environment and health of people, the machines and equipment used on the site must meet all approval criteria and have good acoustic properties.*
- *In the course of the implementation of the Investment Project, during work intervals, motors of construction equipment must be switched off.*

Operation phase

The Ordinance of the Minister of Environment of October 1, 2012 on admissible noise levels in the environment (Journal of Laws of 2012, item 1109), values of equivalent A-weighted sound level for industrial facilities relate to one least favorable hour of nighttime (10:00 p.m. ÷ 6:00 a.m.) and eight least favorable hours of daytime (6:00 a.m. ÷ 10:00 p.m.). The admissible values are defined according to the time of day and purpose of land receiving the noise. Operation of the facility such as CHPP little depends on the time of day. Differences in the level of emitted noise during twenty-four hours may arise from transport and vehicle transport. Due to the applicable acoustic requirements, the selection of technical solutions for individual facilities and equipment is of great importance for solutions applied in ITPFP. Of importance is also adequate selection of construction solutions in terms of acoustic insulation capacity

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of space dividers and other protective devices, which will be equally significant in reducing noise emissions to the environment. New CHPP and whole infrastructure related to it may not cause exceeding of the admissible values defined for areas subject to noise protection, located around the plant (at the border of residential areas).

The influence of the new CHPP on the acoustic climate of protected areas was determined basing on a computer simulation using SoundPlan 7.3 Professional software, according to the methodology provided by PN-EN ISO 9613-2 Attenuation of sound during propagation outdoors -- General method of calculation – which is required by the Ordinance of Minister of Environment of November 4, 2008 on requirements for performance of measurements of emission rates and quantities of taken water.

All input data for calculations of sound propagation in the environment, in the form of the following:

- sound power levels of point and linear noise sources,
 - noise levels inside the buildings,
 - sound reduction indices of enclosed structure walls,
 - location of individual facilities in the area of ITPFP,
- were included in Appendix No. 10 to this Report.

Due to the fact that there are no acoustically protected areas in the immediate vicinity, resulting from the local land development plan in force, the nearest existing residential areas were included in the calculations and on these areas immissions were defined during daytime and nighttime.

The nearest **existing residential area**, not covered by the local land development plan in force, is at the distance of:

- approx. 270 m to the north-east of the Investment Project boundaries at ul. Lubelska 47b
- approx. 870 m to the west of the Investment Project boundaries at ul. Towarowa 18
- approx. 570 m to the south of the Investment Project boundaries at ul. Al. Marszałka Józefa Piłsudskiego
- approx. 800 m to the east of the Investment Project boundaries in the town of Klebark Mały 24a
- approx. 800 m to the north-east of the Investment Project boundaries in the town of Klebark Mały 37a

Comparing the character of these residential areas in the light of classification of areas included in the Ordinance of Minister of Environment of October 1, 2012 on admissible noise levels in the environment (Journal of Laws of 2012, item 1109), the following levels of noise emitted from new CHPP were assumed: 45 dBA for nighttime and 55 dBA for daytime, which are used for multifamily housing areas, farmstead areas and mixed housing-service areas.

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Calculation results of noise propagation in the environment

The carried out calculations show that noise level A coming from the normally-operating new CHPP to the residential areas will not exceed the following admissible values:

for farmstead residential areas:

- admissible A-weighted sound level for daytime LAeq D = 55 dB
- admissible A-weighted sound level in nighttime LAeq N = 45 dB

for multi-family housing areas:

- admissible A-weighted sound level for daytime LAeq D = 55 dB
- admissible A-weighted sound level for nighttime LAeq N = 45 dB

for mixed housing-service areas:

- admissible A-weighted sound level for daytime LAeq D = 55 dB
- admissible A-weighted sound level for nighttime LAeq N = 45 dB

The following Tables present the results of calculations of noise propagation from the new CHPP on the neighboring areas in daytime and nighttime

Table 67. Calculated equivalent A-weighted sound level in defined observation points (daytime) caused by operation of the planned noise sources of ITPFP

Observation point number	Location of observation points	Calculated equivalent sound level [dB A]	Admissible noise level [dB A]
1.	approx. 270 m to the north-east of the Investment Project boundaries at ul. Lubelska 47b (retail and residential buildings)	45.3	55
2.	approx. 870 m to the west of the Investment Project boundaries at ul. Towarowa 18 (multi-family housing)	37.1	55
3.	approx. 570 m to the south of the Investment Project boundaries at ul. Al. Marszałka Józefa Piłsudskiego (farmstead building)	39.7	55

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4.	approx. 800 m to the east of the Investment Project boundaries in the town of Klebark Mały 24a (farmstead building)	38.1	55
5.	approx. 800 m to the north-east of the Investment Project boundaries in the town of Klebark Mały 37a (farmstead building)	37.2	55

Table 68. Calculated equivalent A-weighted sound level in defined observation points (nighttime) caused by operation of the planned noise sources of ITPFP

Observation point number	Location of observation points	Calculated equivalent sound level [dB A]	Allowable noise level [dB A]
1.	approx. 270 m to the north-east of the Investment Project boundaries at ul. Lubelska 47b (retail and residential buildings)	44.9	45
2.	approx. 870 m to the west of the Investment Project boundaries at ul. Towarowa 18 (multi-family housing)	37.1	45
3.	approx. 570 m to the south of the Investment Project boundaries at ul. Al. Marszałka Józefa Piłsudskiego (farmstead building)	39.7	45
4.	approx. 800 m to the east of the Investment Project boundaries in the town of Klebark Mały 24a (farmstead building)	38.0	45
5.	approx. 800 m to the north-east of the Investment Project boundaries in the town of Klebark Mały 37a (farmstead building)	37.2	45

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Actions to reduce noise emission to the environment, especially to the nearest acoustically protected residential areas include: selection of partitions (walls of newly designed buildings) with adequate sound reduction capability and other sound reduction measures (e.g. silencers on HVAC units), and also specifying a demand of allowable workplace noise level of 85 dB/8h for all the supplied equipment. Suitable acoustic conditions specified in standard No. PN-87/B-02151/02, "Acceptable A-weighted sound level on the premises designed for human occupancy," shall be ensured inside the residential buildings located in areas not subject to noise protection, in accordance with Article 114 of the Act of April 27, 2001 – Environmental Protection Law (Journal of Laws of 2008, No. 25, item 150, as amended). All the above mentioned measures will contribute to preventing and minimizing an impact on the acoustic climate in the area of potential impact of ITPFP. The impact of ITPFP, together with the existing acoustic background will not cause exceeding of daytime and nighttime environmental quality standards in any of the analyzed observation points. The analysis of the impact of the new CHPP on the acoustic climate of the neighboring areas with distribution of sound level isolines, is provided in Appendix No. 11-13 to this Report. Moreover, the location of noise observation points was shown in these Appendices.

Conclusions

- *The Investor is obliged to make at least once in two years control noise level measurements connected with the operation of the Investment Project and also at any change of type, number and location of key noise sources. The measurement points ought to be located on the perimeter of the existing acoustically protected residential areas.*

13.4. IMPACT ON SURFACE- AND GROUNDWATER

An impact on the water environment may take place through an intake of water from the environment or emission of pollutions into the environment. Due to the planned manner of water supply and wastewater discharge, no negative impact of ITPFP on surface- and groundwater is foreseen.

Implementation phase

Impact of the Investment Project on groundwater in the phase of the Investment Project implementation may be connected with possible necessity of excavations draining for foundations of the facility and in case of emergency. Based on the documentation "Soil investigation with a geotechnical report " prepared by Geotest in September 2014 in order to determine the geotechnical conditions for the foundation of facilities of the planned CHPP in Olsztyn at ul. Lubelska, it has been concluded, that:

Two aquifers are present in Quaternary formations

- Within the first aquifer, the water table stabilizes at the depth of 1.7 – 2.2 m bgl, that is at 126.4 – 126.6 m asl.

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- Within the second aquifer, the water table stabilizes at the depth of 7.2-17.0 m bgl, that is, at the level of 118-123.0 m asl. .

Therefore it is assumed that the excavations for civil structures shall be drained.

In the case when the limits of depression cone necessary for temporary lowering of groundwater table beneath the bottom of excavation trenches extend beyond the boundaries of the site, to which the Investor holds the legal title, it will be necessary to obtain the water permit for discharging of the abovementioned waters into the environment – as required according to the water law. It is also possible to discharge drainage water and water from drainage of excavations to the sewerage network operated by PWiK according to the conditions agreed upon with the utility company or on a basis of a separate civil law contract for their collection, concluded by the investor with the company holding relevant permits. The implementation of the Investment Project involving the use of mechanical construction equipment represents a potential source of soil and groundwater contamination. As a result of equipment failure, oil, fuel, hydraulic fluid may escape into environment. To eliminate such risks the equipment used for construction works shall be in good technical condition, in the course of the works it shall be kept clean to guarantee trouble-free operation of the equipment, and consequently no negative impact on the groundwater environment. Refueling of vehicles and machinery shall be done on hardened and leakproof surface. If fuel leakage is found out, both during refueling and operation of equipment and motor vehicles, it will be immediately neutralized with dedicated sorption materials stored at the site back-up facilities. The composition of rain water pollution infiltrating into soil during works shall not deviate basically from the current level of rain water pollution on the same site, under the provision that construction equipment will be kept in good technical condition and clean during works. The quality of rain water on the site will not pose any threat to the environment. Proper operation of equipment, protection of construction site and machinery parking place will allow to protect groundwater environment against pollution penetration. The occurring impact shall be short-lived, reversible and shall not cause permanent changes in the groundwater environment within the site of the Investment Project.

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Operation phase

Water intake

Due to the operation of the planned Investment Project water will be needed for industrial processes and sanitary and domestic purposes. Water will be supplied to ITPFP from the designed Ø 400 mm water supply main of PWiK Olsztyn. Due to this manner of water supply no negative impact of the planned Investment Project on surface waters is foreseen. Adequate methods of limiting discharge of pollutants into surface- or groundwater, presented in chapter 14, will efficiently minimize the possibility of ITPFP impacting on groundwater environment. If earthworks and measures to protect groundwater environment are properly executed, the quality of surface- and groundwater will not be changed. Detailed characteristic of water intake is given in chapter 13.1.

Raw water supplied from water supply main of PWiK in Olsztyn will be directly used for production of softened and demineralized water. The water will be used as specified below:

- raw water - water for production of demineralized and softened water for the FGDP, for management of furnace waste, for other purposes (washing, fire-fighting, etc.), as well as for domestic purposes (potable water).
- softened water - make-up water for the district heating network, water for production of demineralized water, the water will be produced in the water softening station,
- demineralized water - make-up water for the steam-water cycle of the steam boilers and for the dilution of the reacting substance in the deNOx plant, the water will be produced in the water demineralization station,

Demineralized water

The demineralized water will be produced in the water demineralization station on the premises of ITPFP. Water demineralization station will be equipped with the reverse osmosis and electrodeionization (EDI) module. Moreover, a demineralized water tank will be installed, sized for 24 h demand, i.e. with the capacity of approx. 50 m³.

Softened water

The softened water will be produced in water softening station in ITPFP area. Water softening station will be equipped with cation softener, in which calcium and magnesium hardness and deaeration will occur. In order to cover the peak demand for softened water for make-up of the district heating circuit, it is assumed to provide a retention tank for softened water of approx. 200 m³ capacity.

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Wastewater discharge

Industrial wastewater, after pre-treatment will be supplied to the slag quenching system or/and discharged together with grey and black water to sewerage of PWiK under the conditions agreed with the utility company. Rain water from soiled surfaces will be discharged to the existing irrigation and drainage system (Struga Szęsne) and/or into the ground in the area of the planned Investment Project.

Rain water will be purified in the rain water treatment system before being admitted to either of the service points. Rain water and thaw water will comply with the requirements set forth in the Ordinance of the Minister of Environment of November 18, 2014 on conditions to be fulfilled while discharging wastewater to the water or ground, and on substances particularly harmful to water environment, specifying:

- quantity of oil derivative substances - 15 mg/dm³,
- quantity of total suspended matter - 100 mg/dm³.

Rain water treatment system will be composed of a sedimentation tank integrated with the coalescent separator and retention tank, dimensioned for the maximum torrential rain.

Wastewater discharged to the sanitary sewerage system of PWiK shall meet the requirements set out in the Ordinance of the Minister of Construction on the manner of performance of obligations of industrial wastewater suppliers and conditions for introducing wastewater to drainage facilities (Journal of Laws of 2006 No. 136, item 964).

Waste storage facilities will be designed and operated in a way preventing an unacceptable or accidental release of polluting substances into soil or surface waters.

Due to the manner of discharge of wastewater and methods for protecting the water environment described in chapter 14.2, no negative impact of the planned Investment Project on surface- or groundwater is foreseen. A detailed break-down of the volumes of wastewater is presented in chapter 8.2 of this Report.

Impact on environmental targets defined for the Homogeneous Surface Water Body (HSWB)

The planned Investment Project is located at the distance of approx. 4.5 km to the east of the Łyna river, for which environmental targets were defined in the "Water Management Plan for the Pregola River Basin".

The environmental target for the Homogeneous Surface Water Body is to achieve at least a good ecological state of waters and a good chemical composition thereof. Due to the manner in which water and wastewater will be managed, and owing to the significant distance from waters designated as HSWB, the planned Investment Project will have no impact on the realization of environmental targets for surface waters.

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The environmental target for the Homogeneous Underground Water Body, according to Article 38e of the Water Law (Journal of Laws of 2012 No. 145), is:

- to prevent or limit discharge of pollutants to groundwater,
- to prevent worsening of their condition and its improvement.

The planned Investment Project will have no negative impact on chemical and quantitative state of HSWB presented in chapter 11.2.1 of this Report.

Impact on environmental targets defined for the Homogeneous Underground Water Body (HUWB)

Pursuant to the definition laid down in the WFD, a good state of underground waters means state achieved by the underground water body, if both its quantitative and chemical states are determined to be at least “good”. The planned Investment Project will have no negative impact on achievement of the environmental targets of HUWB presented in chapter 11.2.2 of this Report. Measures to prevent discharge of pollutants into the underground waters are described in chapter 14.2 of this Report.

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13.5. WASTE MANAGEMENT

Construction phase waste

Pursuant to Article 3, section 32 of the Waste Act (consolidated text, Journal of Laws of 2013, item 21), "The producer of waste generated during the provision of services in the scope of construction, demolition, overhaul of facilities, washing of tanks or equipment, as well as cleaning, maintenance and repairs, is the entity providing these services, unless the contract for the provision of services provides otherwise".

In connection with the above, the contractors executing civil and erection works on the site will be responsible for managing the waste produced in the course of such works. Waste from the construction phase should be reclaimed first and, if for process reasons this is impossible or unjustified for ecology or economy reasons, the construction waste should be forwarded to be neutralized by landfilling. In the aspect of management of waste arising during the construction phase of the planned Investment Project, the contractors will have to minimize the volumes of waste and their negative impact on the environment by taking the following organizational measures:

- training of employees in correct handling of waste,
- controlling the volume of generated waste by maintaining a qualitative and quantitative records of waste,
- rationally managing materials used in civil and erection works, especially materials for insulation and anti-corrosive materials containing hazardous substances,
- conducting selective collection of waste and its storage in specialized containers,
- handing over for recycling waste which has properties that allow its reuse under the current state of the art, technology and organization,
- conducting the correct packaging waste management - which should be collected selectively in the indicated places on the construction site and handed over to recycling companies for utilization.

The following Tables below provide information on types of waste which are expected to arise, with their volumes, storage method and recovery or/and neutralization in the course of ITPFP construction.

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Table 69. List of hazardous waste arising during construction

Waste code	Waste type	Estimated volume of generated waste [Mg/year]	Waste characteristic	Waste storage method on the plant premises	Waste handling method Recycling or neutralization method
1	2	3		4	5
08 01 11*	Waste paint and varnish containing organic solvents or other dangerous substances	0.5	Leftovers and expired paints used in the finishing works, based on synthetic oils and dyes. They comprise a mix of aromatic and aliphatic hydrocarbons, dyes in the form of titanium white, ultramarine, yellow and orange dyes.	Collected in tightly closed, labeled containers in a separate locked room.	Handed to recipients holding relevant permits for R2 recovery or D1 neutralization.

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13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	1.0	Used oils containing polycyclic aromatic and saturated hydrocarbons, meliorating additives: S, P, N, Cl and heavy metal compounds as well as products of wear of elements of working equipment or products of incomplete combustion (particles of soot, exhaust carbon, lead compounds).	In a labeled, tightly closed barrel placed on a leak-tight floor	Handed to recipients holding relevant permits for R9 recovery.
13 02 07*	Readily biodegradable engine, gear and lubricating oils	1.0	Waste machinery oils replaced in operated gears or engines which constitute a mixture of basic oils - aromatic and aliphatic hydrocarbons and various contaminants in the form of particulate matter or metals (iron, aluminum, copper and tin), products of wear of the engine elements or products of incomplete combustion (particles of soot, exhaust carbon, lead compounds)	In a labeled, tightly closed barrel placed on a leak-tight floor	Handed to recipients holding relevant permits for R9 recovery

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14 06 03*	Other solvents and solvent mixtures	0.5	Residues of chemicals in form of solvents	Waste collected in tight labeled containers located in a designated place	Handed to recipients holding relevant permits for R9 recovery
15 01 10*	Packaging containing residues of or contaminated by dangerous substances	1.0	Metal (steel, aluminum), plastic and glass packaging contaminated with leftover chemicals used in the finishing works, containing hazardous substances (oils, lubricants, solvents)	In a separate tightly closed, labeled container located in a designated place.	Handed to recipients holding relevant permits for R5 recovery

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15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths ,protective clothing contaminated by dangerous substances	1.0	Rags used for cleaning soiled instrumentation, soiled electrical equipment, cleaning cloths soaked with oil, petroleum, gasoline, soiled worker's protective clothing, protective gloves, dust mask cartridges. Waste composition: textiles made of natural raw materials (wool, cotton, linen) and artificial materials (polyester, PCV, aniline) soiled with hazardous substances, mainly oil derivative substances and heavy metals.	Waste collected in tight labeled containers located in a designated place	Handed to recipients holding relevant permits for D5, D10 neutralization
16 07 08*	Wastes containing oil	1.0	Waste from operation of vehicles and machines	In a labeled, tightly closed barrel placed on a leak-tight floor	Handed to recipients holding relevant permits for R5 recovery or D5 neutralization
17 02 04*	Glass, plastic and wood containing or contaminated with dangerous substances	1.0	Sleepers arising from erection of cranes or standing of containers	Collection of used sleepers in the waste generation place	Handed to recipients holding relevant permits for D5, D10 neutralization

(*) at the waste code indicates hazardous waste - Ordinance of the Minister of Environment of September 27, 2001 on waste catalog (Journal of Laws No. 112, item 1206).

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Table 70. List of other than hazardous waste arising during the construction process

Waste code	Waste type	Estimated volume of generated waste [Mg/year]	Waste characteristic	Waste storage method on the plant premises	Waste handling method Recovery or neutralization method
1	2	3	4	5	6
08 01 12	Waste paint and varnish other than those mentioned in 08 01 11	1.0	Leftover paint used in finishing works, based on synthetic oils and dyes or other paints not containing hazardous substances	Selectively collected in containers in a separated place near the area of performed works	Handed to recipients holding relevant permits for R5 recovery or D5 neutralization

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08 04 10	Waste adhesives and sealants other than those mentioned in 08 04 09	0.5	Leftover used glues applied in the finishing works, not containing hazardous substances	Selectively collected in closed containers in a separated place near the area of performed works	Handed to recipients holding relevant permits for R9 recovery
12 01 13	Welding wastes	2.0	Used electrodes or welding wire used for the welding process in a mechanical workshop or on the plant premises. Chemical composition of electrodes: Fe 40%, Mn 17%, F 10%, Ca 12%, Si 8%, Na 6%, Cr 4%, K 2%, Ti 1%. Chemical composition of welding wire: Fe 60%, Mn 12%, Si 5%, Cr 1% other elements Ni, Cu 22%	Selectively collected in containers	Handed to recipients holding relevant permits for R4 recovery
12 01 17	Waste blasting materials other than those mentioned in 12 01 16	2.0	Waste generated in the course of grinding works. Grinding dust containing the abrasive and grinding materials and handled materials	Selectively collected in containers	Handed to recipients holding relevant permits for R4 recovery
15 01 01	Paper and cardboard packaging	5.0	Paper and cardboard packaging in which various raw materials, equipment elements and office materials are delivered. Chemical composition of this waste includes cellulose and lignin	Selectively collected in containers in a separated place near the area of performed works	Handed to recipients holding relevant permits for R1, R3 recovery

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15 01 02	Plastic packaging	3.0	Waste of damaged, non-contaminated burst polypropylene bags of stretch-type, the main component of which is non-toxic synthetic plastic polymer. This group includes plastic containers in which liquid or bulk substances are delivered as well as protective measures applied inside cardboard packagings which protect the products against transportation damages.	Selectively collected in containers in a separated place near the area of performed works	Handed to recipients holding relevant permits for R5 recovery
15 01 03	Wooden packaging	5.0	Elements of packaging in which various raw materials are delivered, wooden protective elements in other packaging and disposable and non-reusable pallets on which raw materials are supplied and stored. Chemical composition includes cellulose, hemicellulose and lignin	Selectively collected in containers in a separated place near the area of performed works	Handed to recipients holding relevant permits for R1, R3 recovery
15 01 04	Metallic packaging	5.0	Metal packaging, barrels and cans containing residues of non-hazardous substances, e.g. paints containing natural oils and pigments. This also includes steel tapes and container fasteners.	Selectively collected in containers in a separated place near the area of performed construction works	Handed to recipients holding relevant permits for R4 recovery

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15 01 05	Composite packaging	5.0	Multi-material packaging protecting the transported new equipment against transport damage containing plastic films with styrofoam or timber	Selectively collected in containers in a separated place near the area of performed construction works	Handed to recipients holding relevant permits for R3, R5 recovery
15 01 07	Glass packaging	2.0	Glass bottles containing residues of various substances. Chemical composition of glass is silica with additives in the form of sodium carbonate and calcium carbonate and flux in the form of boron and lead oxides, as well as dyes which are typically cadmium and manganese oxides	Selectively collected in containers	Handed to recipients holding relevant permits for R5 recovery
15 02 03	Absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02	5.0	Rags used for cleaning soiled instrumentation, soiled electrical equipment, soiled worker's protective clothing and protective gloves. Waste composition: textiles made of natural raw materials (wool, cotton linen) and artificial materials (polyester, PCV, aniline) soiled with non-hazardous substances	Selectively collected in containers in a separated place near the area of performed construction works	Handed to recipients holding relevant permits for R5 recovery or D5, D10 neutralization

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17 01 01	Concrete	100.0	Large concrete elements or concrete debris. This is a mixture of sand, gravel, cement, lime	Direct collection from the generation place.	Direct collection from the generation place to the recovery place (R5, R10) or storage place at neutral waste landfill D1
17 01 03	Tiles and ceramics	5.0	Waste generated in the course of the finishing works Waste of sanitary elements, damaged ceramic tiles. These elements can be made of stoneware or porcelain and contain various types of clay and sand, with glazing and ceramic paint coat	Direct collection from the generation place	Handed to recipients holding relevant permits for D1, D5 neutralization
17 01 02	Bricks	5.0	These will be residues of damaged bricks	Direct collection from the generation place.	Handed to recipients holding relevant permits for D1, D5 neutralization
17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	10.0	This waste will consist of concrete elements of different fractions contaminated with hazardous substances. They will include damaged bricks, roof tiles, sanitary elements, large concrete elements, brick debris	Direct collection from the generation place.	Handed to recipients holding relevant permits for D1, D5 neutralization

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17 02 01	Wood	5.0	Elements of damaged shuttering panels The basic components are cellulose, hemicellulose and lignin.	Selectively collected in containers in a separated place near the area of performed construction works	Handed to recipients holding relevant permits for R1, R3 recovery
17 02 02	Glass	2.0	Cullet, replaced glazing from windows and doors. Waste composition: quartz sand, calcium carbonate, sodium carbonate, fluxing agent – boron compound.	Selectively collected in containers in a separated place near the area of performed construction works	Handed to recipients holding relevant permits for R5 recovery
17 02 03	Plastic	4.0	Pipe left-overs, gaskets, scraps of sealing foils. This waste consists of polymers with additives in the form of fillers, plasticizers, fixing agents and dyes	Selectively collected in containers in a separated place near the area of performed construction works	Handed to recipients holding relevant permits for R3 recovery
17 04 01	Copper, bronze, brass	3.0	Used or damaged elements of automatic control systems of control equipment made of copper, bronze or brass	Collection in containers for scrap metal. Transport by means of internal transport to the storage place.	Handed to recipients holding relevant permits for R4 recovery
17 04 02	Aluminum	2.0	Damaged, used aluminum elements of casings	Collection in containers for scrap metal. Transport by means of internal transport to the storage place.	Handed to recipients holding relevant permits for R4 recovery

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17 04 05	Iron and steel	100.0	Elements of steel structures and used elements and auxiliary hardware, such as nails, screws, drills and discs	Collected in bulk in a separated place near the area of performed construction works or in containers for scrap metal. Transport by means of internal transport to the storage place.	Handed to recipients holding relevant permits for R4 recovery
17 04 11	Cables other than those mentioned in 17 04 10	2.0	Waste cables from installed technical and power cables. These will include damaged insulated wires e.g. made of copper, single- or multi-core, encased in a common plastic sheath (PE, PVC).	Selectively collected in containers in a separated place near the area of performed construction works	Handed to recipients holding relevant permits for R4 recovery
17 05 04	Soil and stones other than those mentioned in 17 05 03	100.0	Earth from excavations, stones, other waste from earth works	Waste collected in bulk in an organized manner in a temporary storage place for overhaul waste.*	Road transport to recovery places. Use for land re-cultivation (R10) or storage at the neutral waste landfill (D1, D5).

