



Investment project – biogas plant for electricity production
(2,57 Mw_{el})

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ACTIVITY SCOPE

 Energy

 Pure water

 Energy saving



 Energy

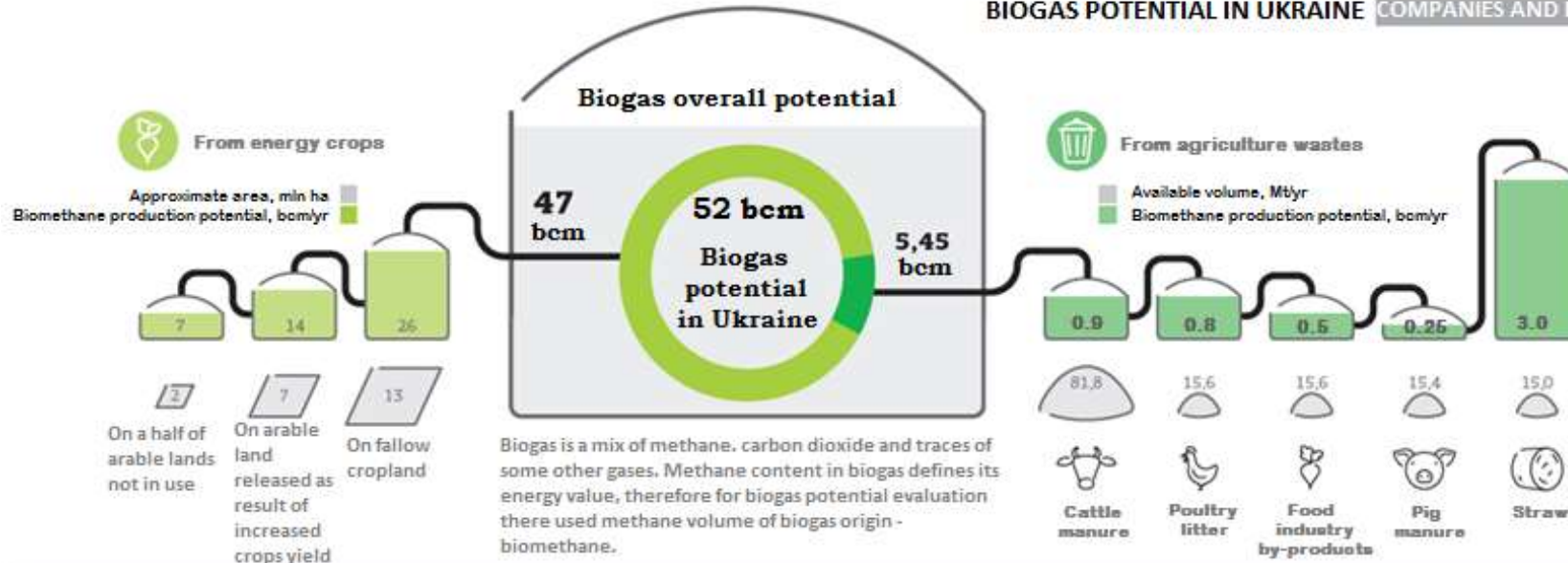
 Pure water

 Energy saving



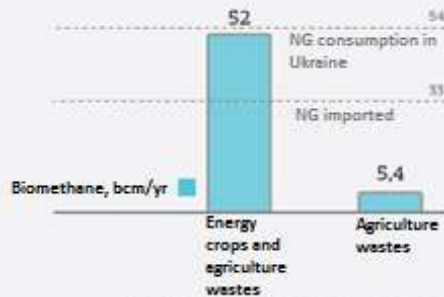
BIOGAS POTENTIAL IN UKRAINE

BIOGAS POTENTIAL IN UKRAINE COMPANIES AND INFRASTRUCTURE

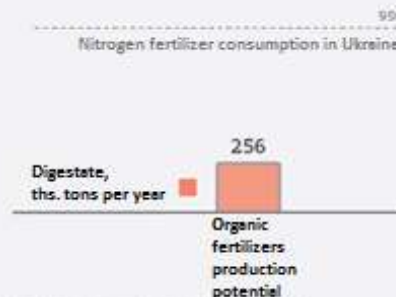


Biogas use potential

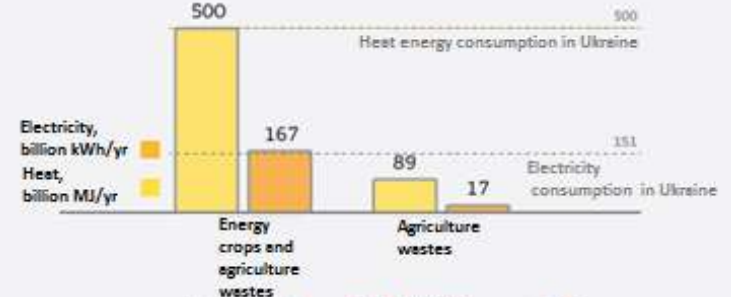
Potential for NG substitute with biomethane



Potential for mineral fertilizers substitute with organic fertilizers [4]



Potential for biogas co-generation



Джерело: Baker Tilly

¹ Загальна АЕС, налічується в Європі
² Дані в млрд тн сухого ТЗС в Україні

³ В складі субстрату для ферменту. Тільки ферментативна частка
⁴ В порівнянні із поточним рівнем

PROJECT DESCRIPTION



Location: village Semypolky, Brovarsky rayon, Kyiv oblast.

Stage I. Construction of biogas plant for combined production of heat and electricity with capacity 2,57 MW_{el}

Stage II. Biogas upgrading till natural gas quality, obtaining of additional product – CO₂ of food quality, digestate drying and selling

- Electrical energy will be sent to the grid and sold by “green tariff”
- Heat is planned for utilization by digestate drying and own plant consumption, and also for electricity production by ORC- module.
- Digestate (bio fertilizer product of digester operation) will be offered to local population and used as fertilizer for energy crops cultivation
- CO₂ will be sold to drink producers and greenhouses

Project has demonstration status. The latest European technology for crop products processing will be featured including closed loop with no CO₂ emissions to the atmosphere.

Row material: maize silage, agricultural byproducts

PROJECT PARTICIPANTS



