

## Pre-Feasibility Study for Waste to Energy Plant in Poltava city

### Project background

Name of applicant	Poltava Oblast Council 'Poltavateploenergo'
Project info/Project name	Pre-Feasibility Study for Waste to Energy Plant in Poltava city
Contractor	Afry Finland Oy
Project duration	November 2021 – June 2022
Contract value	€55 000.00

### Project summary

- Project summary**

The project aimed to assess the technical and economic feasibility of the development of a Waste-to-Energy (WtE) plant in the City of Poltava. The main objective of this study was to carry out financial and energy calculations based on the latest CAPEX (capital expenditures) and OPEX (operational expenditures) information and prepare a preliminary layout for the new plant. The study covered profitability analysis and conceptual technology selection.

The scope for this pre-feasibility study included: a baseline study, technology review and description, selection of conceptual solution and estimation of plant performance, investment components and their operation and maintenance costs, financial analysis and project implementation plan.
- Project conclusions**

The main conclusion of the report is that there is 120-150kton/a of MSW (Municipal Solid Waste) available for the WtE plant from the Poltava oblast. The plant could save 19 million Nm<sup>3</sup> of natural gas annually and prevent the release of 38 000 tons of CO<sub>2</sub> emissions. Such a waste-to-energy plant is technically and economically possible to implement in Poltava. The WtE plant would be located in the Polovki district and connected to two existing DH networks.

The technological process of the Poltava WtE plant requires the following main plant sections: a waste bunker, a boiler, a turbine and flue gas treatment (FGT). The boiler is based on a reliable grate technology, which is the most commonly used technology in WtE plants. A grate boiler does not need waste pre-treatment. The FGT plant is based on semi-dry technology, which is the most competitive concept in both technological and economic terms. The FGT plant also includes a flue gas condenser (FGC) and wastewater treatment plant. The FGC recovers waste heat from flue gases and utilises waste heat in the district heating network. The investment cost estimate is €92.3 M (including DH interconnection costs).

The waste handling capacity of the Poltava WtE plant is 150 000t/a. The nominal thermal input from the waste is 34.3MW. The plant's maximum district heat rate during spring/autumn is 29.8MW and nominal net electricity power is 7.1MW. Plant pre-engineering and permitting phase will take approximately 1 year and the implementation and construction phase 2-3 years. Due to possible external financing, a fixed-price turnkey project model is recommended for the Poltava WtE.

Annual district heating production will be 172GWh/year (148 thousand Gcal/year). This represents 48% of the total DH consumption in the two interconnected DH networks (Site 1 + Tsiolkovskoho). The plant can save 19 million Nm<sup>3</sup> of natural gas annually and prevent 38 000 tons of CO<sub>2</sub> emissions.
- Impact on Human Rights and the project's Sustainable Development Goals (SDGs)**

The introduction of a WtE system in the energy and waste management value chain will have a positive impact on SDGs 7 Affordable and Clean Energy, 8 Decent Work, 9 Industry, Innovation and Infrastructure, 11 Sustainable Cities and Communities, 12 Responsible Consumption and Production and 13 Climate Action.

The plant will process 150t/y of waste, converting waste to green energy and reusing materials. Typically, WtE plants ensure a cost-effective and long-term energy supply for neighbouring industries. The plant will provide sustainable employment and help preserve the environment by working more effectively within the industry.

A WtE plant results in better air quality and greater energy efficiency, as well as considerable reductions in GHG emissions and other pollutants. WtE helps achieve policy objectives by replacing fossil fuels used by conventional power plants with

renewable energy generated from partially biodegradable residual waste. This enables WtE plants to contribute to the EU's renewable energy target under the EU 2030 Climate and Energy Framework.

WtE contributes significantly to district heating networks (about 172GWh per year). There is a major opportunity for further benefits by linking more customers of heat or process steam to the WtE plant. The WtE plant can supply heat to 48% of consumers in the city of Poltava. WtE represents a great symbiosis with renewable heat.

Overall the project positively impacts the following SDGs:



#### 4 Project deviations

Due to the Russian invasion of Ukraine, the dissemination seminar in Ukraine was postponed and the seminar organised as a site visit to a WtE plant in Vilnius, Lithuania, on 15 June 2022. The beneficiary's (Poltavateploenergo) representatives were invited by the consultant (AFRY) to visit the plant. The plant visit was organised by the plant owner, Vilniaus Kogeneracinė Jėgainė (VKJ).

The purpose of the visit was to show a modern operating WtE plant to Poltavateploenergo and its stakeholders and share the experiences from the Vilnius WtE plant project. The visit started at the plant with a quick review of the pre-feasibility study and discussions between AFRY, Poltava representatives and the plant operator. After the discussion, the plant operator organised a plant tour on the premises of the WtE plant.

#### 5 Project lessons learnt

##### Lessons learnt

The pre-feasibility study showed that it is technically and economically possible to implement a WtE plant in Poltava. The project demonstrated the importance of WtE technology from the technical and environmental perspectives. In addition, a WtE plant can save 19 million Nm<sup>3</sup> of natural gas annually and prevent the release of 38 000 tons of CO<sub>2</sub> emissions. This is a very important issue given the ongoing energy crisis in Ukraine.

Such a WtE plant can be a base-load energy source for the city of Poltava. The analysis demonstrated that the most beneficial location to maximise energy output is the Polovki district, and the heat supply will be ensured via two DH networks. The selected combustion concept of the Poltava WtE plant is a grate boiler. Grate firing is the most common solution for MSW WtE plants.

The project provided an opportunity to share experiences from the Vilnius WtE project (VJK) with Poltavateploenergo. VKJ highlighted the need to ensure appropriate procurement package controls and technical specifications during the tendering phase. The requirement for an appropriate EPC (turnkey) contractor with technical knowledge and references was highlighted in the discussions. The EPC contractor should also have good contacts in the project implementation country. Local contractors used in the project should have resources suitable for large projects. Waste management and district heating characteristics in Vilnius were also discussed between the parties.

##### Benefits of the project

The project improved cooperation between Finnish and Ukrainian experts on the important topic of WtE. Ukraine needs WtE plants not only to produce renewable energy but also to improve the environmental situation in the waste management value chain and ensure a reliable alternative energy supply to natural gas.

The project contributed to the following FUTF targets:

Consultation on policy and technology solutions – Poltava city has attracted interest from around Europe as an example of cooperation between a government and the WtE industry to achieve circular economy goals. It has provided the impetus for the Ukrainian WtE sector to invest in innovative technologies.

New technology introduction – WtE (or energy-from-waste) facilities provide a safe,

technologically advanced means of waste disposal that reduces greenhouse gases, generates clean energy and allows for metal recycling. WtE is widely recognised as a technology that can help mitigate climate change. The primary benefit of the WtE process is the utilisation of waste, and secondly it produces resource for green energy production.

Training and transfer of expertise and experiences of WtE plants – For the beneficiary Poltavateploenergo and its stakeholders, the visit to the Vilnius WtE plant provided a great opportunity to see how a modern WtE plant operates and how it can help with waste management. The visit practically supported the pre-feasibility study. The shared experiences and recommendations for project development by the plant owner in Vilnius were also valuable.

Finnish content – Finland has extensive expertise in the area of WtE plants, from consulting and engineering to project implementation and operation and performance. The project increased Finnish experts' understanding of the market conditions in Ukraine and opened opportunities for further cooperation.

### **Effectiveness of the project**

The project was implemented successfully and the project deliverables complied with the Pre-FS targets and FUTF objectives including promoting cooperation between Finland and Ukraine and identifying opportunities for projects.