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17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	2.0	Leftover mineral wool and styrofoam. Mineral wool consists of glass fibers impregnated with an organic binding agent (mixture of hide glue, latex and thermosetting resins) Styrofoam is a porous plastic made of polystyrene	Selectively collected in labeled containers in a separated place near the area of performed construction works	Handed to recipients holding relevant permits for D5 neutralization
17 08 02	Gypsum-based construction materials other than those mentioned in 17 08 01	5.0	Pieces of gypsum plasterboards used for finishing of rooms	Direct collection from the generation place	Handed to recipients holding relevant permits for D5 neutralization

(*) Relates to earth mass and humus (17 05 04) The earth masses and topsoil shall be used for leveling and landscaping of land in the final phase of construction, pursuant to Article 2, section 3 of Waste Act „the provisions of waste Act do not apply to uncontaminated soil and to other materials present in natural condition, extracted during civil works, provided that such material is used for civil works in natural condition on the site where it was extracted”, under such circumstances the material in question is not a waste.

The stripped topsoil shall be stored in regular heaps on the construction site of the new CHPP. The topsoil storage sites shall be selected by the Contractor in the manner protecting the topsoil against contamination, consolidation and running over by vehicles.

The topsoil shall not be stripped during heavy rains and immediately after them to avoid fouling with clay or other type of soil.

CONCLUSIONS

- Waste generated in the construction phase of the Investment Project is to be stored selectively in adequate containers/containers in designated areas on the construction site. Waste should be handed for recovery or neutralization to the companies holding relevant permits in terms of waste management.
- Solid communal waste is to be collected selectively and handed for utilization to specialized companies or transported to landfills.

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- *In case of use and storage of bulk materials on the Investment Project site, these should be stored in a manner preventing them from dusting, e.g. under tarpaulins.*
- *Soil from excavations is to be stored in a designated place – divided into fertile soil and other soil. Within the practical limits, soil ought to be used for landscaping and leveling of the Investment Project site.*
- *Dumps of soil from the foundation trenches should be sprayed with water in periods of prolonged drought or strong winds.*
- *Construction site is to be protected against any leaks of oil derivative substances from operating machines and construction equipment and vehicles, as well as against any substances being washed away from the materials used for construction.*
- *Site back-up facilities should be located on hardened areas protected against the ingress of harmful substances into the soil-water environment.*
- *The construction site should be equipped with technical and chemical measures for removing or neutralization of any accidental leaks of oil derivative substances.*
- *On the completion of construction works the Contractor is to clear the site back-up facilities and hand over the free-of-waste site to the Investor.*

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13.6. IMPACT ON THE GROUND SURFACE, INCLUDING MASS SOIL MOVEMENTS, CLIMATE AND LANDSCAPE

13.6.1. Impact on the ground surface, including mass soil movements

Construction phase

Due to the construction of the ITPFP, the current composition of land of its location will be altered. Owing to the significant differences between the existing and the designed land development, the leveling works shall be carried out before the proper construction works. The area on which the Plant is to be located is very diversified in terms of land elevation. In order to limit the volumes of earthworks the planned elevation of western part of the CHPP site will be 135.00 m asl, whereas in the rest of the site it will be 130.00m. Further east there will be located mechanical draft cooling towers and Peak-load Boiler House, waste unloading objects, Turbine Hall and Boiler House. The ground level for these facilities will be at 135m asl.

To the south-east from the Boiler House and the waste unloading facilities there will be located a slag storage shed, ash and sorbent stabilization hall, ash and sorbent storage silos, light fuel oil tank, repair workshop, facilities for water treatment and other facilities. The ground around these facilities will be at 130.0m asl.

After the completion of civil and erection works for the newly designed facilities, the final leveling works shall be performed consisting in earth-moving, top-soiling and grass seeding of individual portions of land altered in the course of the construction works, also trees and bushes will be planted. The planned Investment Project requires ca. 8 hectares of land, which is only a part of this property. Construction of ITPFP will necessitate excavation of trenches for the foundations of buildings, tanks and equipment. Areas for the collection of input materials and waste, parking area and tanks for oil will have the sub-bases adequately protected against any possibility of soil contamination.

Operation phase

During its operation, the planned Investment Project will not cause any impact on the ground surface. The technical solutions used for handling water and sewage, as well as applied waste management measures (tight trays protecting oil and chemicals tanks of adequate retention capacity, hardened and profiled sub-base, a drainage system with preliminary cleaning facilities, etc.) will effectively protect the soil-water environment against any ingress of contaminants. Construction of ITPFP will bring about an increase in the share of industrial and service areas in the neighboring localities, i.e. the share of built-up area to undeveloped areas and open areas of agricultural character.

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No landfill for direct storage of waste on the ground is planned on the site of ITPFP. Based on information from the Polish Geological Institute, it is possible to conclude that the site of ITPFP is not directly connected with areas of landslides or other mass soil movements. The site of ITPFP is outside of the areas of mining operations.

New duties in the revised Environmental Protection Law

The planned Investment Project will require an Integrated Permit (IP). In the case of plants requiring an IP, it is necessary to prepare an initial report on the state of contamination of soil, ground and underground water with substances posing a risk:

Pursuant to Article 208:

Application for an Integrated Permit which will be submitted before the planned Plant is put into operation, ought to include:

Point 4 "In cases where the operation of the Plant involves using, manufacturing or releasing of substances posing risk, and there is a possibility of contamination of soil, ground or underground water on the Plant's site – an initial report on the state of contamination of soil, ground and underground water with these substances.

A screening analysis for the need of such an initial report must be included in the application for the Integrated Permit before the Plant is put into operation.

Due to the above, initial reports are one of the means of preventing emissions into soil and underground waters and promote their maintenance and monitoring. In order to evaluate the impact of the planned Investment Project on the soil-water environment, it will be necessary during the liquidation phase to prepare a final report allowing for making quantitative comparisons of the results of measurements and tests with the results of measurements and tests included in the initial report.

Geotest consultancy based in Włocławek was ordered by Miejskie Przedsiębiorstwo Energetyki Ciepłej Sp. o o.o. in Olsztyn to prepare a documentation of soil sub-base survey with a geotechnical report, for determining the foundation conditions for the planned CHPP in Olsztyn, located at ul.Lubelska.

The analysis of this documentation has demonstrated that:

The concentrations of chemical pollutants in the soil are at trace levels (natural hydrogeochemical background) and are well below the permitted threshold values.

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13.6.2. Impact on climate and landscape

Construction phase

Climate, landscape

No impact of ITPFP construction on the existing climatic conditions is foreseen. However, short-term impact on landscape and aesthetic values will appear in connection with building works, i.e.:

- lighting of the construction site,
- removal of vegetation cover in places for the construction of ITPFP facilities,
- storage of machines and materials,
- structural elements,
- traffic of vehicles and machines.

New industrial facilities will be created within the planned Investment Project. Gradually, new volumes of Main Building (boiler and turbine), pick load back-up boiler house and stacks, as well as other new facilities will appear in the existing landscape. Landscape quality of the so-far undeveloped land may be deteriorated due to cutting down of vegetation in the area of construction activity. On completion of the construction works, the site will be planted with low vegetation and landscaped according to the architectural concept. However, it is to be remembered that the undertaking will be implemented on industrial areas, therefore the areas of low landscape value. All undertaken activities will comply with the resolution No. LIII/866/14 of the City Council of Olsztyn dated May 28, 2014 on enactment of the local development plan for the area located between the railway siding, ul. Lubelska and the boundary of the City of Olsztyn" named "Industrial District - Wschód 4".

Operation phase

Climate

Local climatic conditions may change due to CO₂ emissions into the air. Research made by the Łódź University has demonstrated that only the biggest facilities using fossil fuel combustion for energy generation purposes, as for example the Bełchatów Power Plant, may affect the local climatic conditions due to the emissions of heat, steam and pollutants into the air. Such emissions may cause short-term fluctuations of temperature in the range of 0.5°C. The consequence of temperature fluctuations may be an increase of annual precipitation in the range of 50 to 200mm. The scale of ITPFP is relatively too small to significantly affect the local climate.

Landscape

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Landscape values are identified with a visualization of the environment perceived by humans as aesthetic categories. Land designated for the construction of ITPFP is undulating and hilly, with several elevations. In the immediate vicinity there is a logistics center of "Michelin" company. The site allocated for the planned Investment Project has a typical anthropogenic-technical landscape. In connection with implementation of the Investment Project, the facilities which are to be constructed will be large-sized of significant surface. It can be stated that buildings and structures of ITPFP will present new architectural statements shaping the landscape. Because of their shapes, mutual location and used color schemes the individual facilities will not be aggressively imposed on the landscape, despite being distinct from the background. The site designated for the construction of ITPFP is of a trapezoid shape and has an area of ca. 8 hectares. Dominating in size will be buildings of boiler and turbine hall and stacks. Possible overshadowing is regulated by the Ordinance of Minister for Infrastructure of April 12, 2002, on technical conditions for buildings and their location (Journal of Laws No 75, item. 690) paragraph 13 and 60. The areas immediately adjacent to the site are industrial grounds. According to the local land development plan, the area between Lubelska street, railway siding and the city boundary of Olsztyn is an industrial land. The tallest objects within the planned Investment Project (main building, stack) will be located in such a relation to the residential areas that no overshadowing will take place. The new Plant will undoubtedly present a distinct element in the landscape, however its will be designed according to the principles of spatial order, including such shaping of spaces that will create a harmonious whole and cater for any requirements and conditions related to functionality, social and economic matters, environment, culture and aesthetics and composition. Observing such requirements will alleviate the impact of the planned Investment Project on the landscape.

In the aspect of the needs for cultural landscape shaping:

- architectural forms of the facilities will not exceed the dimensions required by process engineering and will have no unnecessary vertical elements;
- color scheme of facades will be designed in a manner avoiding aggressive impact on the landscape.

Annex 4 to this Report includes the visualization of the planned Investment Project, composed into the existing landscape panorama.

13.7. IMPACT ON HUMANS, PLANTS, ANIMALS AND NATURA 2000 AREAS

5.3.4. Impact on human health and safety

Construction phase

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Construction works on the ground provided for the construction of ITPFP will have no adverse impact on neighboring residents, including those in the immediate vicinity of the Plant. The impact of the construction works will be limited to the construction site area and the access roads, except for noise which will reach industrial areas. Workers employed for the construction period will observe OH&S regulations and carry out all construction works in accordance with building and environmental protection regulations.

Civil and erection works will be carried out with consideration of OH&S regulations, including:

- Ordinance of the Minister of Labor and Social Policy dated September 26, 1997 on general provisions on occupational health and safety (consolidated text, Journal of Laws No. 169, item 1650, as amended)
- Ordinance of the Minister of Economy of September 20, 2001 on occupational health and safety during operation of machines and other technical devices for earthworks, construction works and road works (Journal of Laws No. 118, item 1263).
- Ordinance of the Minister of Economy of October 30, 2002 on the minimum requirements for occupational health and safety, related to operation of machines by workers at work (Journal of Laws No. 191, item 1596, as amended)
- Ordinance of the Minister of Infrastructure of February 6, 2003 on health and safety at work during performance of construction works (Journal of Laws No. 47, item 401).
- Ordinance of the Minister of Infrastructure of June 23, 2003 on information concerning safety and health protection and health and safety plan (Journal of Laws No. 120, item 1126).

Operation phase

Impact of air pollution on human health is regulated by the following acts:

- Directive of the European Parliament and the Council 2008/50/EC of May 21, 2008, on air quality and the cleaner air for Europe
- Directive of the European Parliament and the Council 2004/107/EC of December 15, 2004, on arsenic, cadmium, nickel, mercury and polycyclic aromatic hydrocarbons in ambient air
- Ordinance of the Minister of the Environment of August 24, 2012 on the levels of certain airborne substances (Journal of Laws of September 18, 2012, item 1031),

Pollutants' concentrations in the air permitted in the aspect of protection of human health according to the Ordinance of Minister for Environment of August 24, 2012 on the levels of certain airborne substances, are included in the following Tables.

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Table 71. Limit values for some substances in the air, differentiated for the protection of human health, date by which the limit values should be met, numerical marking of these substances, averaging periods, permissible frequency of exceeding of these limits

Item	Name of substance (CAS number) ^{a)}	Averaging period	Limit values of substances in the air [µg/m ³]	Permitted frequency of exceedences of the limit value in a calendar year	Date by which limit values should be met
1.	benzene (71-43-2)	calendar year	5 ^{c)}	-	2010
2.	nitrogen dioxide (10102-44-0)	one hour	200 ^{c)}	18 x	2010
		calendar year	40 ^{c)}	-	2010
3.	sulfur dioxide (7446-09-5)	one hour	350 ^{c)}	24 x	2005
		24 hours	125 ^{c)}	3 x	2005
4.	lead ^f (7439-92-1)	calendar year	0,5 ^{c)}	-	2005
5.	suspended particulate matter PM2.5 ^{g)}	calendar year	25 ^{c)j)}	-	2015
			20 ^{c)k)}	-	2020
6.	suspended particulate matter PM10 ^{h)}	24 hours	50 ^{c)}	35 x	2005
		calendar year	40 ^{c)}	-	2005
7.	carbon monoxide (630-08-0)	eight hours	10,000 ^{c)l)}	-	2005

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Explanations:

- a) Numerical marking of substances according to Chemical Abstracts Service Registry Number.
b) In case of air protection programs mentioned in Article 91 of the Act of April 27, 2001 - Environmental Protection Law, the frequency of exceedences refers to the limit values including the margin of tolerance.
c) Limit value for the protection of human health.
d) Sum of nitrogen dioxide and nitrogen oxide converted to nitrogen dioxide.
f) Sum of metal and its compounds in suspended particulate matter PM10.
g) Particulate matter concentration with the aerodynamic diameter of the grains up to 2.5µm (PM2.5) measured with the gravimetric method with separation of fractions or with the equivalent methods.
h) Particulate matter concentration with the aerodynamic diameter of the grains up to 10µm (PM10) measured with the gravimetric method with separation of fractions or with the equivalent methods.
i) Maximum eight-hour average among moving averages calculated every hour from the eight hourly averages during a day. Each eight-hour average calculated in this way is assigned to a day on which it ends, the period starting from 0500 PM of the previous day and finishing at 0100 on a particular day is the first calculation period for each day; the period starting at 0400 PM and finishing at 0000 CET on this day is the last calculation period for each day.
j) Limit value for suspended particulate matter PM2.5 to be met until January 01, 2015 (phase 1).
k) Limit value for suspended particulate matter PM2.5 to be met until January 01, 2020 (phase 2).

Table 72. Target values for some substances in the air, differentiated for the protection of human health, date by which the limit values should be met, numerical marking of these substances, averaging periods, permissible frequency of exceeding of these limits

Item	Name of substance (CAS number) ^{a)}	Averaging period	Target value of substances in the air	Permitted frequency of exceedences of the limit value in a calendar year	Date by which limit values should be met
1.	arsenic (7440-38-2)	calendar year	6 ^{c)} ng/m ³	-	2013
2.	benzo(a)pyrene (50-32-8)	calendar year	1 ^{c)} ng/m ³	-	2013
3.	cadmium (7440-43-9)	calendar year	5 ^{c)} ng/m ³	-	2013
4.	nickel ^{b)} (7440-02-0)	calendar year	20 ^{c)} ng/m ³	-	2013
5.	suspended particulate matter PM2.5 ⁱ⁾	calendar year	25 ^{c)} µg/m ³	-	2010

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Explanations:

- a) Numerical marking of substances according to Chemical Abstracts Service Registry Number.
- b) Total contents of this chemical element in suspended particulate matter PM₁₀; and for benzo(a)pyrene, the total contents of benzo(a)pyrene in suspended particulate matter PM₁₀.
- c) Target value for the protection of human health.
- e) Maximum eight-hour average among the moving averages calculated from the hourly averages during a day; each eight-hour average calculated in this way is assigned to a day on which it ends, the period starting at 05:00 pm of the previous day and finishing at 0100 on a particular day is the first calculation period for each day; the period starting at 04:00 pm and finishing at :00 CET on this day is the last calculation period for each day.
- f) The number of days on which the target value was exceeded in a calendar year averaged over next three years; in case measuring data over three years is missing, the measuring data from at least one year is taken to verify if the permissible frequency of exceedances was met.
- g) Expressed as AOT 40, which means the sum of differences between the hourly average concentration expressed in µg/m³ and the value 80 µg/m³, for each hour during a day between 8:00 am and 08:00 pm CET for which the concentration is greater than 80 µg/m³; if some values are missing in the measuring series, the calculated value AOT 40 needs to be multiplied by the quotient of the number of possible measuring dates to the number of measurements performed in this period.
- h) The value averaged for the next five years; in case measuring data over the period of five years is missing, the data from at least three years is taken to verify if the permitted frequency of exceedances was met.
- i) Particulate matter concentration with the aerodynamic diameter of the grains up to 2.5 µm (PM_{2.5}) measured with the gravimetric method with separation of fractions or with the equivalent methods.

The air pollutants (sulfur dioxide, nitrogen dioxide, particulate matter and heavy metals contained in it, aromatic hydrocarbons and benzo(a)pyrene and tar substances, dioxins and furans) may have a long-term impact on human organism. Humans are subjected to the impact of mixtures of these compounds capable of triggering remote results in the form of civilizational diseases.

And so, eg. nitrogen dioxide (oxidizing properties) may irritate respiratory tract causing changes in bronchi and alveoli. Toxic impact of nitrogen dioxide consists in limiting of oxygen supply to the organism; it reduces defensive capabilities of the organism against bacterial infections. NO₂ acts irritatingly on the eyes and the respiratory tract, causes allergies, a.o. asthma – especially in children living in cities subject to smog.

Sulfur dioxide most often attacks the respiratory tract and vocal chords. Inhaling SO₂ causes bronchial spasms. Long-term breathing of air with SO₂ content, even in low concentrations, causes damage to the respiratory tract leading to bronchitis; frequent cases of this disease were found during epidemiologic examinations of the inhabitants of cities with polluted air. Sulfur dioxide, after penetrating into the walls of the respiratory tract, enters into the bloodstream and further into whole organism, accumulating in the walls of trachea and bronchi, as well as in the liver, spleen, brain and the lymphatic glands. High concentrations of SO₂ in the air may lead to changes in cornea of the eye.

Whereas carbon monoxide, as the compound highly similar to the hemoglobin, reduces the availability of oxygen to individual organs, mainly to the heart muscle.

Furnace dust may affect human organism mechanically and chemically. Dust particles of diameter less than 3mm act mechanically, being retained in conjunctive tissue of the lungs, which may lead to inefficiency of the circulatory system. At the same time silicon compounds, being one of dust constituents, cause mainly fibrosis of the conjunctive tissue. Their content in ash is ca. 50%. Moreover, from the microelements present in ash, arsenic and in the lesser degree selenium, lead and titanium may accumulate in the organism. Higher accumulations of potassium, manganese, copper, vanadium, cadmium, sulfur,

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mercury and chromium were not found. Nuisance of furnace dust is connected mainly with the size of precipitation. According to the World Health Organization, harmful impact on human health comes mainly from particulate pollution in the air, whose source is often fuel combusted in engines and factories and traffic dust. The particulate contamination is expressed in various manner, a.o. as TSP (Total Suspended Particles) that is total suspended particulate matter containing fractions of all sizes), PM₁₀, PM_{2,5} or BS (black smog), (www.ekoprognosa.pl).

The fundamental role in generation of dioxins plays the concentration of free radicals of chlorine in the combustion zone and in the flue gas cooling zone. Depending on the form of chlorine (free chlorine, hydrogen chloride, chlorine in slag, chlorine bound in fly ash) its impact on generation of dioxins is different. Research results (*Liu* 2000) show that the share of free chlorine, which may take part in PCDD/PCDF synthesis is small, very much temperature-dependent. Although the concentrations of polychlorinate dibenzo(p)dioxins and polychlorinate dibenzofuranes in flue gas from waste incineration plants are commonly insignificant (0.01 – 100 ng TEQ/m³); nevertheless, their emission is subject of particular scrutiny and the allowable concentration of the sum of 17 most toxic congeners in flue gas was established in all EU Member States at 0.1 ng TEQ/m³ of dry flue gas in reference conditions (temperature 273K, pressure 1013hPa, oxygen concentration 11%). After approximately 30 years of research it is now known that dioxins do not present acute toxicity to human organism (*Fátima-Reis* 2007a, 2007b, *Ferre-Huguet* 2006), nor are cancerogenic for humans (*Cole* 2003); nevertheless they belong to the group of the so-called *endocrine disrupters* and are not neutral to human organism (*EPA* 2000).

However, it is very difficult to evaluate the impact of specific pollutants, and even more so of individual chemical compounds on the development of various diseases (eg. infectious disease of respiratory tract, circulatory system diseases, allergic diseases), because the results of research are highly ambiguous. The impact of pollutants depends though on many factors, such as age, individual resistance of the organism, climatic conditions, concentration and period of impact on the human organism.

In the context of analyses carried out in this Report, it is forecast that ITPFP, due to limiting the emissions of gaseous and particulate pollutants within the allowable limit concentrations and amounts, will not contribute to the deterioration of health of inhabitants in the area of potential impact of the Plant. The planned Investment Project will be equipped with a system of solutions and protections guaranteeing maintaining of current standards for emissions of pollutants into the environment, so the environmental quality standards will be observed. Concentrations of individual pollutants in the air, permitted in the aspect of protection of the human health will not be exceeded throughout the operation of the Plant (Tables 68-71 of this Report).

The assumption of the planned Investment Project **not contributing to any deterioration of health of residents in the area of potential impact of the Plant** is based not only on not exceeding the concentrations permitted in the aspect of protection of human health demonstrated by calculations

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of spreading of pollutants in the air, but also on the analysis of the current state of pollution of the air in this area.

Current conditions of air pollution (2014) in the site of ITPFP were defined by the Voivodeship Inspectorate of Environmental Protection (WIOŚ) in Olsztyn (see Chapter 11.5.1 of this Report). The measurements of the air quality maintained by the Voivodeship Inspectorate of Environmental Protection and Voivodeship Sanitary-Epidemiologic Station in Olsztyn show exceedence of permitted concentrations of benzo(a)pyrene. One of the causes of this state is an increased emission of pollution from the communal sources in the unfavorable climatic conditions in wintertime and combustion of low-grade heating material in less efficient stoves in households ("Assessment of air in Warmińsko-Mazurskie Voivodeship in 2013).