Project will be implemented by **new company**

Participants – development by «Pro-Energy» Ltd, project operator «Verbacom-Energy» Ltd, technology and equipment by Dutch company HoSt bv .

«**Pro-Energy**» Ltd - engineering company specializing in energy efficiency, renewable energy and water purification solutions. The company offers “turn-key” projects in the field of biomass processing, industrial water purification and installation of individual heat points, participates in the implementation of the World Bank, EBRD, NEFCO projects including “warm loans” program

«**Verbacom-Energy**» Ltd – agrarian company working in the field of bioenergy and specializing in the cultivation of energy plants. In 2016, the company started energy willow and acacia plantations and has plans for willow on area about 1,500 hectares. From next year it is planned to grow silage maize on 1000 hectares for biogas production.

HoSt bv – Dutch developer of biogas plants with 25 years of experience. More than 100 projects throughout Europe have been implemented. Total installed capacity of implemented projects - about 40 MW_{el} (from 51kW to 5MW) Output of biogas upgrading is more than 4 000 m³/h.



www.pro-energy.com.ua



PROJECT PARTICIPANTS



Participants

Main success factors

Functions



- Partner with agricultural experience;
- Base for maize silage cultivation, well-established relationships in the region

- Production of raw material for biogas plant;
- Use of fertilizers
- Co-financing of the project.



- Specialization in development of solutions in the field of energy efficiency;
- Availability of experts with experience in implementation of similar projects and projects of EBRD, World Bank, NEFCO, etc .;

- Project development;
- Project management;
- Development of project documentation;
- Lending under the project;
- Technical Support;
- Co-financing



