Feasibility Study for construction of landfill gas collection, control and utilisation facilities at Melitopol city landfill

Project background

Name of applicant	Melitopol city council
Project info/Project name	Feasibility Study for construction of landfill gas collection, control and utilisation facilities at Melitopol city landfill
Contractor	Doranova Oy
Project duration	July 2021 – July 2022
Contract value	€75 000.00

Project summary

1 Project summary

The aim of the project was to assess the technical and economic feasibility of developing a Landfill Gas (LFG) control and utilisation project at the Melitopol city landfill in Ukraine. The objective of the Feasibility Study (FS) was to quantify the potential clean energy production capacity from landfill gas, estimate the potential of 'green tariff' allowances and calculate the potential for greenhouse gas emission (GHG) reductions. FS was expected to justify the rationale of such a project implementation and propose a general implementation plan.

The scope of the FS included: baseline study, analysis of LFG recovery, comparative analysis of LFG solutions, selection of the LFG concept, LFG to energy balances, investment plan, financial modelling, environmental review and implementation plan.

2 Project conclusions

Project results have demonstrated significant potential to collect LFG and ensure constant green electricity production for 10 to 15 years. Based on gas availability and landfill conditions, two scenarios were calculated:

(i) Scenario A – a base case in which 100% of the landfill area is covered, plant capacity – 600kWe, CAPEX – EUR 2.98M, payback time – 10.7 years.

(ii) Scenario B – 40% of the landfill area is covered, plant capacity – 400kWe, CAPEX – EUR 1.75M, payback time – 12.1 years.

Calculations have demonstrated that Scenario A would ensure better sustainability from an environmental point of view and better feasibility from a financial point of view.

With the current FIT (Feed In Tariff) programme, an investment in LFG collection and utilisation looks sustainable from both a feasibility and environmental perspective. The main risks are associated with the quality and quantity of gas that can be properly detected by degasification tests. Landfill covering conducted in accordance with European standards will ensure good gas quality over the long term.

In parallel with the LFG project, a second project was prepared within FUTF (by Deep Scan Tech Oy) to promote an innovative deep scan technology that can be used to investigate the conditions of the landfill by generating 3D pictures of soil structures to identify potential methane pockets and sources of humidity and leakages to the environment.

3 Impact on Human Rights and the project's Sustainable Development Goals (SDGs)

Providing landfill gas to an energy facility clearly contributes towards increasing access to affordable and clean energy. LFG capture and utilisation is an important step on the road to sustainable waste management, and conversion to clean energy allows the utilisation of captured methane for gas, electricity and heat production. Indirect GHG Reductions: Energy produced from LFG reduces the need to use non-renewable resources (such as coal, oil or natural gas).

Using LFG helps to reduce odours and other hazards associated with LFG emissions from the landfill and prevents methane being released into the atmosphere and contributing to climate change. Typically, an LFG energy project captures 60 to 90% of the methane generated in a landfill, depending on the system design and effectiveness. Captured methane is eventually converted into water and carbon dioxide at the final use

point. LFG systems also require a certain coverage of the landfill, hence reducing leachate water emissions caused by rainfall.

Overall the project positively impacts the following SDGs:

4 Project deviations

Delays in the project implementation schedule occurred due to the Covid 19 pandemic.

5 Project lessons learnt

Lessons learnt

The project demonstrated the importance of LFG conversion to a clean energy solution to ensure sustainable landfill management while protecting the environment and improving landfill management and the sanitary conditions of the overall landfilling process.

Landfill gas can greatly contribute to reducing GHG. An LFG system also requires covering landfill. For the Melitopol region, landfill covering and LFG utilisation will not only bring financial benefits but also reduce GHG emissions, air and groundwater pollution, odour and the risk of gas explosions.

The critical phase of the project is the sizing of the gas well network and estimation of CHP capacity; to minimise risks, more on-site studies into the gas potential are needed. For the execution phase, an experienced contractor with good knowledge of building LFG infrastructure is required. When executed and operated properly, a fully pledged investment of close to EUR 3.0 million could be paid back in about ten years.

Benefits of the project

The project improved cooperation between Finnish and Ukrainian experts on the important topic of converting landfill gas into clean energy. The project contributed to the following FUTF targets:

Consultation on policy – FS study covered the EU BATs that describe proper landfill management practices to minimise climate impact.

Consultations of the technology solutions – local landfill operators had an opportunity to learn about EU standards and approaches to the landfill gas project implementation.

New technology introduction – helped the city administration to select a realistic transition concept for project implementation.

Training and transfer of expertise and experience in landfill gas; organised workshops demonstrated how international funds are looking at potential investment projects with an emphasis on environmental reviews.

Finnish content – Finland has expertise in landfill gas management and operation of landfill facilities. 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 FS targets as well as FUTF objectives including promoting cooperation between Finland and Ukraine and identifying opportunities for projects. The project created additional opportunities for the city administration and landfill operators to approach potential international investors. International level A FS is a key document required by investors for establishing a dialog for investment project financing. The City administration team increased its capacity to prepare the necessary documentation for investment project implementation.