Zoning classification according to pollution measured by the Voivodeship Inspectorate of Environmental Protection is the following:

- sulfur dioxide – class A
- nitrogen dioxide – class A
- particulate matter PM10 – class A
- lead –.....class A
- nickel –.....class A
- cadmium.....–.....class A
- arsenic.....–.....class A
- **benzo(a)pyrene.....class C**
- benzene...–.....class A
- carbon monoxide –.....class A
- particulate matter PM2.5 –.....class A

Warmińsko-Mazurskie Voivodeship is twelfth in Poland in terms of population (3.8% of country's citizens). According to the most recent National Census in 2002 (published in 2003), the number of inhabitants in the Voivodeship is ca. 1.5m. Approximately 60% live in towns and the remaining 40% in rural areas. Analysis of the structure of population shows that 26% of inhabitants are children and youth under 19 years of age, men and women aged 20-59 present 56% of total, and the smallest group of 15% are people above 60 years, 51% of inhabitants are women, 60% live in towns and 40% in villages, women are in majority in towns and men in rural locations.

Average life expectancy is one of the indicators of health of the population. Men in Warmińsko-Mazurskie Voivodeship live 68.17 years on average (Poland's average 68.87) which puts the region in 14th place in the country. Average life expectancy for women is 77.6 years (Poland's average 77.34) which puts the region in the middle place in the country. Extended life expectancy translates into the

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growth of share of population in the post-productive age. Such a systematic increase is being observed in the Warmińsko-Mazurskie Voivodeship. Life length is one of the fundamental and most frequently used simple synthetic measures for a general assessment of health of the population and social-economic development. However, its limitations are well visible due to the fact that it doesn't reflect the health of people. Because of this fact compound indicator is used more and more often, which is Healthy Life Years – HLY or Disability Free Life Expectancy- DFLE (entire life being divided into years in health and in its absence). The absence of health usually mean some limitation of capacity, chronic diseases and poor self-evaluation of the state of health.

According to the definition provided by WHO, health is a state of full well-being of physical, mental and social nature and not only the absence of illness or ailment. Many factors influence the human health. These include social-economic conditions, state of the external environment (work environment, contamination of dwellings, contamination of waters, food and soil) and individual predispositions. Consequently, complexity of these provisions makes it difficult to evaluate impacts on health.

Threats to human health and well-being arising in physical environment or transmitted by it are connected on the one hand with the rapid growth of industry and progressing of urbanization, and on the other hand with the improper past ecological policies and lack of care for the protection of the environment. There was little awareness of full consequences of environmental pollution for health or they were inadequately recognized. As a result, the environmental condition deteriorated considerably and only in recent years has environmental pollution been decreased and reduced threat to human health. Environmental characteristics of the Warmińsko-Mazurskie Voivodeship for the occurrence of physical factors influencing the state of health of its inhabitants includes mainly air pollution, potable water provision and communal infrastructure.

According to the most recent studies concerning the health risk factors linked with the lifestyles in Poland, these may also be related to the inhabitants of the Warmińsko-Mazurskie Voivodeship. Steady growth of the so-called civilizational diseases, increasingly designated as chronic diseases, which are affecting developed countries, brings about the increased interest in the risk factors of such diseases. In particular this applies to these risk factors that may be effectively prevented by health-promoting activities, so the factors related to the lifestyles. Links between individual risk factors and their health consequences are often very complex and difficult to assess. Nevertheless, there is a number of risk factors whose significance is unquestioned and the applied methods of measurement allow for comparing the situation in Poland with other EU member states. **These include a.o. smoking of cigarettes, improper diet, excessive consumption of alcohol, obesity or inadequate physical activity, as well as the use of drugs and other awareness-altering substances. According to WHO estimates, in 2002 these very factors were responsible for ca. 55% of deaths in Poland and for**

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almost 40% of loss of healthy life years. The air pollution was not included amongst these risk factors.

The following Table provides results of calculations of spreading of these pollutants, for which the allowed levels in the air were defined for the sake of the human health protection.

Table 73. Design values of pollutant concentrations in the air exhausted from the new CHPP

Type of emitted pollutant	Parameter	Unit	Concentrations of the examined pollutants at the ground level
Sulfur dioxide	99.7 percentile	$\mu\text{g}/\text{m}^3$	18.8 (342 during combustion of light fuel oil in the peak load back-up boiler house)
Nitrogen dioxide	99.8 percentile	$\mu\text{g}/\text{m}^3$	approx. 83 (approx. 182 during combustion of light fuel oil in the peak load back-up boiler house)
	average annual concentration	$\mu\text{g}/\text{m}^3$	2.97 (5.38 during combustion of light fuel oil in the peak load back-up boiler house)
PM10 particulate matter	average annual concentration	$\mu\text{g}/\text{m}^3$	0.167 (0.375 during combustion of light fuel oil in the peak load back-up boiler house)
PM2.5 particulate matter	average annual concentration	$\mu\text{g}/\text{m}^3$	0.167 (0.399 during combustion of light fuel oil in the peak load back-up boiler house)
antimony, arsenic, lead, chromium, cobalt, copper, vanadium, manganese and nickel	average annual concentration	$\mu\text{g}/\text{m}^3$	0.0002

The current average annual concentration of nitrogen dioxide in the air is $13 \mu\text{g}/\text{m}^3$. The expected average annual concentration of nitrogen dioxide, generated by ITPFP (in the most unfavorable case of burning the light fuel oil in the peak load back-up boiler house) will be $5.38 \mu\text{g}/\text{m}^3$, which constitutes 18%

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of the admissible concentration specified by the World Health Organization (WHO). The expected annual average concentration of nitrogen dioxide, generated by ITPFP (in the case of gas combustion in the peak load back-up boiler house), will be $2.97 \mu\text{g}/\text{m}^3$, which constitutes 10% of the admissible concentration specified by the World Health Organization (WHO). Therefore, we can state that ITPFP **will not contribute to deterioration of health of the people inhabiting the area of potential influence of the plant. The risk of increased incidence due to the air pollution with nitrogen dioxide will be low.**

The current average annual concentration of sulfur dioxide in the air is $3.5 \mu\text{g}/\text{m}^3$. The expected average annual concentration of sulfur dioxide, generated by ITPFP, will be $9.33 \mu\text{g}/\text{m}^3$ (in the most unfavorable case of the combustion of light fuel oil in the peak load back-up boiler house), which constitutes approx. 47% of admissible concentration. The expected average annual concentration of sulfur dioxide, generated by ITPFP and during gas combustion in the peak load back-up boiler house, will be $0.72 \mu\text{g}/\text{m}^3$. The aggregate concentration of SO_2 , including the existing background, will not exceed $10 \mu\text{g}/\text{m}^3$. The expected percentile of 99.7 concerning sulfur dioxide concentration, may be $18.8 \mu\text{g}/\text{m}^3$ in the case of natural gas combustion in the peak load back-up boiler house, which constitutes 5.4% of the admissible value related to the protection of human health. Therefore, we can state that ITPFP **will not contribute to deterioration of health of the people inhabiting the area of potential influence of the plant. The risk of increased incidence due to the air pollution with sulfur dioxide will be low.**

Particulate matter (PM) constitutes one of the pathogens. They settle on the walls of lung alveoli and impede the gas exchange process, cause epidermis and skin irritation, infection of upper respiratory tracts, allergy, asthma, as well as lung, throat and larynx cancer. There is no concentration threshold below which the negative effects of dusts on the human health do not exist. Such negative effects of dusts may particularly influence the elderly people, children and persons suffering from respiratory and blood circulation system diseases. The dusts may derive from natural or anthropogenic sources. The natural sources include sea aerosols, dusts coming from deserts, volcanic eruptions and dusts derived from biogenic processes. The anthropogenic sources include industrial and agricultural processes, fuel combustion and abrasion of road pavements and vehicle tires. Due to the aerodynamic diameter and particle size, we distinguish between:

- **TSP** – Total Suspended Particulates,
- **PM10** – inhalable dusts with a grain aerodynamic diameter of $10 \mu\text{m}$, which may reach the upper respiratory tracts and lungs,
- **PM2.5** – respirable dusts with a grain aerodynamic diameter of less than $2.5 \mu\text{m}$, which penetrate deep into lungs, reach the lung alveoli and blood circulation system,

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Due to the adverse effect of the MP2.5 particulate matter on human health, this pollutant (apart from the admissible and target level) also has a determined exposure concentration obligation, which refers to the urban backgrounds in cities with over 100,000 inhabitants and agglomerations.

Ordinance of the Minister of Environment dated August 24, 2012, on the levels of certain airborne substances, implements the Directive 2008/50/EC of the European Parliament and of the Council of May 21, 2008 on ambient air quality and cleaner air for Europe (OJ L 152, 11.6.2008, p. 1) to the Polish law and determines, *inter alia*, the maximum admissible levels of the particulate matter PM2.5 related to the protection of human health. Until January 1, 2020, this level for a single calendar year should be 20 µg/m³.

The current average annual concentration of particulate matter PM2.5 in the air, in the area of potential influence of ITPFP, is 20 µg/m³. The expected average annual concentration of particulate matter PM2.5 generated by the plant and during gas combustion in the peak load back-up boiler house, will be 0.162 µg/m³. The aggregate concentration of PM2.5 particulate matter µg/m³, including the existing background, may be 20.162 µg/m³, and the share of ITPFP in the air pollution with particulate matter PM2.5 will be 0.8%. Therefore, we can state that ITPFP will not contribute **to deterioration of health of the people inhabiting the area of potential influence of the plant. The risk of increased incidence due to the air pollution with PM2.5 will be low.**

The current average annual concentration of particulate matter PM10 in the air is 26 µg/m³. The expected average annual concentration of particulate matter PM10 generated by ITPFP and during gas combustion in the peak load back-up boiler house, will be 0.167 µg/m³, which constitutes 0.4% of the reference value. The aggregate concentration of particulate matter PM10 µg/m³, including the existing background, may be 26.167 µg/m³, and the share of ITPFP in the air pollution with particulate matter PM10 will be 0.83%. Therefore, we can state that ITPFP **will not contribute to deterioration of health of the people inhabiting the area of potential influence of the plant. The risk of increased incidence due to the air pollution with particulate matter PM10 will be low.**

Currently, heavy metals (mercury, cadmium, arsenic, lead, chromium, nickel, etc.) existing in the dust do not pose any hazard to the health of the inhabitants of Warmińsko-Mazurskie Voivodeship. Concentration of lead, nickel, cadmium and arsenic in the air remain at a level which allows to include Warmińsko-Mazurskie Voivodeship in class A – the substance concentrations in the zone do not exceed the admissible or the target levels, respectively. The expected average annual concentration of total heavy metals (antimony, arsenic, lead, chromium, nickel, cobalt, copper, manganese, vanadium), generated by ITPFP, will be 0.0002 µg/m³, which constitutes 3% of the admissible concentration of arsenic, determined by the World Health Organization (WHO). The expected average annual

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concentration of cadmium, generated by ITPFP, will be 0.0001 µg/m³, which constitutes 2% of the admissible concentration of cadmium, determined by the World Health Organization (WHO).

Polychlorinated dibenzenodioxins and polychlorinated dibenzenofurans (PCDD+PCDF (dioxins + furans)) are chloro-organic compounds. The substances are mostly produced during combustion of chlorine-rich fuels (e.g. wood, hazardous waste). Certain small amounts are also observed during combustion of fossil fuels, in particular hard and brown coal in small boiler units. The generation of dioxins and furans greatly depends on the cooling conditions existing in the combustion process and on the flue gas itself. According to the review titled "Dioxins and Furans in the Environment and their Effect on the Body" (Zdzisław Brzeski, 2011), the main sources of the contamination of water by dioxins and furans are: paper mills, wood and paper processing facilities as well as pulp mills.

Sources of dioxins in the environment:

- waste incineration plants: gases, fly ashes
- cars: unleaded gasoline – addition of scavengers
- metal industry: recovery of metals, remelting of scrap and raw materials
- paper and pulp industry: chlorine bleaching, sulfate cellulose
- chemical industry: all the organic processes using chlorine
- accidents, failures, catastrophes in the chemical industry, fires, volcanic eruptions, explosions

With the use of active carbon injection, the emission of dioxins and furans will remain at the level provided by the law. It should not contribute to deterioration of health of the people inhabiting the area of potential influence of the CHPP. In accordance with the Regulation (EC) 166/2006 of the European Parliament and of the Council of January 18, 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC, the threshold for the release of PCDD+PCDF (dioxins and furans as Teq) is 0.0001 kg/year. If the values of PCDD+PCDF emission by the new boiler, based on the indicators given in the table above, were proved by measurements, the plant operator would be bound to report on this pollutant on an annual basis, and thus to monitor the emission of this pollutant to the environment.

Benzo(a)pyrene is a product of incomplete, especially low-emission, combustion. Waste-to-energy process of municipal waste is carried out in the temperature 850 ÷ 1100°C and the emission of benzo(a)pyrene (BaP) from the plant emission sources is impossible. The substance is also not mentioned in any reference document or in the emission standards stipulated in relevant EU directives or Polish ordinances. BaP is an inseparable element of the so-called low emission related to the combustion of solid fuels in boilers and home furnaces. The emission of benzo(a)pyrene caused by the combustion of fuel from municipal waste in the new CHPP. The pollutant may appear when the peak load back-up boiler house will burn natural gas or light fuel oil. According to the Methodical Guide on

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PRTR for fuel combustion plants (*prepared at the request of the Chief Inspectorate for Environmental Protection (GIOŚ) – Contract dated October 26, 2007 No. DliO-20/2007*), PAH is the aggregate of polycyclic aromatic hydrocarbons: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene PAHs are emitted to the air with flue gas, as gases, and may be also present as a component of carbon black in furnace waste. Like most of organic substances, their presence in the combustion products is related to incomplete chemical combustion of fuel. For the purpose of reporting, we may use calculation methods for the PAH emission taking into account the data concerning business activity (the amount of fuel used, production capacity) and known emission values for a given pollutant to a specific element of the environment.

It is estimated that the concentrations of benzene in the air, generated by ITPFP, will be negligibly low. **The emission of this pollutant from ITPFP will not influence a change in zone classification in Warmińsko-Mazurskie Voivodeship.**

In the noise-protected areas, the environmental quality standards will not be exceeded due to ITPFP operation. The admissible noise levels will not be exceeded at any moment of operation. Evaluation of the impact of ITPFP on the acoustic environment and air quality is included in separate chapters of the Report.

ITPFP operation will be carried out in accordance with the provisions concerning occupational health and safety as well as with the general and position-related instructions applied in the plant. The new CHPP will implement a work safety management system. Therefore, the CHPP will meet all the requirements specified in the standards and provisions of law. The company will provide the employees with a safe and healthy working environment by performing, *inter alia*, the following tasks:

- regular analyses of the conditions and safety of work during opinion giving, retrofit planning or equipment overhauls,
- detailed controls over the employee work safety during commissioning of the overhauled equipment,
- implementation of OH&S improvement plans,
- reviews of the sanitary and hygienic conditions, participated by the employees, OH&S services, firefighting services, occupational medicine physician, and social labor inspectors,
- analyses of important issues concerning employee safety at the OH&S committee meetings.

The employees involved in the operation of the new CHPP will be subject to the aforementioned OH&S rules.

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5.3.5. Impact on plants, animals and protected areas

Construction phase

The civil and erection works to be carried out at the CHPP construction site will not have any impact on plants, fungi or animals existing in the environmentally protected areas (including the areas covered by Natura 2000). Such impact may emerge only within the construction site and (to a small extent) outside the plant premises, due to increased vehicle traffic and movements of machines on site.

During construction, the animals and plants may be impacted by:

- changes in the soil surface (removal of the existing crust vegetation, soil leveling, excavations),
- increased vehicle traffic related to the supply of construction materials,
- operation of special equipment during construction.

The noise generated by construction machines and the presence of people may frighten the animals. Due to local removal of soil cover and plants in the area intended for the new CHPP, the soil and overground fauna will also be removed by scaring away the animals and/or destroying their habitats (in particular the habitats of small mammals, amphibians and invertebrates). During construction of individual facilities, the vehicle traffic will be increased. In this case, the fauna may be affected by the increased level of noise, exhaust gas, vibration caused by approaching vehicles, and physical threat to animals moving across the roads, posed by vehicles. The planned Investment Project in the construction phase will have mainly environmental impact within the boundaries of the site. Small off-site environmental impact should be expected because of increased road traffic and the movement of machines on the construction site. The construction of ITPFP will not have any impact on the protected nature. The nearest area covered by Natura 2000 is the Special Protection Area called Puszcza Napiwodzko-Ramucka PLB280007, located approx. 6 km from the site of the planned CHPP. As part of a separate administrative procedure, the Investor will obtain a permit for tree clearing at the planned project site. A field survey has been conducted for the planned Investment Project.

Operation phase

Impact on environmentally sensitive areas, including NATURA 2000 Areas

The site intended for ITPFP is situated outside the areas listed as Special Protection Areas covered by NATURA 2000 and Special Areas of Conservation covered by NATURA 2000. The location and characteristics of the protected areas being closest to the site of the planned Investment Project are presented in chapter 11.4.3.

The evaluation concerned the NATURA 2000 area designated as PLB280007 Puszcza Napiwodzko-Ramucka – bird refuge of European importance. Due to its location, approx. 6 km from

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ITPFP, and possible impact on the elements protected within the area PLB280007 Puszcza Napiwodzko-Ramucka, it is discussed in more detail.

For the NATURA 2000 areas, there are no admissible levels of substances in the air or reference levels of substances in the air. The admissible concentrations of air pollutants, related to the protection of plants (Ordinance of the Minister of Environment dated August 24, 2012 on the levels of certain airborne substances, Journal of Laws No. 47, item 1031), are as follows:

- sulfur dioxide: calendar year – 20 $\mu\text{g}/\text{m}^3$,
- nitrogen dioxide: calendar year – 30 $\mu\text{g}/\text{m}^3$.

The existing background of the aforementioned pollutants is:

- sulfur dioxide: calendar year – 3.5 $\mu\text{g}/\text{m}^3$,
- nitrogen dioxide: calendar year – 13 $\mu\text{g}/\text{m}^3$,

As results from the calculations concerning the propagation of pollutants in the air, the values will be fulfilled for the entire period of ITPFP operation, both for the combustion of gas in the peak load back-up boiler house and the combustion of light fuel oil. The table below includes the results of the calculations concerning the annual average concentrations of sulfur dioxide and nitrogen oxides, converted to NO_2 , on the boundary of the NATURA 2000 area PLB280007 Puszcza Napiwodzko-Ramucka.

Table 74. Impact of pollutant emission on protected areas, combustion of natural gas in the peak load back-up boiler house.

Protected area	Pollutant name	Parameter	Unit	Concentration
Special Protection Area (Birds Directive) – Puszcza Napiwodzko-Ramucka PLB280007	sulfur dioxide	average annual concentration	$\mu\text{g}/\text{m}^3$	0.031 (20)
	nitrogen dioxide	average annual concentration		0.125 (30)

(...) admissible values

The average annual concentrations of the examined pollutants on the boundary of NATURA 2000 area will be very low, for the entire period of ITPFP operation, regardless of the type of fuel combusted in the peak load back-up boiler house. The average annual concentrations of sulfur dioxide in the air on the boundary of NATURA 2000 area may be equal to 0.031 $\mu\text{g}/\text{m}^3$, which constitutes 0.155% of the admissible value related to the protection of plants. The average annual concentrations of nitrogen dioxide in the air on the boundary of NATURA 2000 area may be equal to 0.125 $\mu\text{g}/\text{m}^3$, which constitutes 0.42% of the maximum admissible value related to the protection of plants.

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In the case of combustion of light fuel oil in the peak load back-up boiler house, the concentrations of the aforesaid pollutants on the boundary of NATURA 2000 area will be as follows:

Table 75. Impact of pollutant emission on protected areas, combustion of light fuel oil in the peak load back-up boiler house.

Protected area	Pollutant name	Parameter	Unit	Concentration
Special Protection Area (Birds Directive) – Puszcza Napiwodzko-Ramucka PLB280007	sulfur dioxide	average annual concentration	$\mu\text{g}/\text{m}^3$	0.183 (20)
	nitrogen dioxide	average annual concentration		0.172 (30)

(...) admissible values

The average annual concentrations of the examined pollutants on the boundary of NATURA 2000 area, even with the combustion of light fuel oil in the peak load back-up boiler house, will be very low. The average annual concentrations of sulfur dioxide in the air on the boundary of NATURA 2000 area may be, in such a case, equal to $0.183 \mu\text{g}/\text{m}^3$, which constitutes 0.92% of the admissible value related to the protection of plants. The average annual concentrations of nitrogen dioxide in the air on the boundary of NATURA 2000 area may be equal to $0.172 \mu\text{g}/\text{m}^3$, which constitutes 0.57% of the admissible value related to the protection of plants.

Analyzing the results of the calculations, we may ascertain that due to the implemented technology and solutions protecting the environment, the planned Investment Project will not have any negative effect on the protected areas, in particular the NATURA 2000 areas, as regards the emission of gaseous and particulate pollutants to the air.

Special Protection Area covered by Natura 2000 (PLB280007) – Puszcza Napiwodzko-Ramucka

The area includes Puszcza Napiwodzko-Ramucka, being one of the largest forests at Pojezierze Mazurskie, and neighboring lands. The area embraces more than ten big lakes, the largest being: Łańskie (1042 ha), Pluszne (903 ha), Sasek Wielki (869 ha), Košno (552 ha) and Omulew (509 ha). Additionally, it contains several dozen medium lakes and many small lakes-ponds.

The prevailing forest compositions in Puszcza Napiwodzko-Ramucka are pine and pine-spruce woods. The area boundaries embrace 11 nature reserves: "Bagno Nadrowskie", "Dęby Napiwodzkie", "Galwica", "Jezioro Košno", "Jezioro Orłowo Małe", "Koniuszanka I", "Koniuszanka II", "Las Warmiński", "Małga", "Sołtysek" and "Źródła rzeki Łyny im. prof. Romana Kobendzy", as well as the ecological ground called "Obiekt Stawowy Tylkowo".

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Elements subject to protection

According to the SDF, the key protected elements in the Natura 2000 area PLB280007 Puszcza Napiwodzko-Ramucka are the following:

- A229 Kingfisher (*Alcedo atthis*), population importance: C
- A089 Lesser spotted eagle (*Aquila pomarina*), population importance: C
- A215 Eurasian eagle-owl (*Bubo bubo*), population importance: C
- A224 European nightjar (*Caprimulgus europaeus*), population importance: C
- A031 White stork (*Ciconia ciconia*), population importance: C
- A030 Black stork (*Ciconia nigra*), population importance: C
- A207 Stock dove (*Columba oenas*), population importance: C
- A231 European roller (*Coracias garrulus*), population importance: B
- A122 Corncrake (*Crex crex*), population importance: C
- A038 Whooper swan (*Cygnus Cygnus*) population importance: C
- A238 Middle-spotted woodpecker (*Dendrocopos medius*), population importance: C
- A321 Collared flycatcher (*Ficedula albicollis*), population importance: C
- A127 Common crane (*Grus grus*), population importance: C
- A075 White-tailed eagle (*Haliaeetus albicilla*), population importance: B
- A073 Black kite (*Milvus migrans*), population importance: B
- A074 Red kite (*Milvus milvus*), population importance: C
- A094 Osprey (*Pandion haliaetus*), population importance: A
- A120 Little crane (*Porzana parva*), population importance: C
- A193 Common tern (*Sterna hirundo*), population importance: C
- A409 Black grouse (*Tetrao tetrix tetrix*), population importance: B

Other species mentioned in Annex I to the Council Directive 79/409/EEC, which are not protected in the area (whose population importance is classified as D).

- A294 Aquatic warbler (*Acrocephalus paludicola*), population importance: D
- A223 Boreal owl (*Aegolius funereus*), population importance: D
- A255 Tawny pipit (*Anthus campestris*), population importance: D
- A021 Bittern (*Botaurus stellaris*), population importance: D
- A081 Western marsh harrier (*Circus aeruginosus*), population importance: D
- A307 Barred warbler (*Sylvia nisoria*), population importance: D
- A239 White-backed woodpecker (*Dendrocopos leucotos*), population importance: D
- A236 Black woodpecker (*Dryocopus martius*), population importance: D

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A379 Ortolan (*Emberiza hortulana*), population importance: D

A320 Red-breasted flycatcher (*Ficedula parva*), population importance: D

A022 Little bittern (*Ixobrychus minutus*), population importance: D

A338 Red-backed shrike (*Lanius collurio*), population importance: D

A246 Woodlark (*Lullula arborea*), population importance: D

A072 European honey buzzard (*Pernis apivorus*), population importance: D

A119 Spotted crane (*Porzana porzana*), population importance: D

A082 Dovehawk (*Circus cyaneus*), population importance: D

A084 Hhen harrier (*Circus pygargus*), population importance: D

The most serious threats to the avifauna and its habitats in the area include: development of open areas and lake shores, increasing number of tourists, abandonment of the traditional agriculture of non-forest areas, afforestation or natural overgrowth of post-agricultural lands, clearing of old and hollow trees, contamination and eutrophication of surface waters.