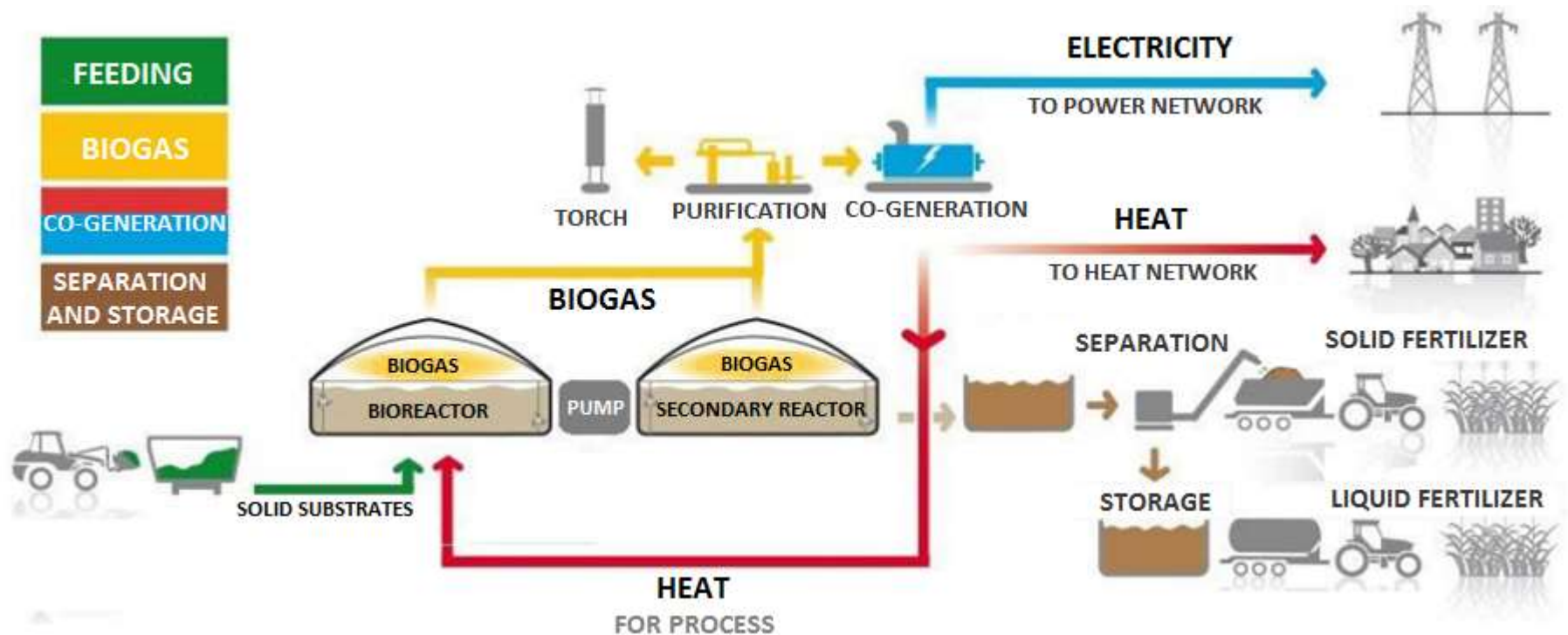
- More than 25 years of experience in the design, construction, operation and maintenance of bioenergy installations;
- The presence of implemented projects in similar climatic conditions.