Table 76. Determination of the importance of the impact on protected species in Natura 2000 area

Subject of protection	Loss of habitat/p opulation	Deterioration of population's habitat/living conditions	Fragmentation	Assessment of the impact importance	Need for environmental compensation / mitigation measures
Kingfisher	No impact	No impact	No impact	No impact	-
Lesser spotted eagle	No impact	No impact	No impact	No impact	-
Eurasian eagle-owl	No impact	No impact	No impact	No impact	-
European nightjar	No impact	No impact	No impact	No impact	-
White stork	No impact	No impact	No impact	No impact	-
Black stork	No impact	No impact	No impact	No impact	-
Stock dove	No impact	No impact	No impact	No impact	-
European roller	No impact	No impact	No impact	No impact	-
Corncrake	No impact	No impact	No impact	No impact	-
Whooper swan	No impact	No impact	No impact	No impact	-

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Middle-spotted woodpecker	No impact	No impact	No impact	No impact	-
Collared flycatcher	No impact	No impact	No impact	No impact	-
Common crane	No impact	No impact	No impact	No impact	-
White-tailed eagle	No impact	No impact	No impact	No impact	-
Black kite	No impact	No impact	No impact	No impact	-
Red kite	No impact	No impact	No impact	No impact	-
Osprey	No impact	No impact	No impact	No impact	-
Little crane	No impact	No impact	No impact	No impact	-

Table 77. Impact on the Natura area as a whole

	Form	Scale	Meaning	Need for environmental compensation / mitigation measures
Interference in key relations shaping the area structure				
Decrease of land	None	-	-	-
Fragmentation of land	None	-	-	-

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Interruption of integrity	None	-	-	-
Interference in key relations shaping the area function				
Disturbances and changes in the key elements of the area	None	-	-	-

Impact of water and wastewater management on the protected areas.

Industrial wastewater as well as rain and thaw water will be drained to the drainage system of PWiK in Olsztyn. Water demand will be fulfilled from the water supply system of PWiK in Olsztyn. Due to the use of the aforesaid solutions and a large distance to the NATURA 2000 areas, ITPFP will not generate any negative impact on the environmentally sensitive areas, including the NATURA 2000 areas, as regards water and wastewater management. ITPFP operation will not be a source of contamination or eutrophication of surface water.

The methods for protection of surface and underground water, presented in chapter 14.2, will allow to minimize possible impact on the groundwater environment. The applied solutions for wastewater management will not contribute to any damage to water environment, and thus will not impede the use of water to other users.

Impact of waste management on the protected areas

The waste management shall be carried out in accordance with the requirements of the Waste Act, in the manner protecting the groundwater environment. It is assumed that the furnace waste generated by ITPFP will be, in the first place, handed for recycling, and if this is technically or economically unfeasible, it will be handed for treatment in accordance with the principles of environmental protection. With the applied protection measures, and the location relative to the protected areas, the planned Investment Project will not have any negative impact on these areas as regards waste management, which also concerns the NATURA 2000 areas.

Impact of noise emission on the protected areas

The analysis conducted as part of the Report, of the impact of the planned Investment Project on the acoustic environment of the areas neighboring ITPFP, have revealed that such impact will be limited to the area to which the Investor holds the legal title. The planned Investment Project will not have any negative impact on the protected areas, including the NATURA 2000 areas. We do not expect any negative acoustic impact on the habitats or species of plants and animals.

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The areas located closest to the site of the planned ITPFP are the following:

- “Dolina Środkowej Łyny” Protected Landscape Area – approx. 3.5 km.
- “Mszary” reserve – approx. 5.3 km.

“Dolina Środkowej Łyny” Protected Landscape Area

It is a Protected Landscape Area of Dolina Środkowej Łyny. It includes Łyna and Wadąg rivers as well as the lands in the western part of the city – near Redykajny and Gutkowo.

Currently, the area is subject to the provisions of Ordinance No. 160 of the Voivode of Warmińsko-Mazurskie dated December 19, 2008 on Dolina Środkowej Łyny Protected Landscape Area (Journal of Laws No. 201 of December 31, 2008). The above-mentioned Ordinance of the Voivode includes, without limitation, the following prohibitions applicable to the protected landscape area:

- prohibition of the implementation of Investment Projects which may significantly impact the environment, within the meaning of Article 51 of the Act of April 27, 2001 - Environmental Protection Law (consolidated text, Journal of Laws of 2008, No. 25, item 150 as amended), with exceptions;
- prohibition of the removal or destruction of buffer, roadside and waterside strips (with exceptions);
- prohibition of the deployment of civil structures in the strip of 100 m from the shores of rivers, lakes and other water reservoirs (with exceptions);
- performing changes to hydrographic conditions in case they serve purposes other than environmental protection and sustained use of arable and forest areas, as well as fishing economy;
- liquidating natural water basins, old river beds and wetland areas;
- performing earth works permanently deforming the natural topography of the land, with the exception of works related to anti-flooding protection or land-sliding protection, or the maintenance, construction, reinstatement or overhaul of water facilities.

The planned Investment Project will not have any negative impact on the Protected Landscape Area.

“Mszary” nature reserve

A reserve with an area of 4.45 ha, located in Las Miejski [Municipal Forest] in Olsztyn. It embraces an undrained depression (former lake) filled with peat with an average thickness of 13 m. The peat bog surface (115 m asl) is situated more than ten meters above the water surface located near Jezioro Długie [Długie lake] (103.6 m asl). The main objective of the protection within the reserve is to preserve the peat bogs of plant compositions, *Vaccinio uliginosi*-Pinetum and Ledo-Sphagnetum

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magellanic, including the sites of numerous, rare and protected plant species. Moss carpet is composed, *inter alia*, of the following species: *Sphagnum warnstorfi*, *S. nemoreum*, *Bryum pseudotriquetrum*. The planned Investment Project will not have any impact on the Protected Landscape Area.

We do not expect any direct or indirect negative impact on the species of plants or animals protected in the aforementioned areas.

The table below presents the impact of the planned Investment Project on the animal species identified on the land intended for the construction of ITPFP.

Table 78. List of animal species, including legally protected species, existing on the land intended for the construction of the planned ITPFP.

English name	Latin name	Protection under EU regulations	Protection under national regulations	Expected Impact
		“Habitats Directive” (2)	Protection of animal species (1)	
Amphibians and reptiles				
Common frog	<i>Rana temporaria</i>	2c)	1b)	No negative impact
Moor frog	<i>Rana arvalis</i>	2b)	1a)	No negative impact
Water frogs	<i>Rana esculenta complex</i>	2c)	-	No negative impact
Invertebrates				
Bronze carabid	<i>Carabus nemoralis</i>	-	-	No negative impact
Carabus cancellatus	<i>Carabus cancellatus</i>	-	-	No negative impact
Burgundy snail	<i>Helix pomatia</i>	2c)	1b), 1c)	No negative impact
Buff-tailed bumblebee	<i>Bomnus terrestris</i>	-	1b)	No negative impact
Rd-tailed bumblebee	<i>Bombus lapidarius</i>	-	1b)	No negative impact
Birds				
Yellowhammer	<i>Emberiza citrinella</i>	-	1a)	No negative impact
Eurasian coot	<i>Fulica atra</i>	-	-	No negative impact
Mallard	<i>Anas platyrhynchos</i>	-	-	No negative impact
Great tit	<i>Parus major</i>	-	1a)	No negative impact
Willow warbler	<i>Phylloscopus trochilus</i>	-	1a)	No negative impact

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Gadwall	<i>Anas strepera</i>	-	1a)	No negative impact
Song thrush	<i>Turdus philomelos</i>	-	1a)	No negative impact
European magpie	<i>Pica pica</i>	-	1b)	No negative impact
Eurasian penduline tit	<i>Remiz pendulinus</i>	-	1a)	No negative impact

Legend:

1. The Ordinance of the Minister of Environment of October 16, 2014 on animal species protection (Journal of Laws of 2014.1348):

- a) Appendix 1 – Strictly protected animal species with indication of species requiring active protection,
- b) Appendix 2 – Partly protected animal species,
- c) Appendix 3 – Partly protected animal species which may be acquired, and the methods of their acquisition,
- d) Appendix 4 – Animal species requiring determination of protection zones, sites of reproduction and regular presence, and the size of protection zones,

2. DIRECTIVE 92/43/EEC of the COUNCIL of May 21, 1992 on the conservation on natural habitats and of wild fauna and flora,

- a) Annex II a – Animal species of Community interest whose conservation requires the designation of special areas of conservation
- b) Annex IV a – Animal species of Community interest in need of strict protection
- c) Annex V a – Animal species of Community interest whose taking in the wild and exploitation may be subject to management measures

In the area intended for the planned Investment Project constitutes, we have found common species being abundant in the territory of Poland. The measures to prevent and limit the impact of the planned Investment Project on the animal and plant species are presented in chapter 14.7.

On the background of the entire ecosystem, the implementation of the planned Investment Project will have a favorable impact on the animal and plant environment. The arrangement of waste management in an efficient system, whose important element will ITPFP, will allow for a safer and more effective waste management than e.g. their storage/composting. The planned Investment Project will have no significant impact on the plant and animal species within its impact zone during the overall operation period. Compliance with the legally required emission to the air and concentrations of airborne pollutants, the use of wastewater in technological processes, economic use of furnace waste, the effective use of raw materials and fuel, will allow to minimize the negative impact of the Investment Project on the environment.

13.8. IMPACT ON AGRICULTURE AND TOURISM**Impact on agriculture****Construction phase**

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During construction of individual parts of ITPFP, the impact on the agriculture could be present mostly within the area equipped with water supply and treated wastewater drainage pipelines, in their operating strips. Nevertheless, the pipeline route does not and will not cross any agricultural lands, in accordance with the Study on conditions and the Local Land Development Plan. Pipeline assembly will require interference in the soil environment and the removal of plants from the entire site of installation. The pipelines will be laid along the plot boundaries, in such a way to interfere in the soil to the minimum possible extent. Wastewater discharge and water intake will be performed by the PWiK in Olsztyn. The tie-in point to the discharge of industrial wastewater and gray and black water will be located within the Investor's plot. Discharge of industrial wastewater and gray and black water will be carried out in a non-agricultural area.

Operation phase

Due to the level of the estimated concentrations of airborne gaseous and particulate pollutants, we do not expect any significant impact of such pollutants on agricultural plants in the area of possible impact of the plant. The solutions described in chapter 14 of the Report will effectively restrain the emission of gaseous and particulate pollutants to the air.

Impact on tourism

The Forecast of Environmental Impact, attached to the amendment to the Study of Conditions and Directions of Spatial Development for the City of Olsztyn, reads: "The area covered by the study is not located in a place with significant tourist qualities".

The tourist potential of the region is not used in full, mainly due to a modest offer of tourist products (especially off the summer season), insufficient number of whole-year high-standard housing points, as well as the lack of coordinated advertising of the voivodeship. Factors and conditions for the development of Olsztyn

Due to the environmental conditions, Olsztyn should be treated as a city with a potential that may be used for the development of tourism, in particular for persons who prefer to rest in the bosom of nature, and at the same time close to an urban center. The increased use of environmental qualities would require improvement and extension of the tourist infrastructure (including: extension and construction of new walking and cycling paths, upgrading of bathing sites, increasing the number of parking spaces) and the improvement of the appearance of certain city districts. (Data acquired from the appendix to Resolution No. LVI/643/10 of the City Council of Olsztyn dated January 13, 2010 – Olsztyn Development Strategy for 2006-2020)

The planned Investment Project will not have any negative impact on the development of tourism in Olsztyn, due to the fact that:

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- the planned project will be deployed in industrial areas,
- the project will not influence the extension of tourist infrastructure.

13.9. IMPACT ON TANGIBLE PROPERTY

Construction phase

The impact of the project implementation on the environment will be local in nature. Therefore, we do not expect any influence on tangible property or a decrease in the value of real property in the area of possible impact of ITPFP.

Operation phase

No facilities being subject to preservation are identified in the area intended for the planned Investment Project. The analysis of the impact of the planned Investment Project on the environment, included in the Report, has revealed that ITPFP will not have any negative impact on the facilities covered by preservation, located in the area of possible impact of the plant, nor will it negatively impact the tangible property situated therein.

The impact of ITPFP on tangible property would only be possible through the emission of pollutants to the air. Air protection regulations do not specify any special requirements as to the protection of tangible property. Fulfillment of general air protection requirements allows to conclude that the impact of ITPFP on tangible property will be negligible and will not cause deterioration of its overall condition.

In accordance with the "Forecast of Environmental Impact, attached to the amendment to the Study of Conditions and Directions of Spatial Development for the City of Olsztyn, intended to allow the construction of the Combined Heat and Power Plant using renewable energy sources, located in the services and economic zone G3", the impact on tangible property is assessed in the following aspects:

- construction of utilities – the implementation will not significantly affect the tangible property,
- use of renewable energy (e.g. alternative fuel) – the implementation will not significantly affect the tangible property,
- emission of dusts and gases into the atmosphere – the implementation will not significantly affect the tangible property,
- water intake from underground sources for production purposes – the implementation will not significantly affect the tangible property,
- discharge of wastewater to municipal sewage system – the implementation will not significantly affect the tangible property,

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- noise generated by the plant – the implementation will not significantly affect the tangible property,
- storage of furnace waste – clear determination of the effects of impact on tangible property is impossible,
- emission or electromagnetic radiation – clear determination of the effects of impact on tangible property is impossible,
- vehicle transport of waste to/from the CHPP – clear determination of the effects of impact on tangible property is impossible.

Furthermore, the location of the planned Investment Project in industrial areas will not contribute to any decrease in the value of immovable property in the area of possible impact of ITPFP.

13.10. IMPACT ON MONUMENTS AND CULTURAL GOODS

Construction phase

No objects included in the preservation zones are located in the area of the planned Investment Project or in its immediate vicinity. Also, no collisions between the planned civil structures and identified archaeological monuments have been identified on the plot intended for the planned Investment Project. If any archaeological discoveries are revealed during the construction works, archaeological supervision will be required. The archaeological supervision will be limited to the observation of soil layers during foundation excavation. At this stage, photographic and (if necessary) drawing documentation will be prepared.

The Investment Project implementation phase will not affect the monuments or cultural landscape located in the area of possible impact. All actions to be taken will be compliant with Resolution No. LIII/866/14 of the City Council of Olsztyn dated May 28, 2014 on enactment of the Local land development plan of the area located between the railway siding, ul. Lubelska and the boundary of the city of Olsztyn named "Industrial Quarter - East 4".

Operation phase

Considering the nature of the planned Investment Project, the only potential impact on the monuments may be caused by atmospheric emissions. However, calculation of the propagation of gaseous and particulate pollutants in the air has revealed that, during ITPFP operation, the maximum concentrations of the examined pollutants will not cause any excess of the reference levels, and the maximum concentrations of the examined pollutants will be present approx. 500 m from the emission sources of the new plant. In accordance with Resolution No. LIII/866/14 of the City Council of Olsztyn dated May 28, 2014, the area of the plan does not include any goods of contemporary culture or

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monuments requiring preservation. The planned Investment Project will not contribute to any deterioration in the cultural values of the monuments present in the range of potential impact.

13.11. CROSS-BORDER IMPACT

Warmińsko-Mazurskie Voivodeship borders to the north with Russia (Kaliningrad Oblast). The border length is 208.3 km. The voivodeship is bordered at one point with Lithuania– it is a tripoint of Poland, Russia and Lithuania. The distance of Olsztyn from the border with Russia is approx. 88 km.

Construction phase

Due to the location of the new plant, the construction works to be carried out due to the Investment Project construction will not have a cross-border scope.

Operation phase

The planned investment projects may be subject to the environmental impact procedures resulting from Polish provisions and from the Convention on environmental impact assessment in a transboundary context (Espoo Convention), ratified by Poland. In case it is found that the cross-border impact may appear, the Polish requirements for the Environmental Impact Reports include the requirements stipulated in the aforesaid Convention. The Convention also specifies the criteria whose fulfillment should imply the launch of the assessment procedure in a transboundary context (Annex III to the Convention). Act of October 3, 2008 on providing access to information about the environment and its protection, participation of the public in the environment protection and assessment of the environmental impact (Journal of Laws No. 199, item 1227, as amended) stipulates that in the event of identifying any possibility of cross-border environmental impact derived from the Republic of Poland, the proceedings for cross-border environmental impact shall be conducted. This shall apply to planned investment projects. The decision on environmental constraints may not be issued prior to concluding the proceedings for cross-border environmental impact. Decision on initiating the proceedings for cross-border environmental impact shall be made by an authority competent to issue the decision on environmental constraints.

The procedure for the cross-border proceedings is specified in Article 104 ÷ 112 of the aforesaid Act.

Impact on air quality

The planned Investment Project will meet the requirements for maintaining the reference levels in the air, and will not be oppressive as to the emission of gaseous and particulate pollutants to the air. The maximum concentrations of the examined pollutants will be present 500 m from ITPFP emission sources. This will depend on, *inter alia*, the weather conditions. As the distance from the plant emission sources increases, the concentrations of the airborne pollutants will be decreasing, and at the state

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border with Russia (i.e. at a distance of approx. 88 km) they will be small, being several percent of the reference levels, and the share of the planned Investment Project in the air pollution will be insignificant and in no case should cause a change in the classification of the air quality zones.

Noise

Noise is a nuisance of a local character. Calculation of noise propagation in the environment has revealed that ITPFP operation will not cause any excess of environment quality standards outside the area to which the Investor holds the legal title.

In the plant operation phase, the impact of noise on the neighboring areas will be limited to several hundred meters, thus it will not form a nuisance of a cross-border nature.

Ground surface

Furnace waste generated during heat and electricity generation process in ITPFP will not be nuisances of a cross-border nature. The method of their management limits the impact range to the place of storage located in the area to which the Investor holds the legal title.

Surface water and groundwater

Water intake from the water supply network of the Water and Sewage Company (PWik) in Olsztyn will not have any cross-border impact on water resources. The planned Investment Project will not imply the use of groundwater. As regards the plant's environmental impact taken as a whole, the water and wastewater management will not have any cross-border impact.

Electromagnetic radiation

Electromagnetic radiation is a nuisance which is closely and permanently related to the place of generation - it is not subject to dislocation and propagation. Therefore the electromagnetic radiation generated by new Combined Heat and Power Plant facilities will not be a cross-border nuisance.

Impact in the case of serious industrial failure

The implemented protection system for individual works will allow to minimize the effects of possible failures and to limit its impact to the plant premises. In ITPFP, detailed instructions for the equipment and facilities will apply, and their strict observance will allow for trouble-free operation, and consequently will reduce the risk of failures posing hazard to the environment. The plant premises will be prepared in such a way to allow the rescue services to easily access the place of failure. Any possible serious industrial failure will not have the nature of cross-border impact.

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13.12. IMPACT OF ELECTROMAGNETIC FIELD

Construction phase

ITPFP construction phase will not involve operation of any devices which emit electromagnetic radiation with voltage limit values of min. 110 kV (Ordinance of the Minister of Environment dated October 30, 2003 on admissible levels of electromagnetic fields in the environment and the methods for verification of such levels, Journal of Laws No. 192.1883). A typical solution during the construction of such facility is the power supply from external sources (local power system) through a medium voltage network (15-20 kV). With such a supply voltage, the electromagnetic radiation emitted by the equipment operated during construction of the new combined heat and power plant is negligibly low.

Operation phase

The area intended for the Investment Project is an undeveloped area, except for the west part in the vicinity of the railway siding, where 110/MV overhead power lines are routed along the tracks. The Investment Project will generate an electromagnetic field with a transmission frequency of 50 Hz. The sources of electromagnetic field emission, to be operated in the CHPP, which may affect the environment condition, will be the devices of a minimum voltage of 110 kV, such as:

- 110 kV electric switching station,
- 110/6.3 kV unit transformer.

Radiation may also be emitted by the 110 kV overhead line for power output from the unit transformer to the switching station. However, at the present stage of designing the plant, we also consider the possibility to export the energy to the switching station through 110 kV cable lines, which will eliminate the impact of these sources on the environment as regards the electric and magnetic fields.

The overhead lines for power output from the 110 kV switching station are in accordance with § 3 section 1 point 7 of the Ordinance of the Council of Ministers of November 9, 2010 on projects that may significantly impact the environment (Journal of Laws No. 213, item 13970), and are autonomous systems implemented in a large area owned by many entities, requiring separate administrative proceedings concerning environmental impact assessment. The construction of the overhead lines for power output will be covered by a separate procedure. The 110 kV overhead lines constitute a project which may significantly affect the environment.

Electromagnetic field is a physical factor which exists only at the place of generation, is permanently linked thereto and is not subject to displacement or propagation. Therefore, the impact of electromagnetic equipment has a local nature and is limited to the nearest surroundings, i.e. it will not exceed the area to which the Investor holds the legal title.

After commissioning the plant, the Investor will conduct measurements and assessment of the electromagnetic field coming from the operated radiation sources, in order to test the employees'

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exposure to the existing magnetic and electromagnetic fields, which results from the occupational health and safety regulations.

Additionally, pursuant to Article 122a of the Environmental Protection Law of April 27, 2001 (Journal of Laws No. 62, item 627, as amended), entities managing the plants which emit electromagnetic field with a rated voltage of minimum 110 kV shall conduct measurements of electromagnetic field levels in the environment directly after beginning the use of the plant. After commissioning the plant, the Investor will conduct measurements of electromagnetic field levels in the environment in order to verify the compliance with the admissible levels of electromagnetic fields in the nearest protected areas.

Ordinance of the Minister of Environment of October 30, 2003 on admissible electromagnetic fields levels in the environment and examinations methods for maintaining these levels (Journal of Laws No. 192, item 1883), the admissible levels of electromagnetic fields, with a frequency of 50 Hz, characterized by the maximum admissible values of physical parameters, are as follows:

- for lands intended for residential buildings:
 - electric component of 1 kV/m
 - magnetic component of 60 A/m,
- for lands intended for permanent stay of people:
 - electric component of 10 kV/m
 - magnetic component of 60 A/m.

Considering the data contained in specialized literature and the results of the measurements carried out for similar equipment, we find that apart from the premises of ITPFP, being fenced and inaccessible for people, there will be no electric or magnetic fields with levels exceeding the admissible values.

13.13. ENVIRONMENTAL IMPACT DUE TO SERIOUS INDUSTRIAL FAILURE

Construction phase

During ITPFP construction, no serious industrial failures are expected. The project should be carried out in such a way to comply with any regulations applicable on site, in particular OH&S requirements, fire protection and environmental protection provisions. The works contractor will be responsible for safe work and proper operation of machinery, plants and all the construction and technical equipment to be used for the construction of individual facilities and systems of the new CHPP.

Operation phase

The Seveso II Directive (Council Directive 96/82/EC of December 9, 1996 on the control of serious-failure hazards involving dangerous substances, as amended) specifies the general guidelines

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for the prevention and management of hazards caused by serious failures involving dangerous substances. Pursuant to Article 1 of the Directive, with a view to ensuring high levels of protection throughout the Community in a consistent and effective manner, the Directive is aimed at the prevention of serious failures which involve dangerous substances, and the limitation of their consequences for man and the environment. The Directive is implemented in Poland by the relevant provisions included in the Environmental Protection Law of April 27, 2001 (Journal of Laws No. 25, item 150 – consolidated text as amended).

The Act defines the term of serious industrial failure. "Serious failure" is understood as an event, especially emission, fire or explosion, occurred during an industrial process, storage or transport, in which one or more hazardous substances are present, which leads to an immediate threat to human life and health or to environment or occurrence of such threat with delay. "Serious industrial failure" is understood as a serious failure at an establishment.

In case of failure, the following actions shall be taken to limit the effects:

- immediate rescue operation using portable equipment and established procedure for evacuation of people from endangered locations,
- in case of explosion – immediate isolation of flammable media,
- in case of fire – immediate protection of the neighboring facilities,
- in case of leak – immediate neutralization using the measures available for the establishment.

In the case of an industrial failures which may cause significant pollution of the environment, the State Fire Service and Voivodeship Inspectorate of Environmental Protection will be notified forthwith. The establishment will update the information mentioned above in accordance with the changing situation and will provide the aforesaid authorities with information on:

- circumstances of the failure,
- hazardous substances related to the failure, allowing assessment of the failure for people and environment,
- undertaken rescue actions as well as actions aiming at reducing the effects of the failure and preventing its reoccurrence.

To classify the plant, we have compared the basic hazardous substances to be stored in the CHPP.

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Table 79. List of chemicals existing in the plant with reference to the valid Ordinance of the Minister of Economy dated January 31, 2006 (Journal of Laws No. 30, item 208)

Item	Name of substance	Type of hazard or CAS	Quantity of hazardous substance (according to the Ordinance of the Minister of Economy dated January 31, 2006), which classifies the plant as an establishment of:	
			increased risk [Mg] Q_{Dx}	high risk [Mg] Q_{Zx}
1.	Hydrochloric acid (HCl)	Classification in accordance with the Council Directive 67/548/EEC R34, R37	not applicable	not applicable
2.	Sodium hydroxide (NaOH)	Classification in accordance with the Council Directive 67/548/EEC R35	not applicable	not applicable
Total hazardous substances classifying the hazard of the plant			not applicable	not applicable

Table 80. List of oils existing in the plant with reference to the valid Ordinance of the Minister of Economy dated January 31, 2006 (Journal of Laws No. 30, item 208)

Item	Name of substance	Type of hazard or CAS	Quantity of hazardous substance (according to the Ordinance of the Minister of Economy dated January 31, 2006), classifies the plant as an establishment of:	
			increased risk [Mg] Q_{Dx}	high risk [Mg] Q_{Zx}
1.	transformer oil	64742-53-6	not applicable	not applicable
2.	lubricating oil	not classified as hazardous to human	not applicable	not applicable

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3.	turbine oil	not classified as hazardous to human	not applicable	not applicable
5.	Light fuel oil	R40	min. 2500	min. 25,000
Total hazardous substances classifying the hazard of the plant			2,500	25,000

Ordinance of the Minister of Labor and Social Policy of February 12, 2003 on supplies of fuels in power industry companies (Journal of Laws of 2003, No. 39, item 338), in the case of fuel oils, the inventories are equal to the use of minimum twenty days, provided the fuel oil is delivered by rail or road to a place of storage which neighbors the energy generating location. The capacity of the fuel oil tank is 1200 m³, so the plant will store the amount of 1032 Mg, which does not classify the plant as establishment of the increased risk of industrial failure.

Table 81. List of other hazardous substances existing in the plant with reference to the valid Ordinance of the Minister of Economy dated January 31, 2006 (Journal of Laws No. 30, item 208).

Item	Name of substance	Type of hazard or CAS	Quantity of hazardous substance (according to the Ordinance of the Minister of Economy dated January 31, 2006), which classifies the plant as an establishment of:	
			increased risk [Mg] Q _{Dx}	high risk [Mg] Q _{Zx}
1.	Ammonia	R10, R23, R34, R50	100	200
2.	Acetylene	74-86-2	5	50
3.	Propane	R12	10	50
Total hazardous substances classifying the hazard of the plant			115	300

Pursuant to the Ordinance of the Minister of Economy of January 31, 2006 amending the Ordinance on types and quantities of hazardous substances whose presence at the plant decides on its inclusion to the plant with increased or high risk of the occurrence of serious industrial failure (Journal of Laws No 30, item 208), the planned Investment Project **will not classify as an establishment of large or increased risk to the environment and will not require the report on system safety.**

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To reduce the effects of industrial failures, the Investor will implement a procedure in case of an industrial failure, including the information concerning:

- the system of water supply, including water for firefighting purposes, along with the arrangement of hydrants,
- specification of the storage points for raw materials and the maximum quantities of the collected raw materials,
- the condition of access and internal roads,
- tasks and obligations of the persons involved in rescue activities,
- alarming in case of danger,
- procedure of rescue operations,
- failure elimination,
- supply of rescue equipment to the establishment.

13.14. END OF PLANT OPERATION

The decision on closing down and decommissioning of the planned Investment Project could be related to the lack of heat demand from external consumers. The Investor assumes a long-term operation of ITPFP – for at least thirty years. This Report refers to the legal status valid as of the date when the Report is issued, and no proposals regarding amendments to the European Union regulations for the decommissioning of industrial facilities are expected in a foreseeable time. Decommissioning of the facility requires demolition permit, with some exceptions. Such a permit may be issued after the Investor obtains the arrangements, permits or opinions of other authorities, required by special provisions. The procedure is similar to the building permit and requires notification sent to the local departments of the Environmental Protection Inspectorate, Sanitary Inspectorate, National Labor Inspectorate and State Fire Service. Prior to the demolition of the facilities, the following must be performed:

- survey of the equipment and facilities, including the possibility of the reuse of decommissioning thereof,
- environmental condition survey based on the results of water and soil analysis carried out in the plant,
- survey of the raw materials, semi-finished products, products, auxiliary materials and waste existing in the plant, including in particular the substances and waste classified as hazardous.

The application for demolition permit should contain:

- consent of the owner of the facility,
- general layout of the civil structure,

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- description of the scope and method of performing the demolition works,
- description of the manner of ensuring safety to people and property,
- permits, approvals or opinions of other authorities, required by special provisions,
- facility demolition design, if required.

The planned Investment Project will require a design for the disassembly of technical ground-based equipment, removal of buried networks and demolition of enclosed structures. In the case of direct threat to the safety of people or property, protection and demolition works should be undertaken without any appropriate permit, but they must be notified forthwith to a competent local administrative authority. The demolition permit is conditioned on the submission of an agreed demolition design, and the environmental impact assessment concerning the decommissioning may also be required. Additionally, a prior survey for the contamination of the site is recommended. At the stage of demolition works it is necessary to adhere to personnel and property safety requirements as well as to respect the environmental protection requirements, particularly in the scope of waste management. During dismantling of the technical equipment and civil structures a considerable amount of waste will be generated - mainly ceramic rubble, scrap metal, pieces of insulation, plastic and wood waste that has to be recycled, disposed or stored.

The process of disassembling the utilities requires special caution, due to the possibility of soil contamination during the removal of the following equipment:

- oil management system (storage tanks, delivery pipes),
- power output equipment (oil-filled transformers),
- hazardous waste management equipment (storage areas for old oils and other hazardous waste),
- water and wastewater management facilities (neutralization devices, chemical substances tanks, oil separators, industrial wastewater drainage system),

Prior to the disassembly, any equipment and supply networks should be emptied, with all deposits and waste chemical substance removed outside the plant area and subject to environmentally-safe disposal (chemical neutralization, thermal decomposition). The decommissioning process should be monitored and documented as the plant operator shall be liable for the effects of the area-wide pollution of the environment, which may be disclosed after decommissioning of the plant. The plant operator will be also responsible for the condition of the site after the plant is decommissioned, which imposes the obligation of land reinstatement through leveling, possible replacement of the upper soil layer, securing against erosion and planting of adequate vegetation.

In general, at the stage of plant decommissioning, the following procedure is recommended:

- minimize the amounts of earth extracted from excavations, reduce its movement and protect against pollution,

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- protect the land against contamination as a result of spillage, improper storage of hazardous materials and deposition of air,
- assess the environmental pollution in order to prepare the regeneration work schedule.

If the Investment Project owner decides to decommission individual production systems and equipment, the procedure will be consistent with appropriate regulations, including the ones concerning environmental protection. The environmental impact of the Investment Project decommissioning phase will be similar to the implementation phase. As mentioned above, the environmental impact at the plant decommissioning stage will relate to the demolition works carried out using construction equipment. In the immediate vicinity of the works, the noise level may be temporarily increased and diffuse emission of particulate pollutants may emerge. The works will also require increased vehicle traffic related to the removal of waste. The aforesaid works will only be carried out during the day.

Good organization of work and the use of equipment being in proper working order will minimize the environmental impact of the works. Adverse impact of this phase of the Investment Project shall be within the boundaries of the area to which the Investor has a legal title.

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13.1. MUTUAL IMPACT BETWEEN COMPONENTS OF THE ENVIRONMENT

As regards mutual impact between components of the environment, we must emphasize a significant favorable influence of ITPFP implementation in this respect:

- reduction of pollutants emission to the air from other sources, due to the limitation of heat and electricity production by hard coal combustion,
- indirect reduction of the impact on groundwater due to minimizing the amount of waste stored at waste landfills,
- reduction of the amount of biodegradable waste, in accordance with the relevant regulations,
- limitation of the storage of waste whose storage poses hazard to the environment, e.g. due to production of landfill gas (methane).

Analysis of the project's environmental impact, included herein, has revealed that ITPFP is not a plant that could influence any deterioration of the local environment. It is expected that ITPFP operation may contribute to restoration of the environmental condition in the area of possible impact of the plant. The emission balances, analyses of the impact on different environmental elements, the indicated methods of minimizing and reducing such emissions, as well as the fulfillment of all the requirements for the emission of substances and energy to the environment, presented herein, prove that ITPFP will be beneficial both to the environment and to proper municipal management in the city of Olsztyn. Due to ITPFP operation, no cumulation of unfavorable impacts of the new plant or the neighboring plants is expected.

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14.DESCRPTION OF THE ASSUMED ACTIVITIES AIMED AT PREVENTING, LIMITING OR PROVIDING ENVIRONMENTAL COMPENSATION FOR THE NEGATIVE ENVIRONMENTAL IMPACT

CONSTRUCTION PHASE

In order to limit the potential negative impact of the Investment Project construction phase on the environment, the following measures will be taken:

- **in the scope of air protection:**
 - exhaust gas emissions from construction equipment and trucks will be reduced to the minimum by switching the engines off during standstill or loading.
 - access roads will be maintained in a dust-limiting condition,
 - the loose materials shall be transported by vehicles equipped with tarpaulins,
 - if necessary, the construction site will be sprayed with water,
- **in the scope of groundwater environment:**
 - the construction site, its back-up facilities and haul roads will be arranged in a way to ensure economical use of the land and maximum reduction of its transformation,
 - material and equipment bases as well as waste storage sites will be located at hardened areas protected against penetration of harmful substances to the groundwater environment,
 - the use of efficient mechanical equipment to prevent the leaks of fuel or operating fluids,
 - the construction site shall be equipped with technical and chemical measures to remove or neutralize any accidental leaks of oil derivative substances,
 - in order to ensure proper management of grey and black water, amenity and sanitary facilities will be arranged for the workers, e.g. by the use of portable sanitary equipment which should be drained on a regular basis by a specialized company,
- **in the scope of waste management:**
 - any waste produced during construction works will be collected in a selective manner which in particular prevents from mixing hazardous and non-hazardous waste,
 - waste will be stored in a way that protects against environmental pollution, in separated locations, properly adapted to a particular type of waste, equipped with a hardened and tight subsoil,

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- after the works are completed, the construction site will be put in order, and all the waste produced in the construction process will be handed to specialized companies holding appropriate authorizations concerning waste management,

- **in the scope of noise protection:**

- the use of construction equipment being in proper working order,
- stopping the motors of machines and vehicles during standstill and loading,
- construction works performed using heavy building equipment, which cause noise emission, will be carried out only during the day, except certain occasional works that also require night-time activities
- the machinery and equipment base on the construction site will be located in such a place and distance from residential buildings to fulfill the requirements of noise emission standards on areas covered by the noise protection regulations,
- the machines and equipment used during the construction works should fulfill requirements regarding noise emissions specified in the Ordinance of the Minister of Economy dated December 21, 2005 *on essential requirements for equipment used outside buildings, concerning noise emissions into the environment* (Journal of Laws No. 263, item 2202, as amended) and related to machines and equipment operated outdoors,
- the prevention and reduction of the risk of noise emission during construction (groundworks and transport) will be realized in location being closest to the construction site and access roads to protected areas (residential buildings).

- **in the scope of fire protection:**

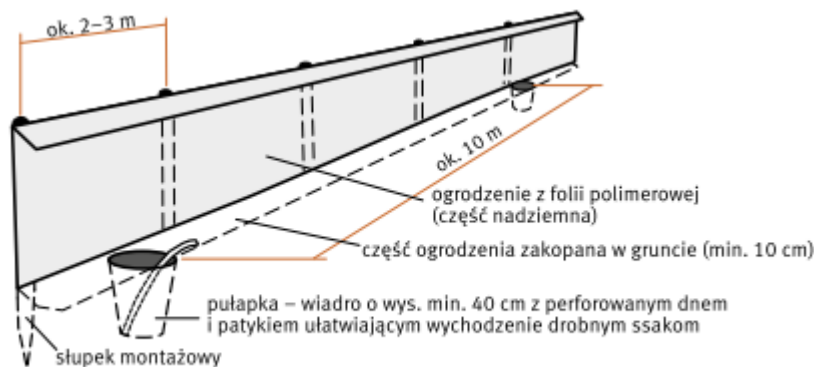
- within the planned Investment Project, the clearing of trees and bushes will be carried out beyond the bird nesting season, and checks for the existence of nests will be conducted each time prior to the clearing. Where it is necessary to carry out the clearing in the nesting period, an environment specialist will be employed, who will perform site inspection before the construction works, in order to exclude any destruction to the nests or full-grown specimens of legally protected species. If any nest is found, it will be protected until the young specimens fly away (approx. 3 weeks),
- in the case of excavations, works will be carried out with special caution to minimize the risk of damaging the rooting system of trees or bushes growing near the work site, which are not intended for clearing,
- during excavations, roots will be protected against freezing or desiccation by fabric mat covers made of straw or fibers,

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- the schedule and method of construction works will be designed in such a way that the works (as far as possible) do not generate animal traps.

Excavations for civil structure foundations will be protected and controlled by the use of separating fences and garden fabric. The fences will be sunk to the depth of approx. 10 cm, and their minimum height will be approx. 60 cm. Additionally, the top part of the fences should be equipped with an "overhung" roof at the entire length of the fencing.

The outline drawing included below presents the protection of excavations against migrating amphibians.



PL	EN
Ok. 2-3 m	Approx. 2-3 m
Ogrodzenie z folii polimerowej (część nadziemna)	Fencing made of polymer sheet (overground part)
Część ogrodzenia zakopana w gruncie (min. 10 cm)	Underground part of fencing buried in the ground (min. 10 cm)
Pułapka – wiadro o wys. 40 cm z perforowanym dnem i patykiem ułatwiającym wychodzenie drobnym ssakom	Trap – a bucket 40 cm high with perforated bottom and a stick to make it possible for small mammals to escape
Słupek montażowy	Mounting post

Figure 29 Protection of the excavations against migrating amphibians.

(source: Ochrona dziko żyjących zwierząt w projektowaniu inwestycji drogowych. Problemy i dobre praktyki. Poradnik Ochrony Płazów [Protection of wild animal species while designing road projects.

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Problems and good practices. Amphibians protection guidebook], R. T. Kurek, M. Rybacki, M. Sołtysiak, Stowarzyszenie Pracownia na rzecz Wszystkich Istot, Bystra 2011)

OPERATION PHASE

In order to limit the potential negative impact of the operation of the planned Investment Project on the environment, the following measures will be taken:

14.1. Air protection against pollution

Activities for the limitation of the planned Investment Project impact on the air quality include:

- combustion of fuel from municipal waste in a grate-fired boiler with efficiency of 86%;
- use of flue gas desulfurization plant utilizing semi-dry method with lime or hydrated lime as a reducing agent for sulfur dioxide and other acidic components (HF, HCl) will limit the emission of those pollutants to air to the level required by the national and European Union law; anticipated efficiency of the desulfurization plant: 90%;
- use of secondary method of limitation of nitrogen oxide emission by the flue gas denitrification plant (SCR or SNCR) with 24% solution of ammonia water or carbamide as reducing agent will limit the emission of this pollutant to the level required by the national and European Union law; anticipated efficiency of the denitrification plant: approx. 50%;
- use of a high-efficiency dedusting device in the form of a bag filter will limit the emission of pollution to the level required by the national and European Union law; anticipated dedusting efficiency of the filter: 99.98%;
- ensuring sufficiently high temperature in the boiler combustion chamber and its maintaining period not shorter than 2 seconds, preferably more than 3.0 seconds will cause decomposition of dioxins, furans and their precursors;
- use of activated carbon injection between the reactor and the bag filter will limit the emission of dioxins, furans and mercury to the air to the level required by the Polish and European Union law; anticipated efficiency of such pollution reduction: approx. 97%;
- air intake from bunker building and introduction of air to the boiler will eliminate emission of odors to the air;
- use of hermetic sorbent unloading system, equipped with hermetic pneumatic lime or hydrated lime conveying system, elastic hoses for connection of compressed air pipeline
- use of hermetic sorbent storage system (tank) equipped with dedusting systems (dust separator bags);

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- equipment of sorbent retention tank with a dust removal equipment, enabling keeping the dust emission at the level of 20 mg/m³;
- equipment of ash retention tank with a dust removal equipment, enabling keeping the dust emission at the level of 20 mg/m³;

All the solutions mentioned above will help prevent and minimize the impact of the planned Investment Project on the quality of air in the area of possible impact of the ITPFP.

14.2. Protection of surface water and groundwater

The prospective Investment Project will not make a direct use of the surface and groundwater sources. Water for the needs of ITPFP operation will be taken from the water supply main of PWiK in Olsztyn. Industrial wastewater will be discharged to PWiK on terms and conditions agreed with the utility company.

To achieve a high protection of the environment as a whole, the following technical and technological solutions will be applied:

- sanitary sewage discharge to the network of PWiK in Olsztyn,
- use of industrial wastewater in the slag quenching process or/and its discharge to the network of PWiK in Olsztyn,
- use of rain water treatment system,
- use of industrial wastewater treatment system,
- discharge of treated rain water to the drainage system of the city of Olsztyn (Struga "Szczesne") or/and to the water or ground in the area of the investor's plot,
- use of rain and thaw water treatment system, including the application of sedimentation tank integrated with the coalescent separator,
- performance of a complete system of collection and treatment of wastewater from ITPFP area, in the areas of possible oil leakage and of high suspended matter content in the wastewater, the industrial wastewater drainage system will be equipped with oil separator and/or separator for preliminary removal of deposits,
- tightness of subsoil in waste collection facilities,
- the leachate from the bunker (the waste storage pit) will be directed via leachate draining and discharge system through internal industrial wastewater drainage system to the industrial wastewater pre-treatment plant,

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- pre-treatment of wastewater from washing in the area of oil management, rain water from the above mentioned area prior to their introduction to the associated drainage system,
- preparation of paved storage areas and separation of zones for storing different types of waste, in order to eliminate risks for the groundwater environment,
- protection of the groundwater environment by placement of transfer areas for chemicals, sorbent and waste as well as storage tanks for oil, sorbents and chemicals on tight containment trays or concrete floorings enabling discharge of leakage to the industrial wastewater drainage system.
- for the purpose of protection against the potential impact on underground water and surface water, in the area of ITPFP the vehicles will be allowed to move around only on the designated and paved roads and yards. The equipment operating in the area of ITPFP will be operational and shall ensure lack of contamination with oil derivative substances,

In order to minimize the amount of the used water and discharged wastewater the following solutions will be used:

- The wastewater from the water treatment plant — will be directed to the industrial wastewater pre-treatment plant and then to the slag quenching system or/and PWiK sewerage system.
- Floor wastewater — (unloading hall, combustion building) — will be directed to the industrial wastewater pre-treatment plant, where separation of oil derivative substances and sand will be performed. The water will be pumped to the slag quenching system or/and PWiK sewerage system.
- Water added to the reactor being the component of semi-dry flue gas treatment system will vaporize and it will be evacuated to the atmosphere in the form of steam mixed with treated flue gas. Therefore, the planned Investment Project will not cause any generation of wastewater from the flue gas treatment system.
- The leachate from the bunker (the waste storage pit) — will be directed via leachate draining and discharge system from the waste stored in bunkers to the internal plant (industrial) wastewater drainage system, the final block of which will be the industrial wastewater pre-treatment plant. Afterwards, upon pre-treatment the water will be used in the slag quenching process or directed to PWiK sewerage system.
- Protection against uncontrolled discharge of water from fire-fighting operation carried out in the Combined Heat and Power Plant area into the rain water drainage system by, among

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others, execution of a leakproof oil pan which can contain at least 125% of the total oil quantity, including also rain water and water from fire-fighting operations.

The above methods of wastewater treatment protects surface water, groundwater and soil against pollution.

14.3. Ground surface protection

Activities for the limitation of the planned Investment Project impact on the ground surface include:

- preparation of paved storage areas and separation of zones for storing different types of waste, in order to eliminate risks for the groundwater environment,
- placement of transfer areas for chemicals, sorbent and waste as well as storage tanks for oil, sorbents and chemicals on tight containment trays or concrete floorings enabling discharge of leakage to the industrial wastewater drainage system.
- stabilization of fly ash and other flue gas treatment products in order to change their properties in the way enabling their storage in landfills for non-hazardous and non-neutral waste.

14.4. Noise protection

To minimize the noise emission by ITPFP facilities and equipment, the following solutions will be applied concerning the structure of walls and roofs of different buildings:

- Waste bunker – enclosed source – minimum composite sound reduction index R=26 dB
- Dry mechanical draft cooling tower – enclosed source – minimum sound reduction index R=26 dB
- Turbine hall – enclosed source – minimum composite sound reduction index R=26 dB
- Building for solidification of ashes and solid waste coming from the flue gas treatment system – enclosed source – minimum composite sound reduction index R=26 dB
- Waste collection hall – enclosed source – minimum composite sound reduction index R=26 dB
- Workshop hall, warehouse – enclosed source – minimum composite sound reduction index R=26 dB
- Boiler house of the FGDP – enclosed source – minimum composite sound reduction index R=26 dB
- Peak Load Boiler House – enclosed source – minimum composite sound reduction index R=26 dB

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For instance, walls composed of sandwich panels and a steel grate give a wall sound reduction index of $R_w = 32$ dB.

Currently, the exact acoustic characteristics of machines and equipment is unknown. The information presented above will form guidelines for potential supplies of different facilities, systems and equipment. Where it is impossible to obtain 80 dBA from the air inlets of the mechanical draft cooling tower, it is allowed to use, **for example**, the following solutions: an absorption sound silencer which reduces the cooling tower emission to 80 dBA should be installed around the cooling tower, in front of the inlet. The silencer may be made of vertical panels (slotted levers) positioned opposite the air inlets. The panels may be filled with a soft material (mineral wool) and their sheathing – of perforated aluminum sheet. Front edges of the panels will be rounded by the application of bent aluminum sheets. The silencer will be covered from top by prefabricated reinforced concrete slabs supported on one side by reinforced concrete beams positioned circumferentially, and on the other side – by the cooling tower shell. The silencer circumferential beams will be supported by reinforced concrete pillars. Silencing capacity of the installed silencer will be min. 5 dB.

In accordance with the Polish Standard PN-N-01307, the average sound level A at the measurement surface, at a distance of 1 m to the new equipment (noise sources) located on the premises of ITPFP, measured during normal operation, may not exceed 85 dB/8h for facilities that include workstations or circulation routes. This is to protect against noise at workstations.

14.5. Electromagnetic radiation protection

Basic power supply of ITPFP auxiliaries and own consumption systems will be provided from the tap of the turbine generator unit and the MV switching station, and further through the MV/0.4 kV transformer and the 0.4 kV switching station. The 0.4 kV switching station will be sectioned. General commissioning processes will be supplied by dedicated 0.4 kV substations. Final commissioning processes will be supplied directly by the main 0.4 kV switching station or by process substations. For the needs of safe shutdown of the Unit, as well as for power supply of I&C and control systems of the Unit, dedicated DC and/or guaranteed voltage systems will be constructed.

Stand-by power supply of the new CHPP will be provided from the local MV network. Due to the voltage level of the local MV distribution network and the planned voltage in the new MV switching station at the level of 6.3 kV, a transformer adjusting MV/6.3 kV with the power output of approx. 4 MVA (power output depends on the size and technology of the Unit) will be installed.

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Emergency power supply of ITPFP will be executed by means of the power generator set with the voltage of 0.4 kV. The set will supply the drives and equipment necessary for safe shutdown of the Unit as well as for the operation of the Plant, including I&C systems and emergency lighting.