- Engineering;
- Delivery of main equipment as EPC contractor;
- Support

Technology Stage I. Implementation 2018-2019

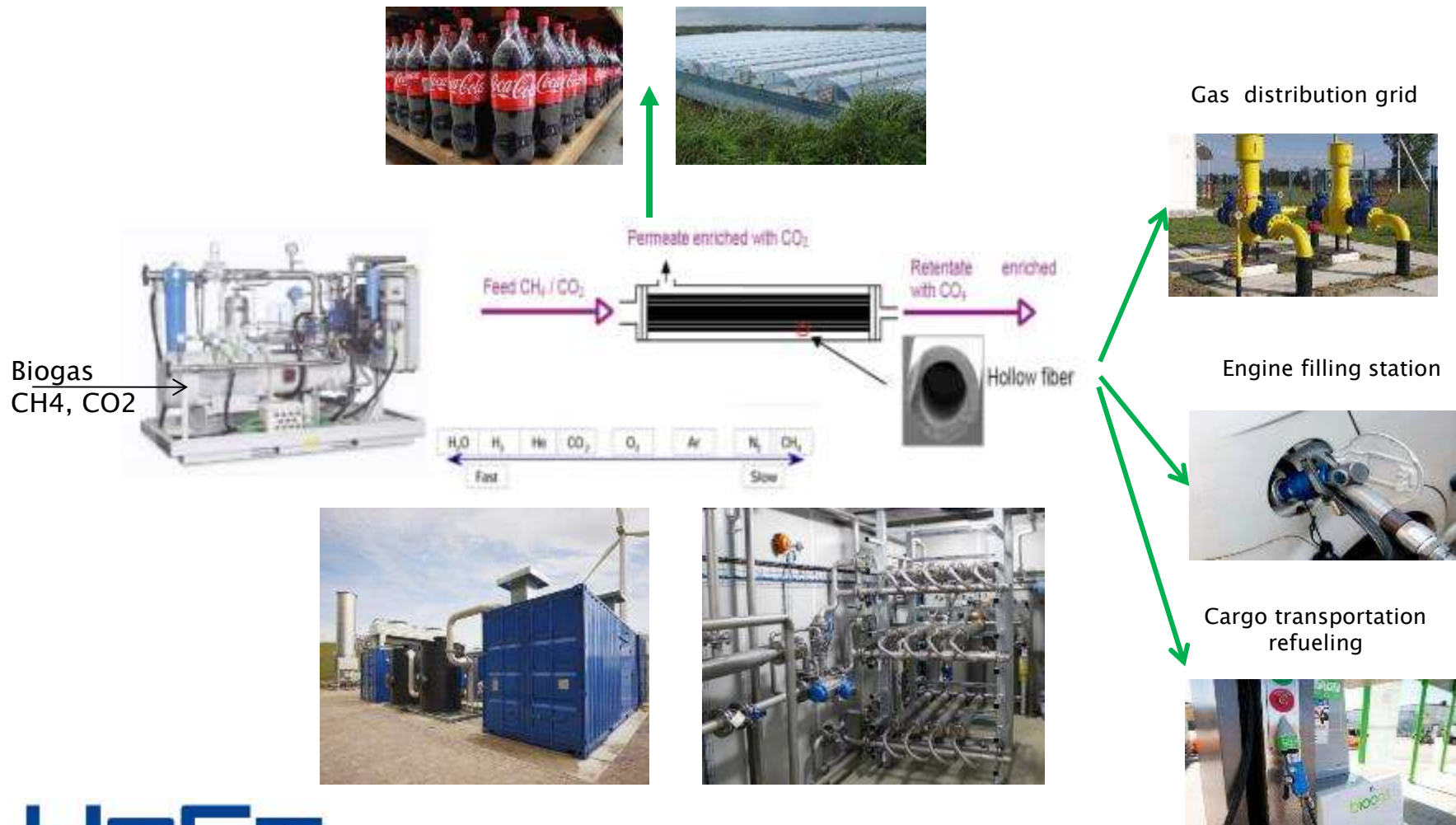
Bioenergy technology with advanced mixing and treatment systems. Allows biogas production from organic products, including straw, grass and plant residuals developed by Dutch company "HoSt.bv."

- Raw material comes from the fields and delivered to oxygen-free reactor
- Process leads to biogas allocation collected under the sealed dome and burned in CHP unit for electricity and heat
- Digested product is separated into solid and liquid bio-fertilizers
- Fertilizers are introduced into the fields for energy crops cultivation



Technology Stage II. Implementation 2020-2021

Biogas upgrading till biomethane and food quality CO₂ production



SIMILAR PROJECTS



Chernozemen (Bulgaria)

Capacity – 1,56 MW

Raw material – maize silage – 25 000 tons,
liquid cattle manure – 25 000 tons

Specifics:

Silage - P/E sleeves, collection radius up to 250 km.

Manure - collection radius - 70 km.



Elough (England) (06.2013-04.2014)

Raw material:

sugar beet pulp, maize silage

Amount of raw materials is 85,000 tons/year

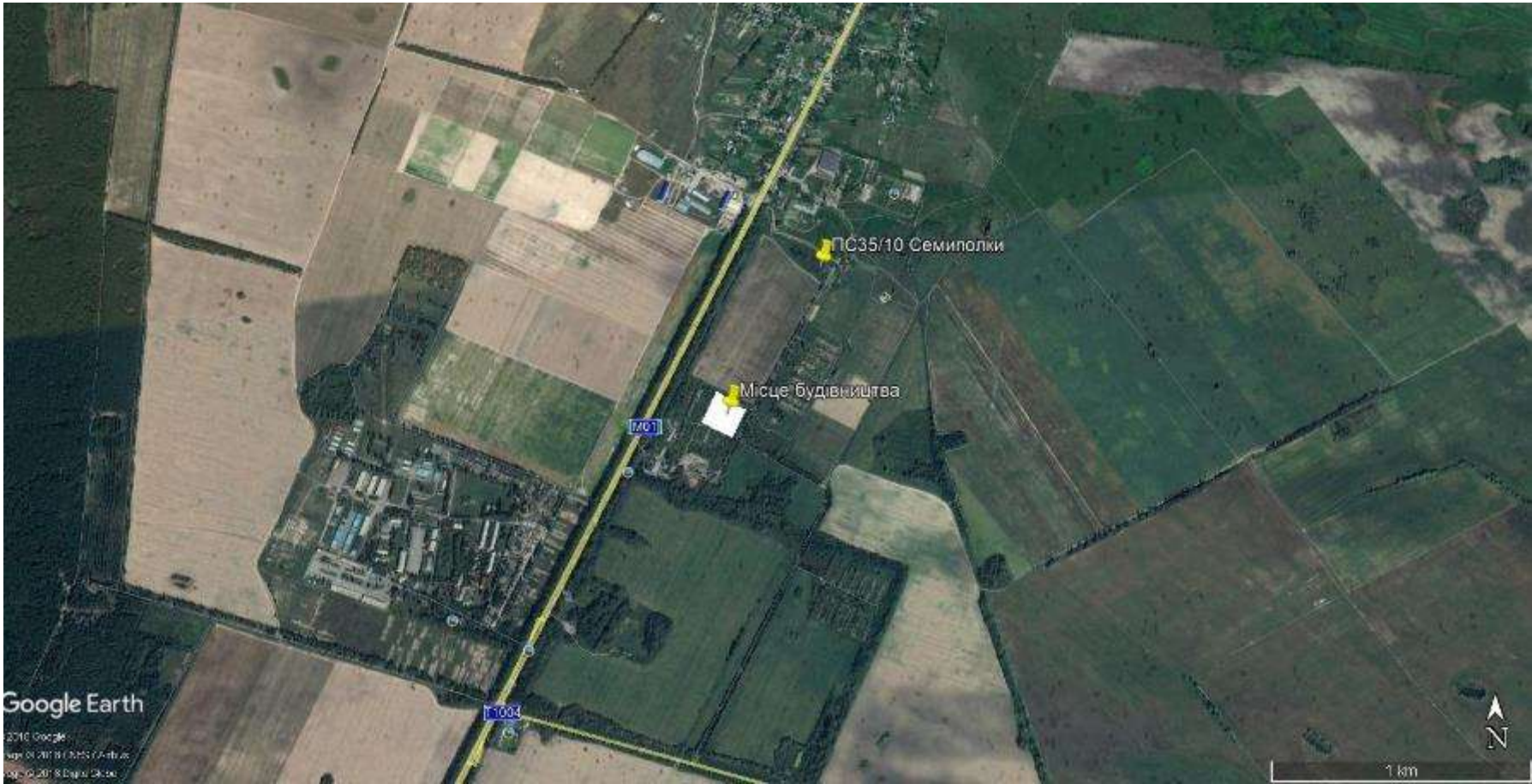
Production of biomethane - 1100 Nm³/year + CHP 499 kW

Power potential - about 5 MW.