The system for power evacuation from the new CHPP includes a range of devices for the transfer of energy from the newly designed generator. Power evacuation busducts will be located in an insulated screen sheathing. Thus, the field impacts will be reduced to the admissible values.

The 110 kV switching station, located in ITPFP, on the side where power will be evacuated to the network, will be an enclosed (fenced) facility, which will fulfill the requirements for the access of third parties to the area of field-emitting equipment. Distance of the 110 kV equipment (unit transformer, overhead line) to the plot boundary guarantees compliance with the maximum admissible values of electromagnetic radiation.

14.6. Possible risks related to the new Investment Project and applied mitigating measures

ITPFP operation may lead to the following risks related to environmental impact:

- **Risks involving air pollution**

The risk is related to possible impact of polluted air on vegetation and human health. Air quality surveys, which have been conducted in Olsztyn by the Voivodeship Inspectorate of Environmental Protection for many years, reveal there is no excess of the average annual concentrations of sulfur dioxide, nitrogen oxides, particulate matter, neither related to human health protection, nor plant protection. When analyzing the level of estimated concentrations of gaseous and particulate pollutants in the air, generated by ITPFP, we may not expect a significant impact of the emitted pollutants on human health or vegetation. As a mitigating measure, in the new plant, the Investor will use a high-efficiency dedusting device, flue gas desulfurization plant and denitrification plant.

- **The risks related to deliveries, reloading and storage of hazardous substances**

Pursuant to the Ordinance of the Minister of Economy of January 31, 2006 amending the Ordinance on types and quantities of hazardous substances whose presence at the plant decides about its classification as the plant with an increased or high risk of occurrence of a serious industrial failure (Journal of Laws of 2006, No. 30, item 208), is not classified to plants of increased or high risk of a serious industrial failure, due to the quantity and types of hazardous substances existing on the premises of the plant. A serious industrial failure, causing hazard to the environment, may arise in the plant in case of a possible leak of oil derivative substances from storage tanks, transformers or in case of a leak of chemicals from storage tanks and subsequent penetration of the substances to: ground, groundwater or surface water. Environmental protection against leaks and environment contamination will be exercised by the installation of tanks in tight troughs and trays which allow leak evacuation to special tanks.

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Environmental risk mitigating measures related to failures / hazards

The table below contains specifications of protective devices to be installed in the planned Investment Project. They include design principles, proposed technical and technological solutions as well as rules for work organization and plant operation.

Table 82. Types of planned protective devices in case of hazard/failure

Facility name	Type hazard or / failure	Protective devices
Boiler house	Fire hazard	Minimizing the number of flanged connections of the start-up oil system in the area of boiler burners. Installation of fire extinguishers in the burner area. Installation of smoke removal vents at the boiler roof.
Fuel feeding line	Odor hazard	Prevention against uncontrolled emission of odor outside the hall by the use of a vacuum exhaust system. Installation of water flushing systems or vacuum cleaning systems in the rooms.
	Fire hazard	Installation of a smoke removal system in the rooms. Protection of equipment and systems against excessive heat emission, fire escape and electric discharge by the use of appropriate protective devices.
Turbine hall	Oil management of the turbine generator unit Oil leaks Fire hazard	Installation of the oil equipment in an enclosed room fitted with a floor having the form of trough, with a slope towards a dead end well whose capacity will ensure the collection of 20% of oil existing in the system. Drainage of waste oil from the collection trough using a water trap to the waste oil tank located in the basement. Installation of emergency ventilation system in the oil room. Enclosing and airtight sealing of the turbine generator unit oil system. Isolation of the oil system in case of fire using a quick - closing valve Installation of a stationary trickle unit in the turbine generator unit oil room. Installation of a stationary or mobile foam-generating firefighting equipment (e.g. foam fire trolleys) in the turbine hall, at the turbine and condensation levels.

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Cable rooms and tunnels	Fire hazard	<p>In the main building, all the tunnels, shafts and cable rooms will be equipped with fire alarming equipment.</p> <p>Installation of stationary or semi-stationary firefighting equipment and sound signaling system to indicate that the equipment is activated.</p> <p>Division of cable tunnels with fire walls into fire compartments with a length of up to 100 m.</p>
Transformer	Oil leak hazard	<p>Placing the transformers on reinforced concrete foundations with rails allowing for their rolling. A tight reinforced concrete oil sump will be located under each transformer.</p> <p>Transformer stands will be fitted with oil sumps or tanks.</p>
	Fire hazard	<p>Transformer chamber rooms will be equipped with stationary fire extinguishing sprinkler systems with water drainage from the chamber to industrial wastewater drainage system.</p> <p>Oil transformers installed overhead or in transformer chamber rooms will be equipped with appropriate fire trolleys.</p> <p>The unit transformer, tap transformer and back-up transformer will be equipped with sprinkler systems.</p>
Water Preparation Station, Water Treatment Plant, Ammonia Water System.	Chemical leak hazard	<p>Deliveries of concentrated hydrochloric acid, concentrated soda lye and chemicals will be carried out using road tankers.</p> <p>Airtight unloading of concentrated hydrochloric acid and concentrated soda lye with the use of unloading pumps.</p> <p>Storage of HCl in double shell tanks made of plastic or steel, chemically protected and equipped with leak detectors.</p> <p>Airtight dosing with the use of dosing pumps.</p> <p>Storage tanks will be placed on chemically resistant trays which, for the acid and lye tanks, will have a capacity equal to one tank for acid or lye, respectively.</p> <p>The entire water demineralization plant will be automatically operated.</p> <p>Simultaneous regeneration of the basic cation and anion exchangers is assumed.</p> <p>Aggressive wastewater from regeneration will be collected and neutralized in a neutralizer situated by the water treatment plant.</p> <p>Doses of regeneration chemicals will be selected in such a way to ensure self-neutralization of aggressive acidic and basic wastewater.</p>
Management of light fuel oil and diesel oil.	Oil leak hazard	<p>The pavement of the road tanker unloading point will be made of concrete, with a slope of 5% towards the drainage to common ducts for oily wastewater.</p> <p>Oil will be stored in light oil tanks made of steel and equipped with a steel shield with double bottom and leakage monitoring.</p> <p>The tanks will be steel structures with appropriate insulation made of anticorrosive coatings and with fire protection systems.</p>

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Methods for animal and plant protection

On the basis of the environmental survey constituting appendix to the Report, we state that the area intended for the planned project is scarcely inhabited by birds. The area is mainly covered with young stands of birch, which are generally not appealing for birds. In case tree felling is necessary, it should be carried out after the birds' nesting period, i.e. from September until March. Any other tree felling operations have to be performed under the supervision of an ornithologist, after obtaining the approval of the Regional Directorate for Environmental Protection. The ornithologist shall evaluate whether any trees are populated by birds.

The area intended for the planned Investment Project includes three water reservoirs, two of them being temporary (they dry almost completely in summer). Two of them are irrelevant to the local population of amphibians. Water basin No. 10 may be significant for the local population of amphibians. Due to the protection of amphibian species, the reservoir is planned to be left unchanged.

To minimize the impact of the planned Investment Project on plants and animals, the following measures are planned:

- protection of habitats and animals against negative impacts during construction, i.e. adaptation of the work period, in particular groundworks, to the birds' nesting periods;

Environmental compensation is a set of activities aimed to restore the environmental balance in a given area and to compensate for environmental damage caused by the Investment Project. Environmental damage is a negative and measurable change in the condition of function of environmental elements, as compared to the initial condition, **caused directly or indirectly by the activity carried out by an entity using the environment.**

Under Article 225 section 1 of the *Environmental Protection Law*, gas and dust emission permits, for areas where exceedance of air quality standards has been noted, may be issued for a newly constructed system or a system undergoing a considerable change provided that there is a guarantee of a relevant reduction of amounts of gas or dust emissions causing violation of these standards that are released from other plants located within the same area.

The current state of air pollution (as of November 2014) for ITPFP location area is specified by the Voivodeship Inspectorate of Environmental Protection (WIOŚ) in Olsztyn (Appendix 9 to the Report). It proves that, in the area intended for ITPFP, there is no excess of the maximum admissible concentrations of the examined pollutants in the air.

Due to fact that, as revealed in the Report, there is no significant impact of the planned Investment Project on the air quality or the surrounding environment as a whole, with the use of the minimizing measures described in chapter 14 of the Report, and that the legal requirements concerning the

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emission of substances and energy to the environment are fulfilled, there will be no need to determine any forms or methods of compensation measures.

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15. DESCRIPTION OF FORECAST SIGNIFICANT IMPACTS OF THE PLANNED INVESTMENT PROJECT ON THE ENVIRONMENT INCLUDING DIRECT, INDIRECT, SECONDARY, ACCUMULATED, SHORT TERM, MEDIUM TERM AND LONG TERM, PERMANENT AND TEMPORARY IMPACTS ON THE ENVIRONMENT

In this chapter the impact of the planned Investment Project on the environment in the construction/liquidation and operation phase has been forecast. Based on the analysis of the ITPFP impact on the environment carried out in dedicated Report chapters, below, in the form of table, a forecast of the impact of the planned Investment Project is presented. The forecast impact has been presented in the following manner:

- impact characteristics (**significant, insignificant**),
- impact duration (**short-term, medium-term and long-term**),
- impact frequency (**permanent, temporary**),
- impact nature (**direct, indirect, reversible and irreversible**),
- impact range (**local and regional**).


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Table 83. The forecast impact of ITPFP in Olsztyn on the environment in the operation phase in a local and regional scale.

Element of the environment		Operation phase												
		Impact		Impact duration			Impact frequency		Impact nature				Impact range	
		Significant	Insignificant	Short-term	Medium-term	Long-term	Permanent	Temporary	Direct	Indirect	Reversible	Irreversible	Local	Regional
Air quality	Pollution		X			X	X		X			X	X	
	Climate		x											
	Odors		X	X		x		X	X				X	
Acoustic climate			X			x		X					X	
Surface water			X			X	X			X			X	
Underground water		+				+	+			+		+		+
Ground surface		X				X	X		X			X	X	
Soils			+			+	+			+	+			+
Landscape			X			X	X		X			X	X	

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Element of the environment		Operation phase												
		Impact		Impact duration			Impact frequency		Impact nature				Impact range	
		Significant	Insignificant	Short-term	Medium-term	Long-term	Permanent	Temporary	Direct	Indirect	Reversible	Irreversible	Local	Regional
Plants														
Animals			X		X		X		X	X			X	
Forms of nature conservation														
Population	Social benefits	+				+	+		+	+			+	+
	Facility nuisance		X			X	X		X		X		X	
Historic assets and cultural landscape														
Interaction between elements of the environment														
Trans-boundary environmental impact														

Marking:  - no significant impact, X -negative impact, +- positive impact

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Table 84. The projected impact of ITPFP in Olsztyn on the environment in the operation phase in a local and regional zone.

Element of the environment		Implementation/liquidation phase												
		Impact		Impact duration			Impact frequency		Impact nature				Impact range	
		Significant	Insignificant	Short-term	Medium-term	Long-term	Permanent	Temporary	Direct	Indirect	Reversible	Irreversible	Local	Regional
Air quality	Pollutant		X	X				X	X			X	X	
	Climate													
	Odors													
Acoustic climate		X		X				X	X			X	X	X
Surface water														
Underground water														
Ground surface		X		X				X	X		X		X	
Soils		X		X				X	X		X		X	


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Element of the environment		Implementation/liquidation phase												
		Impact		Impact duration			Impact frequency		Impact nature				Impact range	
		Significant	Insignificant	Short-term	Medium-term	Long-term	Permanent	Temporary	Direct	Indirect	Reversible	Irreversible	Local	Regional
Landscape			X			X	X		X			X	X	
Plants			X			X	X		X			X	X	
Animals			X			X	X		X			X	X	
Forms of nature conservation														
Population	Social benefits		+	+				+	+	+		+	+	
	Facility nuisance		X	X				X	X	X	X		X	
Historic assets and cultural landscape														
Interaction between elements of the environment														

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Element of the environment	Implementation/liquidation phase												
	Impact		Impact duration			Impact frequency		Impact nature				Impact range	
	Significant	Insignificant	Short-term	Medium-term	Long-term	Permanent	Temporary	Direct	Indirect	Reversible	Irreversible	Local	Regional
Trans-boundary environmental impact													

Source: own analysis

Marking:  - no significant impact, X -negative impact, +- positive impact

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Surface water

No significant impact on surface water, both in the implementation/liquidation and operation phase of the Investment Project, has been found. In the operation phase a possibility of insignificant indirect impacts on the quality of surface water in a local scale is expected to occur. These impacts will be related with a discharge of pre-treated industrial wastewater into the drainage system of Przedsiębiorstwo Wodociągów i Kanalizacji (PWiK) in Olsztyn. No significant impacts will occur in a regional scale due to the distance of designed Plant from surface water and methods of managing wastewater coming from the planned Investment Project.

Underground water

No real significant risks of contamination of the underground water in the construction/liquidation and operation phase have been found. Technical solutions presented in chapter 14.2 will eliminate the risk of deterioration of the underground water quality within the area of the planned Investment Project. The planned Investment Project in a regional scale will contribute to limiting a possible negative impact of municipal solid waste landfills and uncontrolled emissions of landfill leachate on the underground water.

Air quality

The impact of emission of gaseous and particulate pollutants in areas adjacent to ITPFP will be of a direct and permanent nature (during the entire plant operation). As part of the carried out forecast of the impact, a possibility of negative impacts on air quality in the construction phase is found to occur; however, this impact will be of a reversible nature and of local range. The pollutants will be of an insignificant, short-term nature.

Air pollution is one of the most important nuisance for the environment; not only does it affect air quality, but also indirectly affects all ecosystem elements: people, animals, plants, water and soil. Indirect impact of air pollution on soil is revealed when the pollutant concentrations are sufficiently high and when biochemically active compounds and physical and chemical compounds are present among soil components. Depending on the type of soil an indirect impact may cause negative, positive or periodically positive towards negative consequences in soil. Indirect impact is related to the influence of air pollutants on the function of one factor or a group of factors of soil-forming process. It involves clastogenic effects of gaseous pollutants on vegetation assimilation apparatus. Negative effects of indirect impact may be transferred onto soil only after a long period of time. Nitrogen oxides with sulfur dioxide falling on the ground as acid rain cause soil acidification. Soil acidification causes a limitation for soil microorganism growth and creates negative conditions for plants to extract mineral substances necessary for their growth and development. Sulfuric acid also influences the process of dissolving some

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of the mineral substances, thus causing a release of toxic substances into soil (e.g. sulfides, excess of manganese, ferrum and aluminum). Dry and wet streams of sulfur compounds not only do cause progressing soil acidification, but also of surface water; they also cause corrosion of steel structures, buildings, higher degree of machines wear and tear, etc. Gaseous air pollutants (SO_2 , NO_2) negatively impact the environment in a long-term process. A decisive factor in exposing, for instance, vegetation to their (gaseous pollutants) activity is a rate of pollutant concentrations and the exposure time. According to literature data, at average concentrations of SO_2 $0.03 \div 0.32 \text{ mg/m}^3$ visible negative changes in plants occur (foliage damage, growth inhibition or yield decrease), and chronic damage may occur with during a long-term impact of NO_2 concentrations of 0.14 mg/m^3 . Thanks to pro-ecological protective systems compliant with the BAT requirements an insignificant impact on air quality of the Investment Project at its operation stage is predicted. The emission of gaseous and particulate pollutants from ITPFP will not have an adverse impact on the environment (in the form of accumulation of toxic compounds) in a long term.

Noise emission

The impact of ITPFP on the acoustic climate of adjacent and subject to acoustic protection areas will be of indirect and long-term nature (during the entire period of the plant operation). It will not be an excessive (beyond standard) impact. As a result of applied solutions limiting noise emission into the environment, a negative impact of the planned Investment Project will be limited to the boundaries of the land to which the Investor holds a legal title.

Land surface

In the execution phase, a negative impact on the land surface due to land use for the planned Investment Project is predicted to occur. It is the impact in a local scale of a significant nature. Hazardous substances used in water treatment processes for water/steam circulation and in oil management will be stored at the ITPFP area. Tanks for collection of these substances will be protected in the form of double walls and containment trays against a possibility of pollutant permeation into the ground and underground water.

Vegetation, animals and protected areas

A negative impact on fauna and flora existing in the area intended for the planned Investment Project is predicted in the execution phase. This impact will be of a slight, short-term, temporary, direct nature, i.e.

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vegetation cutting – of irreversible nature, however for many cases of a reversible nature (new plantings of local trees/plants species in places which do not collide with the Investment Project are predicted).

In the operation phase no negative impacts which would affect fauna and flora are predicted as the environmental protection methods presented in chapter 14 effectively protect flora and fauna existing within the immediate vicinity of the planned Investment Project. The environmental survey performed for the planned Investment Project proved that only one of three reservoirs located on the planned Project Investment site is important for amphibian population. For protection of fauna habitats it is planned to leave the biggest reservoir in an unchanged condition. However, should it be partially buried, these actions will be limited to the north-west part in which the reservoir is the least developed. A long distance of the planned Investment Project from the nearest areas protected under law ensures a lack of its significant impact on flora and fauna species.

Population

A minimum distance of the planned Investment Project from the areas in which residential buildings are located is 270 m which constitutes a distance that guarantees no sensible impacts as regards the noise. The predicted impact of the planned Investment Project will not be harmful to people due to generation of concentrations of particular pollutants below applicable emission standards, compliant with the legislation currently in force. Within the vicinity of the planned Investment Project and its possible impact range there are no areas subject to protection as health resort areas or health resort protection areas pursuant to the Act of July 28, 2005 on health resort treatment, health resorts and protection zones of health resorts and health resort municipalities (Journal of Laws of 2005 No. 167, item 1399 as amended). Goldap Health Resort is located 165 km north east of Olsztyn. According to the calculations of airborne pollution dispersion made in this Report, one had to analyze the area within a radius of 15174 metres (about 15 km) from the plant emission sources in terms of more strict reference values. Taking into consideration the distance of ITPFP from the above-mentioned health resort, the concentration levels have not been calculated in its area for this Report.

Landscape

The location of the planned Investment Project will not constitute an important negative change in the surrounding landscape of industrial areas.

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16. REQUIREMENT FOR ESTABLISHING A LIMITED USE AREA

Pursuant to Article 135 of the Act of April 27, 2001 Environmental Protection Law (consolidated text: Journal of Laws of 2008, No. 25, item 150 as amended) a limited use area can be established within the immediate vicinity of:

- wastewater treatment plants,
- municipal solid waste landfill,
- composting facility,
- communication/transport route,
- airport,
- power line and station,
- radio communication, radio navigation and radio location system.

The planned Investment Project is not listed among these systems. A need for creating such area may result from the findings of environmental review of the existing plant, environmental impact assessments of the planned Investment Project or from post-execution analysis based on which it has been found that despite applied available technical, technological and organizational solutions, the environmental quality standards outside the area of plant or other facility cannot be met. ITPFP shall be designed in a manner which will not cause a violation of applicable environmental quality standards in any element impacting the environment.

For the investment project under the analysis, it is not planned to establish a limited use area.

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17. ANALYSIS OF POSSIBLE SOCIAL CONFLICTS

The obligation to protect justified third party interests results from the Act of July 7, 1994 Construction Law. Pursuant to Article 5 (1) point 9 of the aforementioned Act, the civil structure and the structure facilities connected thereto shall be designed and built, taking into account the anticipated period of use, in the manner specified in the relevant provisions, including technical and building regulations and principles of technical knowledge, in order to secure respect for reasonable interests of third parties, including securing access to a public road.

In practice, execution of any investment project may be the cause of local social conflicts. They may occur especially in case interests of third parties residing within the range of possible impacts caused by the operation of plant or works carried out on its territory are violated. Increased pollutant emissions into air, noise and negative landscape conversion and excessive road traffic associated with the investment project may be the cause of conflicts.

MPEC S.A. in Olsztyn currently endeavors to maximally limit the chances for social conflict by, for instance, choosing a proper site location. Selected site marked with symbol **1CEO** is designated in a local land development plan for:

- a) principally – the heat generating plant or co-generation power plant generating thermal energy for the district heating system purposes with a possibility of electricity co-generation, including necessary networks and technical infrastructure facilities,*
- b) admissibly – the waste combustion or co-combustion plant with energy recovery, for the district heating system purposes, with a possibility of electricity co-generation.*

Additionally, the entire area is located on the territory of "Industrial District - East 3 in Olsztyn, which should greatly reduce the chances for social conflicts, both at the execution and future operation stage of the ITPFP.

The investment project has been designed in a manner which does not cause nuisance beyond the boundaries of land to which the Investor holds a legal title.

CONSTRUCTION PHASE

During the execution of the planned Investment Project an increased road traffic may occur from time to time and construction machines and equipment will be used. They will cause pollutant emissions into air and may cause an increased noise level in the surroundings. Due to a periodical operation of machines and equipment, while meeting the requirement to carry out works only during daytime, the permissible noise levels within the areas of homestead buildings and residential buildings subject to protection should not be exceeded. Works requiring nighttime activity shall be incidental.

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At the end of each working day roads will be cleaned and vehicles will have their wheels brushed up before leaving the construction site.

OPERATION PHASE

The analysis carried out for ITPFP impact in the operation phase has not shown any abnormal plant impact on the environment in any of these elements.

Social conflicts may be generated by nuisance resulting from noise emission related to the operation of Investment Project. ITPFP will be equipped with a system of solutions and protections to ensure meeting applicable standards for all environmental impacts, including protection against excessive noise emissions. Additionally, regular noise tests of noise levels in the surroundings will be performed at the boundary of homestead and residential building areas subject to protection. The results of own tests and inspections carried out by national authorities shall be made available to public.

LIQUIDATAION PHASE

The risk of conflict in the liquidation phase will be similar to the situation in a construction phase. Demolition of civil structures and systems is similar to the construction phase, i.e. it involves a simultaneous operation of machines for demolition of structures, systems and equipment.

Regardless of the above, one shall take into account that possible social conflicts may also appear from ecological organizations which try to question the environmental impact assessment presented in the report in order to prevent liquidation of the investment project. For non-governmental ecological organizations such a relatively big facility may clearly be associated with unrecognized hazards and danger.

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18. PROPOSED MONITORING OF IMPACT OF THE PLANNED INVESTMENT PROJECT ON THE ENVIRONMENT AT THE CONSTRUCTION AND OPERATION STAGE

CONSTRUCTION PHASE

- **Air monitoring**

Polish regulations regarding air protection against pollution do not state a requirement for monitoring the environmental impact caused by a new facility construction phase. In view of the above, no method for monitoring the amounts of emitted pollutants and air cleanness has been proposed in the Report.

- **Noise monitoring**

It is difficult to predict during the design phase of the new facility noise levels that will occur during the facility's construction. All the more that technical methods of reducing noise emissions coming from the construction site will not rather be feasible, and it will be possible to apply only organizational methods. This is because technical methods apply to reduction of noise at the sources of its generation with the use of, for instance, appropriate types of materials for construction of machines and machines being the sources of noise. The operation phase of technical equipment (here as operation of machines and construction equipment) and heavy trucks for transport is from the technical and organizational point of view expensive and complicated issue. Therefore, at the current stage of design works it is very difficult to determine a degree and range of noise nuisance coming from machines and equipment that will be working at the construction site.

The work organization is assumed to be implemented which predicts the performance of civil and erection works during the execution of co-generation project at daytime and therefore noise coming from the construction site will be less intrusive for surrounding residents. In view of the above, no method for monitoring the noise emission during the construction process of the planned Investment Project has been proposed in the Report.

- **Monitoring of the amount of consumed water and discharged wastewater**

Regulations regarding water and waste management protection do not state the requirement for monitoring environmental impact of water intake and wastewater discharge in the construction phase. At the construction work stage a rigorous record shall be kept for substances posing a risk at the construction site and for wastewater discharge from the construction site in a manner agreed in the

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design documentation. It is assumed that the amount of consumed water and discharged wastewater shall be used for settlement purposes with the sewage provider and receiver.

- **Monitoring of the amount of produced waste and the methods of waste handling**

The waste management monitoring at the construction stage will involve keeping a record of the type of waste produced, the volume of waste produced category-wise and the methods of waste handling with the use of following documents:

- waste record sheet,
- waste transfer notes.

All produced waste shall be monitored and registered by the contractor.

OPERATION PHASE

The plant monitoring shall be carried out according to the secondary legislation to the Environmental Protection Law Act, Water Law and the Waste Act. The monitoring shall be carried out during the entire operation period of a new plant and shall involve monitoring of pollutant amounts emitted to the environment (substances and energy) and monitoring of unit technical parameters, amounts of used materials, consumed resources and fuels.

BAT reference document for general monitoring rules of July 2003 describes the monitoring of industrial emissions at the source of their generation, i.e. monitoring of pollutants released from the plant into the environment.

This document does not include monitoring of these factors which are specific for certain types of industrial activity, mentioned in Appendix I of the Directive. In such cases, applying to a specific industrial activity, one shall be directed to a proper vertical (sector specific) BREF.

The aforementioned document indicates two reasons for which the monitoring was included in the requirements for obtaining IPPC permits:

- Assessment of compliance: monitoring is required to identify and describe in terms of quantity the plant operation in order to enable appropriate authorities verification of compliance with the requirements specified in a permit.
- Creation of reports referring to industrial emissions into the environment: monitoring is required for obtaining information necessary to prepare reports on the scope of environmental use, e.g. in order to meet the obligation pursuant to the IPPC Directive or the European Pollutant Emission Register (EPER). In some cases this information may be required to establish financial fees, taxes or trading of emissions.

Monitoring of substances and energy from a new plant shall be carried out according to the rules specified in the aforementioned reference document or sector specific BREF for waste combustion.

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- **Monitoring water and wastewater parameters**

Raw water shall be taken from the water supply network administered by Przedsiębiorstwo Wodociągów i Kanalizacji (PWiK) in Olsztyn. As per the requirements set forth in a relevant agreement, the amount of potable water taken shall be determined based on the water supplier meter which will be installed in a water meter well at the site of the planned Investment Project or as per the meter installed in a water supply pipeline. The requirements for the quality of raw water taken from the water main of PWiK in Olsztyn are governed by the Ordinance of Minister of Health of March 29, 2007 on the quality of water intended for consumption by people.

Industrial wastewater produced in ITPFP shall be discharged to the drainage system of PWiK in Olsztyn pursuant to a relevant contract determining the terms and conditions for collecting, treatment and controlling the wastewater as well as the payment settlement method for the service provided. Industrial wastewater shall meet the requirements of the Ordinance of the Minister of Construction of July 14, 2006 regarding the manner of performing the obligation of industrial wastewater supplier and on conditions of discharging wastewater to drainage systems (Journal of Laws 2006 No. 136, item 964) and also the conditions of agreement for wastewater discharge. Discharge of rain water and thaw water into a melioration system (Struga Szczesne) and/or into the ground within the plot area to which the Investor holds a legal title is possible. Pre-treated rain water and thaw water shall comply with the requirements set forth in the Ordinance of the Minister of the Environment of November 18, 2014 on conditions to be met when discharging wastewater to waters or ground, and on substances particularly harmful to the water environment (Journal of Laws of 2014 No. 0 item 1800). It is predicted that as part of the monitoring of pre-treated rain water and thaw water the amount of rain water discharged into one of the above-selected reservoirs shall be measured and registered with ultrasonic flow meter and meter installed in the sewer trunk of the rain water drainage system. Tests of the quality of rain water shall be performed in the following scope:

- Total suspended matters $\leq 100 \text{ mg/dm}^3$,
- Oil derivative hydrocarbons $\leq 15 \text{ mg/dm}^3$

once per two months.

- **Monitoring of soil and underground water**

Ordinance of the Minister of Environment of September 9, 2002 on the soil quality standards and earth quality standards (Journal of Laws No. 165, item 1359) specifies the soil or earth quality standards, including their current and planned function. According to the Ordinance – **industrial areas**, mining lands and transport areas belong to group C. For this group, permissible values of concentrations of heavy metals, hydrocarbons, aliphatic hydrocarbons, polyaromatic hydrocarbons, plant protection measures, etc. are many times higher than for the soils of areas subject to protection. Soil or earth is

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deemed polluted when the concentration of at least one substance exceeds the permissible value specified in the aforementioned Ordinance.

If, at the stage of applying for the Integrated Permit, the authority states that for the Investment Project in question it is necessary to prepare an initial report, then one shall:

- present the test results of soil, earth and underground water contamination,
- measured content of the substances in underground water, including samples taken by an accredited laboratory.

It is recommended that observational wells (piezometers) are located in a manner enabling performance of tests during the construction and operation period. During the works on a possible initial report a number of metering points as well as frequency and scope of tests shall be determined.

- **Monitoring of surface water**

The planned Investment Project shall not directly affect the quality and quantity of surface water. Therefore, no monitoring of the quality and quantity of surface water is planned.

- **Monitoring of gaseous and particulate pollutants into the air**

The requirements regarding monitoring of gaseous and particulate emissions into the air originating from the combustion process result from the provisions of the Ordinance of the Minister of Environment of October 30, 2014 on the requirements for performing measurements of emissions and the amount of taken water i(Journal of Laws of 2014 No. 0, item 1542).

Table 85. Substances and parameters measured in a continuous manner and reference methods for taking continuous measurements

Item	Name of substance or parameter – scope	Unit of measure	Reference method
1.	Total particulate matter	mg/m ³	Any measurement technique calibrated with a gravimetric method
2.	SO ₂	mg/m ³	IR radiation absorption or other optical method taking into consideration the PN-ISO 7935 standard
3.	NO _x (converted to NO ₂),	mg/m ³	IR radiation absorption or other optical method taking into consideration the PN-ISO 10849 standard
4.	CO	mg/m ³	IR radiation absorption
5.	HCl	mg/m ³	IR radiation absorption
6.	Organic substances in the form of gas or vapor – expressed as total organic carbon	mg/m ³	Flame Ionization Detector (FID) Technique

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Item	Name of substance or parameter – scope	Unit of measure	Reference method
7.	HF	mg/m ³	IR radiation absorption
8.	O ₂	%	Paramagnetic method, zirconia ceramic cell method or electrochemical method which guarantees uncertainty of measurement not worse than $\pm 0.4\%$ of O ₂ vol.
9.	Flue gas flow rate or flue gas dynamic pressure	m/s Pa	1), 2)
10	Flue gas temperature at the measuring cross-section	K	3)
11.	Flue gas static or absolute pressure	Pa	4)
12.	Absolute humidity of exhaust gases or grade of gas humidity	-	2), 5)

Explanations:

IR - infrared radiation,

1) in case technical or metrology possibilities of installing equipment for continuous measurement of flue gas flow rate or flue gas dynamic pressure are not available, deviations from the performance of continuous measurements of flue gas flow rate or flue gas dynamic pressure are permitted and a stream of flue gas volume can be determined with a balance method if it guarantees that the uncertainty of result is less than 10%,

2) parameters can be measured with any methods guaranteeing that the uncertainty of measurement is less than 10%,

3) any method guaranteeing that the uncertainty of measurement is ± 5 K,

4) any method guaranteeing that the uncertainty of measurement is ± 10 Pa,

5) deviations from the performance of continuous measurements of absolute humidity or a grade of gas humidity are permitted and they can be determined with a balance method if it guarantees that the uncertainty of result is less than 10%,

6) methodology shall be appropriately selected to the concentration of marked element.

Table 86. Substances measured periodically and reference methods for taking continuous measurements

Item	Name of substance	Unit of measure	Reference method
1.	Pb	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
2.	Cr	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
3.	Cu	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾

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4.	Mn	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
5.	Ni	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
6.	As	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
7.	Cd	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
8.	Hg	mg/m ³	Standard PN-EN 13211
9.	Tl	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
10.	Sb	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁵⁾
11.	V	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
12.	Co	mg/m ³	Atomic Absorption Spectrometry or Inductively Coupled Plasma - Atomic Emission Spectrometry ⁶⁾
13.	Dioxins and furans	ng/m ³	Standard PN-EN 1948 – 1, 2, 3

This Ordinance also includes the guidelines on how frequently periodic measurements are to be taken, rules for performing continuous measurements of nitrogen oxides, inspections of continuous measurement systems and accuracy of a single measurements, the method of averaging daily concentrations and rules to be followed in the event of continuous measurement system breakdown. They are summarized below:

- 1) Continuous measurements of nitrogen oxides (NO_x) are taken when the permissible emission value of this substance has been established in the permit for a release of gas or particulate matter into the air or in an integrated permit.
- 2) Systems for continuous measurements of emissions into the air shall be at least once a year subject to procedures compliant with PN-EN 14181 standard which ensure a proper quality level, including at least once every three years the inspection with the use of parallel measurements using reference or manual methodologies (for particulate matter as per PN-Z-04030-7 standard or PN-EN 13284-1 standard, for NO_x as per PN-EN 14792 standard, for HCl as per PN-EN 1911 standard, for SO₂ as per PN-EN 14791 standard, for O₂ as per PN-EN 14789 standard).
- 3) Systems for continuous measurements of emissions into the air shall be subject to a complete calibration and validation procedure as per PN-EN 14181 standard in the case of:

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- newly installed systems,
 - existing systems - at least every three years,
 - any major change in the operation of fuel combustion system and major changes or repairs of the existing systems.
- 4) Daily average values are determined based on the average 30-minute or 10-minute values of concentrations of substances measured during the operation of plant, taking into consideration commissioning and stoppage periods, as long as waste are combusted in their duration period, after deducting values of confidence interval specified in point 5 of this Appendix.
- 5) The values of confidence interval for a single measurement result shall be determined according to PN-EN 14181, assuming that 95% of the confidence interval value of a single measurement result should not exceed the following values expressed in percentage of the emission standard:
- a. 10% – for carbon oxide,
 - b. 20 % – for sulfur dioxide,
 - c. 20 % – for nitrogen dioxide,
 - d. 30 % – for total particulate matter,
 - e. 30 % – for organic carbon content,
 - f. 40 % – for hydrogen chloride,
 - g. 40 % – for hydrogen fluoride.
- 6) If due to fault or maintenance of the continuous measurement system, during a calendar year more than 10 days occur in which more than five 30-minute average values of concentrations of substances are invalid during each 24 hours , then the plant operator shall take actions to increase the reliability of system for continuous measurement of emissions and shall inform the Voivodeship Inspector for Environmental Protection on actions taken.

The continuous measurement system shall be supplemented by the periodical measurement system which will ensure control of pollutant emission levels. The periodic measurements shall cover the pollutants that will not be measured in a continuous manner and the measurements of which are necessary due to the Investment Project nature. Periodic measurements shall be performed at least once every six months, and during the first twelve months of the plant or equipment operation at least once every three months. Continuous measurements of nitrogen oxides (NO_x) are taken when the permissible emission of this substance has been established in the permit for release of gases or particulate matter into the air or in the integrated permit.

- **Noise monitoring**

The obligation to perform periodic noise measurements results from the Ordinance of the Minister of Environment of November 4, 2008 on requirements for performing measurements of

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emissions and of the amount of taken water (Journal of Laws No. 206, item 1291). The measurements will be taken pursuant to the reference method for periodic measurements of environmental noise emitted by the plant. The frequency of measurements, pursuant to the aforesaid Ordinance - once every two years.

Additionally, measurements will be taken according to recommendations, as per the following standards:

- PN-N-01341 Environmental noise. Methods for measurements and evaluation of industrial noise.
- PN-ISO 1996-1: 1999. Acoustics. Description and measurement of environmental noise. Basic quantities and assessment procedures.

Proposed location for periodic measurement points

It is proposed to take control noise measurements in points located in areas subject to acoustic protection, resulting from the provisions of the local land development plan (MPZP).

Until the updated MPZP is adopted it is proposed to take periodic measurements in points at the nearest **existing residential building** area which is not included in MPZP at the distance of:

- approx. 270 m to the north-west of the Investment Project boundaries at ul. Lubelska 47b
- approx. 870 m to the west of the Investment Project boundaries at ul. Towarowa 18
- approx. 570 m to the south of the Investment Project boundaries at ul. Al. Marszałka Józefa Piłsudskiego
- approx. 800 m to the east of the Investment Project boundaries in the town of Klebark Mały 24a
- approx. 800 m to the north-east of the Investment Project boundaries in the town of Klebark Mały 37a

- **Monitoring of amounts of produced waste and the methods of waste handling**

Pursuant to the Waste Act of December 14, 2012 (Journal of Laws of 2013, item 21) the waste owner is obligated to keep a regular record of the quantity and quality of waste, in line with the waste catalog (Ordinance of the Minister of Environment of September 27, 2001 on the waste catalog, Journal of Laws, No. 112, item 1206). The waste management monitoring will involve keeping a record of the type of waste produced, the volume of waste produced category-wise and the methods of waste handling with the use of following documents:

- waste record sheet,
- waste transfer notes.

Reporting shall include preparation of annual collective data comparisons of:

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- types and volumes of waste produced,
- types and volumes of waste collected,
- types and volumes of waste recycled, types and volumes of waste disposed.

Additionally, pursuant to the aforementioned Waste Act and the Public Statistics Act, reports will be prepared which will include preparation of annual collective data comparisons of:

- types and volumes of waste produced,
- types and volumes of waste recycled,
- types and volumes of waste disposed,
- systems and equipment used for waste recycling,
- waste landfilled.

In the event of the occurrence of a serious failure or a serious industrial failure, the Poviats Governor will be provided, within 30 days from the occurrence of failure, information on waste produced and on methods of managing produced waste which will include the following data:

- specification of amounts and type of waste resulting from a failure,
- determination of a place and method of storing waste produced as a result of failure,
- description of a future management method for this waste.

• **Monitoring as regards electromagnetic fields**

Pursuant to Article 122a of the Environmental Protection Law Act of April 27, 2001 (consolidated text of 2008, Journal of Laws No. 25, item 150 as amended) the entity, acting as the operator of the plant emitting electromagnetic field with the minimum rated voltage of 110 kV shall take measurements of the electromagnetic field levels in the environment right after the start of the plant operation and each time after the plant operational conditions change, including changes caused by the plant equipment modifications, as long as such modifications affect the electromagnetic field levels emitted by the plant or a piece of equipment.

• **Monitoring of technical parameters**

Monitoring of technological process considered as supplementary to the environmental monitoring shall be carried out in ITPFP. It is the source of information on the plant technical condition and on additional data which may be used to assess the impact of the plant on the environment. In the planned plant both basic production process and auxiliary processes shall be equipped with the Instrumentation and Control. They will allow to continuously control production processes and maintain their optimal operational conditions thanks to a quick and appropriate response to the change of external parameters which influence their operation. The most important elements of a technological process influencing the impact magnitude of the plant on the environment which should be monitored are:

- combustion process in a grate-fired boiler,

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- materials and resources management.

The aforementioned scope of monitoring will allow to prevent the impact of a new power unit on the surrounding environment as a whole.

A new unit shall be equipped with a system for monitoring and optimizing technological processes – Master Automatic Control System. Optimization shall be carried out in a real time (*on-line*) or in an *off-line* system. *On-line* optimization shall enable operation on the Unit model using current values of operating and performance parameters. The data shall be processed and sorted for further analysis; most of the data shall be collected directly from the unit equipment. *Off-line* optimization shall provide for various situations and scenarios influencing the efficiency and, thereby, effectiveness of the unit operation.

Examples of optimization tasks using *on-line* and *off-line* optimization systems with application of nonlinear techniques are as follows:

- balancing of fuel consumption in relation to the required load changes in order to maximize the overall efficiency of the unit,
- providing the operating engineer on duty and operators with tools for determination of future scenarios (management optimizer), including consequences of possible changes of operation data and/or making *on-line* modifications on the optimizer, if justified.

- **Monitoring process parameters for the operation control and monitoring system**

Monitoring of process parameters shall be carried out for the following scope:

- recording momentary values for calculations and reporting,
- archiving of the above-mentioned data for a period of 1 year directly in the system and future archiving onto external data carriers,
- on-demand generation of shift, daily, monthly and annual reports:
- momentary values of selected parameters,
- hourly average values of parameters,
- daily average values of selected parameters,
- exceeded admissible values of selected parameters including excess duration and value,
- operating condition of equipment,
- operating time of the main and auxiliary equipment including total operating time, the number of on and off cycles, load, etc.,
- consumption of fuel, water, etc.
- All recorded data shall be accessible on-line in the following forms:
- as graphics - on mimics of operator stations in the scope necessary for operation of the unit,

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- as graphics and tables - on the operation control station of the Operating Engineer on Duty and station of the System Engineer,
- numerical values in the Unified Process Monitoring System.

- **Monitoring of combustion processes**

According to the Ordinance of the Minister of Economy on requirements for waste thermal processing (Journal of Laws 02.37,339 as amended) during waste combustion process it is necessary to perform continuous measurements of:

- temperature of flue gas measured nearby the internal wall in a manner eliminating influence of flame heat radiation,
- oxygen content in flue gas,
- flue gas pressure.

In the case where measuring techniques used for sampling and analyzing the composition of flue gas do not cover gas drying prior to the analysis, the process shall also be monitored with respect to the content of water vapor in flue gas. The retention time of flue gas at the required temperature shall be subject to verification during the commissioning and after each plant retrofit.

Flue gas monitoring system shall comprise sampling systems, pumps, coolers, sample analyzers and electronic calibration system for analyzers.

- **Monitoring of the materials and resources management**

The main raw materials (resources) used for production of energy in ITPFP will be:

- gas,
- light fuel oil,
- industrial water,

and they shall be subject to a continuous control to check if specific parameters are met.

- **Monitoring of the effectiveness of resources use**

Monitoring of the effectiveness of resources use in ITPFP shall be carried out as part of the materials and resources management as well as the water and waste management.

- **Monitoring of the amounts of used fuel generated from waste**

The amount of fuel used in a grate-fired boiler shall be monitored on a current basis. The system for controlling and weighing of fuel received in the form of waste comprising automatic weigh bridges (at the entry / exit), including computer hardware and software enabling registration of the mass of waste delivered to the installation, shall function at the plant site. Fuel for a grate-fired boiler shall also be monitored with respect to the net calorific value.

- **Monitoring of power consumption by the auxiliaries**

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The effectiveness of power management shall be executed by:

- production of heat and power with a high efficiency,
- reduction of power consumption by the auxiliaries,
- minimization of the operation time under conditions diverting from standard ones (e.g. boiler firing process).

Power consumption by the auxiliaries shall be measured by measuring systems based on electronic meters of active power and adders. ITPFP shall be equipped with the software for reading and processing measurement data from meters. The data shall be used for optimizing heat and power production process and archived in a designated organizational unit. General auxiliaries will be fed from the auxiliary system and will partially be equipped with a metering devices or billed based on a lump sum. These amounts will be deducted from the auxiliaries and thus the amount of production auxiliaries will be determined.

Plan of actions

The Contractor of the Investment Project shall be responsible for managing environmental protection issues during the construction of ITPFP. Once the planned Investment Project is put into operation the management of environmental protection issues will be transferred to the competence of designated organizational units.

Prior to putting the plant into operation Miejskie Przedsiębiorstwo Energetyki Ciepłej in Olsztyn will apply for obtaining of the Integrated Permit for ITPFP.

The Integrated Permit specifies the requirements for use of the environment in the scope of:

- the level of gaseous and particulate pollutant emissions into the air,
- the level noise emissions in the areas subject to acoustic protection,
- waste production and methods of waste handling,
- water intake from municipal water supply system of PWiK.
- conditions to be met by wastewater discharged into drainage system of PKWiK in Olsztyn.

The application for the Integrated Permit in the case where the operation of the planned plant includes use, production or release of substances causing a risk or occurrence of possible contamination of soil, earth or underground water within the plant area shall include, pursuant to Article 2008 (2) of the Environmental Protection Act of April 7, 2001, changed according to the Act of July 11, 2014 on the change of environmental protection act and some others acts of law (Journal of Laws of August 21, 2014, item 1101), an initial report on the soil, earth and ground water contamination by substances causing a risk, a description of methods used to prevent emissions into soil, earth and ground water and suggestions regarding the method of carrying out a systematic assessment of the risk of contamination of soil, earth and underground water by substances causing a risk which may be present within the plant

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area, due to the the plant operation, or suggestions regarding the method of performing tests of soil and earth contamination by these substances as well as measurements of content of these substances in the ground water, including sampling.

19.IDENTIFICATION OF THE DIFFICULTIES RESULTING FROM SHORTAGES IN ENGINEERING OR GAPS IN THE CONTEMPORARY KNOWLEDGE, WHICH WERE ENCOUNTERED DURING ELABORATION OF THE REPORT

The technical and process solutions which will be applied in connection with the performance of ITPFP in the city of Olsztyn are known and commonly used in the power industry. Therefore, during the preparation of the Report no difficulties or gaps in the technical knowledge were encountered regarding the designed solutions. Difficulties encountered during the preparation of the report concerned, e.g. the estimation of the volume of waste at the stage of the planned Investment Project implementation, sound power levels of some equipment.

At the present pre-investment stage no specific solutions are known to be applied in the process of construction of the new Combined Heat and Power Plant. Therefore, the volume of the waste from the construction phase, specified in chapter 8.4 of the Report, is an estimated figure.

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20. SUMMARY

The environmental impact assessment carried out in this Report with regards to the project to construct the Waste-to-Energy Plant in Olsztyn, consisting of systems, facilities and infrastructure, in particular the waste to energy plant and the peak load back-up boiler house equipped with the boilers fired with natural gas or light fuel oil, leads to the conclusion that the Investment Project is advantageous considering the social and economic development of the region and protection of the environment. Considering the requirements of the regulations which, from January 1, 2015, impose an obligation to decrease the volume of biodegradable waste landfilled by further 25% compared to 1995 and the fact of Michelin CHPP withdrawal from heat supply to the MPEC Olsztyn network and resulting perspective of deficit in heat supply in 2017, the construction of ITPFP will contribute to the achievement of the following goals:

- management of the municipal waste fraction that is not recycled,
- completion of the waste management in the area of Warmińsko-Mazurskie Voivodeship — performing the role of one of the elements of municipal waste management system based on recovery of materials and management of fraction left over after the processing and treatment of mixed municipal waste, elaborated in order to: "address the problem of waste management in the area of 37 communes of the central part of Warmińsko-Mazurskie Voivodeship",
- satisfying the heat demand of the city of Olsztyn,
- reduction of the mass and volume of landfilled waste in the area of Warmińsko-Mazurskie Voivodeship,
- increasing the share of the waste recovery, including recovery of energy from waste,
- limitation of environmental hazards resulting from waste landfilling,
- limitation of the coal used for heat generation for the purposes of the whole city,
- reduction of the CO₂ and other greenhouse gases emission.
- production of electricity and heat in the waste to energy process,
- diversification of the streams of fuels used for heating the city of Olsztyn, which will be related, among other things, to the reduction of consumption of coal and increase in the energy security (combustion of waste, gas/oil, coal),
- reduction of CO₂ emissions.

The planned Investment Project will contribute to the fulfillment of both Polish and EU requirements for the waste management. Their implementation will allow to achieve the required levels of recovery and the threshold of the waste volume permitted to be landfilled under national and international laws. The Investment Project will also contribute to satisfying the heat demand of the city of Olsztyn, during the disposal of at least 50 thousand tons/year of the fuel from municipal waste

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produced by ZGOK Olsztyn and 50 thousand tons from other RIPOK plants in the voivodeship. The construction of ITPFP is compliant with national, voivodeship and municipal strategic documents.

Technology of combustion of fuel from waste in the grate-fired boiler equipped with environment protection systems will contribute to minimization of the impact on the environment in the vicinity of ITPFP. Generation of heat and electricity based on the combustion of fuel from waste will contribute to the reduction of the volume of landfilled waste in the Warmińsko-Mazurskie Voivodeship and decrease in the amount of heat generated for the purpose of the municipal district heating system of the city of Olsztyn based on fossil fuels, such as hard coal whose combustion in the grate-fired boilers is a source of much higher emission of gaseous and particulate pollutants to the air than the combustion of fuel from municipal waste. Therefore, the lower coal consumption can be expected to result in the improvement of the quality of the air in the city.