Purpose: biogas upgrading and feed into main gas pipelines



CONSTRUCTION LOCATION



SANITARY ZONE



CONNECTION POINT



LOCATION PLAN



Technical parameters of biogas plant

Biogas plant	Units	2 ,57MW el
INPUT DATA		
Operation hours	hours/year	8 000
Raw material		Maize silage
Total capacity of CHP unit	MW	2 x 1,2
Total capacity of ORC unit	kW	170
Biogas production	m3/year	8 853 140
Methane content in biogas	%	54
Annual biomethane production	m3/year	4 780 696
ENERGY BALANCE		
CHP gross	kWh/year	19 200 000
ORC gross	kWh/year	1 360 000
Own plant consumption	kWh/year	1 360 000
Own ORC consumption	kWh/year	120 000
ELECTRICAL ENERGY NET	kWh/year	19 080 000
PRICES		
Electricity by green tariff	EUR/kWh	0,124
Digestate liquid	EUR/t	1,07
Digestate solid	EUR/t	4,21



Investment and operation expenses

Biogas plant	Units	2 MW el
CAPEX		
Connection to power grid (design, obtaining of technical conditions, green tariff etc.)	EURO	€ 82 049
Payment for the connection to power grid (needs adjustment)	EURO	€ 335 832
Design	EURO	€ 40 379
Construction	EURO	€ 3 772 665
Earthworks and landscaping	EURO	€ 172 628
Lagoons for collection of liquid fraction + mixing equipment	EURO	€ 63 791
Silage	EURO	€ 546 061
Transportation	EURO	€ 550 000
<i>Unpredictable expenses (5%)</i>	EURO	€ 278 170
Taxes	EURO	€ 42 348
Total without VAT	EURO	€ 5 883 922
Total with VAT	EURO	€ 7 060 707
OPEX		
General operation cost (operators, spent materials)	EUR/year	€ 173 800
Raw materials cost	EUR/year	€ 1 150 000
CHP service	EUR/year	€ 227 981
Total	EUR/year	€ 1 551 781

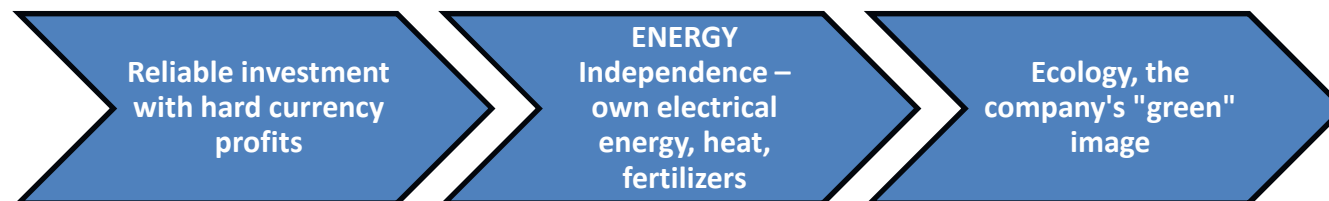
Project payback



Biogas plant	Units	2,57 MW el
Total project cost with VAT	Euro	€ 7 016 909
Own input - 30%	Euro	€ 2 233 174
Loan -70%	Euro	€ 4 783 735
Interest rate	%	7
Loan duration	months	84
Expected incomes		
Electricity sale	EUR/year	€ 2 365 920
Digestate sale	EUR/year	€ 130 692
Project efficiency parameters		
Discount rate	%	11
Net Present Value, NPV	%	2 486 302
Internal Rate of Return, IRR	%	17
Simple Payback Period	Years	6,2
Operational Income (without VAT) 2019-2029	Euro	8 070 190
Average Annual EBITDA (without VAT)	Euro	733 654
ROI	%	13
ROE	%	43

Advantages of the project

- Biogas plant is **the source of its own stable renewable electrical and thermal energy** for the enterprise. The most important tool for company's energy independence.
- **The source of hard currency earnings** for the company. Green tariff is fixed in Euros, and indexation is conducted quarterly for leveling exchange rate changes.
- **Investment project** that allows diversifying the assets of the owners.
- Biogas fermentation residuals (so-called digestate) is **a high-quality organic fertilizer**, which exceeds the properties of mineral fertilizers and cattle manure.
- **Solving of numerous environmental problems** associated with emission of methane and CO₂ into the atmosphere, unpleasant odors (respectively, relations with the local population).
- "Green" projects that improve the environment - an integral attribute of modern western-oriented business.





**Thank you
for your attention!**



pro energy

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