Gas and dust pollutants will be emitted to air as a result of combustion of fuel from waste in the grate-fired boiler. The most significant pollutants are sulfur dioxide, nitrogen oxides, suspended dust, heavy metals, dioxins and furans. These pollutants will be reduced in high-efficiency plants using sorbents in the following manner: sulfur dioxide and other acidic flue gas components (HF, HCl) in a semi-dry flue gas desulfurization plant with lime or hydrated lime dosed as sorbent; dust and heavy metals it contains - in a high-efficiency bag filter. In order to limit the nitrogen oxide emission, a flue gas denitrification plant will be used, with ammonia water or carbamide used as reacting substances. Activated carbon will be injected into the plant between the reactor and the bag filter to adsorb mercury, dioxins and furans. Reactions of the reduction of the amount of harmful substances from flue gas will take place in both the flue gas ducts and on the bag filter surface. The air quality protection systems will ensure compliance with the emission standards specified in the Directive 2010/75/EU of the European Parliament and of the Council of November 24, 2010 on industrial emissions and in the Ordinance of the Minister of Environment of November 4, 2014 on emission standards for certain plants, fuel combustion sources and waste firing or co-firing equipment (Journal of Laws of November 7, 2014, item 1546).

The prospective Investment Project will not make a direct use of the surface and groundwater sources. Water for the needs of ITPFP operation will be taken from the water supply main of PWiK in Olsztyn. Industrial wastewater will be discharged to PWiK on terms and conditions agreed with the utility company. The general wastewater management diagram is presented in Appendix No. 8. The solutions concerning the method of water intake and wastewater discharge will not cause any changes in the water ecosystems and will not have any negative impact on the groundwater environment

During the operation of the grate-fired boiler, the furnace waste will be generated. Such waste will be used as beneficially as possible. The furnace waste will be transferred to companies holding relevant

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permits in order to be used further. During the operation of ITPFP the waste belonging to the following categories will be generated:

- **process waste**, generated in the production processes in the fuel combustion plant and in auxiliary systems,
- **operation and maintenance waste**, produced during operation, overhauls (also during construction and overhauls of civil structures) and maintenance of equipment operated in the CHPP,
- **packaging waste**, generated as a result of unpacking materials and raw materials,
- **personnel work-related waste** (including office waste), generated as a result of operating personnel work and the waste generated during maintaining cleanliness and order (municipal waste).

The following furnace waste will be generated in the grate-fired boiler: slag, fly ash and other flue gas treatment products.

- 19 01 12 Slags and furnace ashes other than 19 01 11,
- 19 01 15* Boiler dust containing hazardous substances,
- 19 01 13* Fly ash containing hazardous substances,
- 19 01 07* Solid waste from exhaust gas cleaning,

(*) means hazardous waste.

The slag considered as non-hazardous waste will be collected by specialist companies after the seasoning process (alternatively, it shall be allowed to have the slag collected by specialist companies, without seasoning). Seasoning is aimed at improvement of slag properties, mainly at reduction of metal leachability and stabilization of the waste. After 6 to 8 weeks, the slag can be used as an additive to bitumen and can be collected by buyers using trucks. Hazardous waste in the form of ash and waste from the Flue Gas Treatment Plant will undergo the stabilization process during which the waste physical and chemical properties will be altered. The post-stabilization product is not to be considered as hazardous and, depending on the stabilization process, it can be stored on landfills for non-hazardous waste (alternatively, it will be collected by specialist companies, without the stabilization process). The waste generated in the stabilization process may be deposited at the landfill in Wysieka which is planned to be extended. The landfill in Wysieka will act as the regional landfill where mainly the waste remaining after the processes of recovery and neutralization of waste from ITPFP in Olsztyn will be stored.

ITPFP will be a plant in constant operation. The noise level emitted to the surrounding environment by the machines and equipment operated during the process of energy generation will be similar in the daytime and nighttime, and it will strictly depend on the quantity of the noise sources operating simultaneously. Differences in the level of emitted noise during twenty four hours may arise, among

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others, from the road transport which takes place during the daytime only. Due to the applicable acoustic requirements, the selection of technical solutions for individual facilities and equipment is of great importance. Appropriate selection of civil engineering solutions regarding adequate sound reduction indexes of the space dividers and other protections that will constitute equally significant measures reducing the noise emission to the environment is also important. Large distance to the nearest development and ITPFP location in the industrial areas will ensure compliance with the acoustic standards.

Construction of ITPFP will not violate the rules and regulations regarding the protection of the protected areas under the environmental protection act. It will not have any negative impact on the NATURA 2000 ecological network. The analysis of process variants of the heat and electricity generation in the location selected by the Investor, carried out in the Report, indicates that the variant requested by the Investor is at the same time the variant which is most advantageous for the environment. The location of the planned Investment Project is very beneficial, both due to being situated in the industrial areas and due to the distance from the nearest residential development. The area where ITPFP will be constructed is owned by Miejskie Przedsiębiorstwo Energetyki Ciepłej in Olsztyn and was entered by Resolution No. LIII/866/14 of the Council of the City of Olsztyn on enactment of the local development plan as the CEO category industrial building area - areas intended for buildings and equipment for heat and electrical power generation and for waste management.

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21. CONCLUSIONS

- This Report discusses the environmental impact assessment carried out for the purpose of obtaining the Decision on environmental constraints for the project named: "Construction of a waste-to-energy plant processing combustible fraction produced in municipal waste treatment process, ensuring energy recovery and heat supplies for the citizens of Olsztyn, including accompanying infrastructure".
- The report covers all systems, facilities and infrastructure planned to be located on the premises of MPEC at ul. Lubelska 48 in Olsztyn, including in particular the waste to energy plant and the peak load back-up boiler house equipped with the boilers fired with natural gas or light fuel oil.
- Pursuant to the law the planned Investment Project belongs to the category which requires an environmental impact assessment and preparation of the report on the completed assessment, due to the type and size: "the plants for recovery and neutralization of non-hazardous waste with use of the processes of Waste-to-Energy process, cracking process, physico-chemical treatment of waste with capacity not lower than 100 ton per day, excluding the plants combusting waste in the form of biomass under the provisions on standards of emissions from plants" (the Ordinance of the Council of Ministers of November 9, 2010 on projects that may significantly impact the environment, Journal of Laws No. 213, item 1397, as amended).
- The main purpose of the planned Investment Project is to manage the municipal waste combustible fraction, including energy recovery, which will ensure the heat supply to the municipal district heating system of the city of Olsztyn and to perform the role of one of the elements of the municipal waste management system in Olsztyn which was developed to solve the problem of waste management in 37 municipalities in the central part of the Warmińsko-Mazurskie Voivodeship and the remaining parts of the voivodeship, with as little environmental impact as possible, using the Best Available Techniques (BAT).
- ITPFP will generate the heat and electricity based on the combustion of fuel from waste, which will contribute to the reduction of the volume of landfilled in the Warmińsko-Mazurskie Voivodeship and decrease in the amount of heat generated for the purpose of the municipal district heating system of the city of Olsztyn based on fossil fuels. The lower consumption of coal should be expected to significantly reduce the emission of pollutants into the air associated with providing the heating for the city.
- ITPFP will be implemented in the area to which the Investor has a legal title, in the city of Olsztyn (Warmińsko-Mazurskie Voivodeship).
- The planned Investment Project will have the environmental impact due to the volume of emitted pollutants to the atmosphere, volume and type of generated waste, amount of water taken for

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process purposes, volume of discharged industrial wastewater and rain water and grey and black water, as well as the visibility of new facilities on the horizon line background.

Investment process and its environmental impact

- The planned Investment Project will be implemented in accordance with the agreed schedule and shall include the preparation of detailed building permit designs for individual works, preparation of the site, performance of construction works, erection and installation of individual pieces of equipment of the plant, performance tests, trial run and handover of the plant for operation.
- During the construction of ITPFP the pollutants will be emitted into the air as a result of using mechanical construction equipment during construction works and during transfer of earth masses. Machines used for performance of the works will be driven mainly by diesel engines and they will also be a source of pollution emission to the air during the Investment Project implementation. Typical transport pollutants will be emitted such as dust, sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons. Pollutants will be introduced to the air through low emission sources, which causes that the impact range will be very small, limited to the place of performance of the works and will not go beyond the boundaries of the area to which the Investor holds a legal title.
- The impact on surface and groundwater in the phase of the planned Investment Project implementation may be connected with possible necessity to drain excavations for the foundations of the facilities and may result from possible occurrence of a failure of technical equipment. In accordance with the results of the performed environmental impact analysis, the construction of ITPFP will have no permanent impact on the groundwater condition and will have no impact on the surface water. The composition of rain water pollution infiltrating into soil during construction works shall not deviate basically from the current level of rain water pollution on the same site, under the provision that heavy equipment shall be kept in good technical condition and clean during works execution.
- If the operation of the planned plant includes the use, generation or release of substances causing hazard and possible occurrence of pollution of soil, earth or underground water in the area of the plant, an initial report will have to be prepared at the stage of obtaining an integrated permit, which report will include information on the condition of the soil and groundwater pollution with such substances.
- In total, during the Investment Project implementation, approx. 380 Mg of non-hazardous waste and approx. 7 Mg of hazardous waste may be generated. All waste generated at this stage of the Investment Project implementation will be collected selectively in designated places in bulk

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or in containers provided by companies that are authorized to collect it. Hazardous waste will be collected in a separate, tight and closable container protected against access of unauthorized persons.

- During the planned Investment Project implementation a periodic increase in sound level may occur in the immediate vicinity of the construction site, at the daytime only (some works may also be performed at night, including the works which require this due to the technology and such that do not generate excessive noise). The equipment used for performed works shall have the acoustic power lower than the equipment related to the normal operation of the plant, therefore no significant impact of the construction phase on the acoustic climate of the protected areas is expected. Adverse impact of the Investment Project in its implementation phase shall be within the boundaries of the area to which the Investor has a legal title.

Impact on air pollution

- The following sources of gaseous and particulate emissions into the air will be operated on the premises of ITPFP:
 - grate-fired boiler with thermal power of ca. 48 MW_t in fuel input, fired with fuel from municipal waste, the flue gas of which will be discharged to the air via E - 1 emission source with the height of $h \geq 60$ m and outlet diameter of ≤ 2 m;
 - two peak load back-up boilers, each with ca. 38 MW_t in power output, fired with natural gas or light fuel oil as an alternative; the flue gas produced in the boilers will be discharged into the air via E-2 double-duct emission source, with the height of $h \geq 25$ m and outlet diameter of ≤ 1.3 m for each duct;
 - fly ash retention tank which shall have a capacity of $V = 300 \text{ m}^3$; the carrier air will be introduced to the air through a filter, emission source with the height of $h = 22$ m and a diameter of $d = 0.4$ m;
 - sorbent retention tank which shall have a capacity of $V = 150 \text{ m}^3$; the carrier air will be introduced to the air through a filter, emission source with the height of $h = 14$ m and diameter of $d = 0.3$ m;
 - source operating only in emergency situations:

Diesel generator set with thermal power of 0.85 MW_t in fuel input, running on diesel oil and used to enable emergency start-up or safe shutdown of the unit equipment in blackout conditions; the flue gas from the generator will be discharged into the air via an emission source with the height of $h = 5.0$ m and diameter of $d = 125$ mm;

- The prospective Investment Project will be designed so as to simultaneously ensure compliance with the emission values resulting from the Directive 2010/75/EU of the European Parliament

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and of the Council of November 24, 2010 on industrial emissions (IED) and from the Ordinance of the Minister of Environment of November 4, 2014 on emission standards for certain plants, fuel combustion sources and waste firing or co-firing equipment (Journal of Laws of November 7, 2014, item 1546).

- Emission of pollutants from other emission sources shall not exceed the following values:
- peak load back-up boilers:
 - sulfur dioxide - 35 / 850 mg/m³_u,
 - nitrogen dioxide - 150 / 400 mg/m³_u,
 - dust - 5 / 50 mg/m³_u.

* in mg/m³ of dry exhaust gases in contractual conditions with 3% content of the oxygen

.../... - emission standard for the gas combustion/emission standard for light fuel oil combustion

sorbent retention tank:

- dust - 20 mg/m³_u.

fly ash retention tank:

- dust - 20 mg/m³_u.

- Currently, the quality of air in the city of Olsztyn is proper. The average annual concentrations of tested pollutants do not exceed the admissible values specified in the Ordinance of the Minister of Environment of January 26, 2010 on reference values for certain substances in the air (Journal of Laws No. 16, item 87).
- In 2013 the target level of benzo(a)pyrene in PM10 particulate matter in each of the three zones was exceeded. The main cause of the level exceeding was increased pollution emission from municipal sources due to adverse weather conditions in winter and combustion of the heating materials of poor quality in less efficient furnaces.
- Values of the concentrations of the analyzed air pollutants in the air, generated by the operation of ITPFP, were calculated for the standard (resulting from the emission standards) emission values of gases and dusts released to the air from emission sources and based on the data of the manufacturers of the dedusting equipment for retention tanks, which will be operated on the premises of the plant. Such approach shows the maximum possible, under the law, impact of the planned Investment Project on the air quality in the area of potential impact of the plant.
- In the event of shortages in gas supply, if the light fuel oil is combusted in the boilers in the peak load back-up boiler house, the concentrations of sulfur dioxide, nitrogen oxides and dust in the air will increase in the area of potential impact of ITPFP, however, the admissible concentrations of pollutants in the air shall still be met.

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- The results of the calculations show that following the plant start-up the permissible values of pollutant concentration in the air will be met both at the ground level and at a height of 3 m above ground level.
- The range of maximum values of concentrations of pollutants in the air, generated by the operation of ITPFP will be approx. 500 meters regarding the emission of analyzed pollutants.
- The calculated concentration values of the analyzed air pollutants generated due to operation of ITPFP prove that the new plant will not cause an increase in the annual average concentration of the air pollutants compared to values specified in the law as permissible, the classification of zones will not change in the Warmińsko-Mazurskie Voivodeship due to the pollutants tested by the Voivodeship Inspectorate of Environmental Protection.
- The prospective Investment Project will not be a nuisance for the neighboring countries in terms of emission of gaseous and particulate pollutants to the air. Values of concentrations of the analyzed pollutants at the state border with Russia will be very low and will not exceed the values defined as permissible in the Member States of the European Union and specified as permissible by the World Health Organization (WHO).
- The operation of the planned Investment Project will have no adverse impact on the health of people living in the area of its potential impact. The annual average concentrations of the analyzed pollutants will not exceed the permissible, regarding the protection of human health, level of concentrations specified in relevant laws.
- The operation of the planned Investment Project will have no adverse impact on the vegetation in the area of its potential impact. The annual average concentrations of the analyzed pollutants will not exceed the permissible, regarding the protection of vegetation, level of concentrations specified in relevant laws.

Water and wastewater management

- The water and wastewater management concept at ITPFP will be based on water intake from the PWiK network and industrial wastewater discharge to the PWiK sewerage system in Olsztyn.
- The water in the process cycles will circulate in a closed circuit, yet for correct operation of the equipment it will be necessary to recondition the cycle by discharging a part of water from the circuit. Wastewater from water and steam circulation desalination will be mainly discharged for the purposes of furnace waste management.
- The planned Investment Project will be equipped with the sewage system, the kind and parameters of which will be defined in technical conditions of connection. The quality of treated wastewater produced during operation of ITPFP will comply with the requirements specified in the Ordinance of the Minister of Construction of July 14, 2006 on the manner of performing the

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obligations of industrial wastewater suppliers and conditions for discharging wastewater into drainage facilities and in the contract between the entity discharging the wastewater and Przedsiębiorstwo Wodociągów i Kanalizacji in Olsztyn.

- The pre-treated industrial wastewater discharged to PWiK drainage facilities will not affect the surface and groundwater within the potential impact area of the prospective Investment Project. The pre-treated rain water and thaw water will comply with the requirements set forth in the Ordinance of the Minister of Environment of November 18, 2014 on conditions to be fulfilled while discharging wastewater to the water or ground, and on substances particularly harmful to water environment,
- The method of discharging the industrial wastewater, rain water and thaw water discharged from ITPFP will not cause any damage to the water environment and will not be hinder the water use by other users.
- The water for domestic and process purposes will be supplied based on the contract with the network operator.

Waste management

- The process of energy generation in ITPFP will be based on the combustion of the fuel from waste in the grate-fired boiler and will also be a source of waste generation.
- During the operation of ITPFP, the furnace waste shall be generated with codes: 19 01 12, 19 01 15, 19 01 13, 19 01 07.
- The waste will also be generated due to the necessity to maintain the facilities in good technical condition. This will include mainly used oil, damaged and worn elements of plant equipment, used packaging.
- Part of the waste will also be generated in the process of preparation of water for steam production as well as in connection with the treatment of industrial wastewater, rain water and thaw water.
- Other waste shall include construction and overhaul waste generated during overhaul activities and typical waste produced during business operations.
- The waste will be handed over for recovery or neutralization to entities holding necessary permits to collect, transport and neutralize the waste.
- Furnace waste will be stored in retention tanks.
- Slag will be subject to seasoning which allows for using it as an additive for bitumen production (optionally it is allowed to collect waste by specialist companies without carrying out the process of seasoning).
- Hazardous waste of ashes and waste from flue gas treatment plant will be subject to the process of stabilization which will change the properties of waste in such a way that it will be possible to

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store waste at storage areas for waste other than hazardous and neutral (optionally it is allowed to collect the waste by specialist companies without carrying out the process of seasoning).

- To reduce nuisance of the waste generated as a result of the operation of ITPFP for the environment, in particular the negative impact on the ground surface, the maximum utilization of the generated waste as a raw material or semi-finished product in other processes and minimization of the volume of landfilled waste are planned.

Impact on the noise level in the environment

The main emission sources on ITPFP premises will be as follows: Waste bunker - enclosed source

- ID fan - point source
- Dry mechanical draft cooling tower - enclosed source
- Turbine hall - enclosed source
- Transformer - point source
- Solidification process building for ash and solid waste from the flue gas treatment system - enclosed source:
- Waste collection hall - enclosed source
- Workshop hall, warehouse - enclosed source
- Stack outlet - point source
- Boiler house with FGDP - enclosed source
- Peak load boiler house - enclosed source
- Turbine hall - enclosed source
- In ITPFP other potential noise sources will also operate in the form of mobile sources, e.g. delivery trucks.
- New equipment - potential noise sources will be provided with solutions reducing the noise emission to the surrounding environment.
- The closest residential areas are farmstead buildings as well as commercial and residential properties. These are not covered by the valid Local Land Development Plan. However, the immission of the noise defined on the border thereof does not exceed admissible noise levels. The calculations performed for noise propagation prove that the level of noise spreading from ITPFP into residential development areas during normal plant operation will not exceed the permissible values which are:

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- 45.0 dB in the nighttime,
- 55.0 dB in the daytime,
- Space dividers in new buildings will have the sound reduction index allowing for effective reduction of the noise emission to the surrounding environment.
- Suitable acoustic conditions specified in standard No. PN-87/B-02151/02, "Acceptable A-weighted sound level on the premises designed for human occupancy," shall be ensured inside the residential buildings located in areas not subject to noise protection, located in the areas neighboring with the new power plant, in accordance with Article 114 of the Act of April 27, 2001 – Environmental Protection Law (consolidated text, Journal of Laws of 2008, No. 25, item 150, as amended).

Electromagnetic radiation emissions

- Regarding the external environment protection, the plant such as ITPFP (facility generating electromagnetic field) should be treated as a fenced whole. The electromagnetic field generated here, being a physical factor occurring only in the place of its generation and permanently connected to it – is not subject to relocation and propagation. Regarding the people and environment protection the planned Investment Project will not cause a hazard to the surrounding environment as a result of the electromagnetic radiation.

Impact on the natural environment

- In order to reduce the negative impact of the planned Investment Project on the natural environment, the latest technologies for reduction of the emission of substances and energy to the environment will be applied.
- The nearest NATURA 2000 area, Puszcza Napiwodzko-Ramucka PHL280052, is located at a distance of approx. 6 km to the south-east from the planned Investment Project site, which limits the potential impact of ITPFP on the natural environment. The planned Investment Project site is not of significant natural value.
- The planned Investment Project will not have the negative impact on the surrounding nature, including flora, fauna, habitats and protected areas, including the NATURA 2000 network. The condition of habitats and natural habitats in NATURA 2000 areas will not deteriorate as a result of the implementation of this Investment Project. The calculations of propagation of pollutants in the air have shown that the average annual levels of pollutant concentration in the region of valuable natural areas will be very low.

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Impact on the landscape

- The planned Investment Project will be implemented in the industrial areas with low landscape values. All actions to be taken will be compliant with Resolution No. LIII/866/14 of the City Council of Olsztyn dated May 28, 2014 on enactment of the Local land development plan of the area located between the railway siding, ul. Lubelska and the boundary of the city of Olsztyn named "Industrial Quarter - East 4"; The planned Investment Project will not have the negative impact on the landscape values of the city.

Monitoring

- ITPFP will be equipped with automatic monitoring of the emission of pollutants into the air. The following measurements will be carried out continuously: sulfur dioxide, nitrogen oxides, dust, carbon monoxide, hydrogen chloride, hydrogen fluoride, total carbon, oxygen content in flue gas, flue gas flow rate or flue gas dynamic pressure, flue gas temperature, flue gas pressure.
- The emission of heavy metals, dioxins and furans will be measured periodically.
- During operation of ITPFP the amount of water consumed and wastewater generated will be recorded automatically.
- During operation of ITPFP the volume of waste received for the incineration process will be recorded. The measurement of the volume of waste delivered by individual suppliers based on the indications of the weighbridge will be performed at the delivery station. Readouts from the weighbridge will be registered in the Plant computer system.
- Due to the applied protection of the groundwater environment against the penetration of any pollutants, monitoring of groundwater is not planned.
- During the operation of ITPFP the waste management will be monitored, including keeping records of the types of waste generated, volume of the generated waste of particular types and the manner of waste handling.
- During the operation of ITPFP noise emission will be measured once every two years in the noise-sensitive areas located around the plant. The measurements will be taken pursuant to the reference methodology for periodic measurements of environmental noise emitted by the plant.
- ITPFP will be equipped with a system of monitoring of processes and their optimization. The above will allow for mitigating and preventing the adverse impact of the plant on the environment as a whole.

Prevention of failures

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- Pursuant to the Ordinance of the Minister of Economy of January 31, 2006 on types and quantities of hazardous substances whose presence at the plant decides about its classification as the plant with an increased or high risk of occurrence of a serious industrial failure (Journal of Laws No. 30, item 208), the prospective Investment Project will not qualify as the plant with an increased or high risk of occurrence of a serious industrial failure.
- Emergency situations, if any, may be caused by fortuitous events such as fire, explosion or leakage of hazardous substances. On the premises of ITPFP the places were identified which are subject to the risk of potential failures and the plant design includes a series of protection devices against the possible occurrence of the failure.
- The fuel used for firing of the grate-fired boiler will be the fuel from waste, correctly conducted process of fuel combustion will not pose a hazard to the environment.
- Hazardous substances used in the processes of water treatment for the water - steam cycle and in the oil management will be stored. The tanks for collection of these substances will be protected against the possibility of penetration of pollutants to the soil and groundwater, by means of double walls and safety trays.
- Any risk related to the use of hazardous substances will be described in detail in the procedure in case of extraordinary hazards.
- Protection against uncontrolled discharge of water from fire-fighting operation carried out in the new plant area into the rain water drainage system will be provided by, among others, execution of a leakproof oil pan which can contain at least 125% of the total oil quantity, including also rainwater and water from fire-fighting operations.

Possible social conflicts

- The analysis of the impact of the planned Investment Project on individual elements of the environment, included in the Report, has shown that the operation of ITPFP should not result in the infringement of the rights of third parties, thus it will not be a source of social conflicts.
- The planned Investment Project will be provided with a system of solutions and protections ensuring compliance with the applicable standards regarding all environmental impacts, including protection against excessive noise emission, therefore its operation shall not cause any social conflicts.

Environmental compensation

- As a result of the findings included in the Report that there is no significant negative environmental impact of the planned investment if minimizing activities are taken and legal

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requirements concerning emissions to the environment are met, forms of compensating operations do not have to be determined and executed.

As a result of the analysis carried out in this Report regarding the environmental impact of the Investment Project named:

**CONSTRUCTION OF A WASTE-TO-ENERGY PLANT PROCESSING COMBUSTIBLE FRACTION
PRODUCED IN MUNICIPAL WASTE TREATMENT PROCESS, ENSURING ENERGY RECOVERY
AND HEAT SUPPLIES FOR THE CITIZENS OF OLSZTYN, INCLUDING ACCOMPANYING
INFRASTRUCTURE**

The Investor applies for the issue of the Decision on environmental constraints for the planned Investment Project.