



Co-funded by the Intelligent Energy Europe
Programme of the European Union

Application of 'smallBIOGAS' to 3 pilot case studies in Poland

BIOGAS³

Sustainable small-scale biogas production from agro-food waste
for energy self-sufficiency

Date:

August 2014

Authors:

BIOGAS³ Consortium

DATA OF THE PROJECT:

Programme	Intelligent Energy Europe (IEE) - ALTENER
Key action	Promotion and dissemination projects
Grant Agreement	IEE/13/477/SI2.675801
Start / end date	1 st March 2014 – 28 th February 2016

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General statements

The tool smallBIOGAS has been tested in three pilot case studies for the next countries: France, Germany, Italy, Ireland, Poland, Spain and Sweden.

The pilot cases presented have been carried out in order to test the tool and evaluate the viability of small-scale AD installations under different scenarios in the mentioned countries. The data used to create the scenarios has been obtained from the questionnaires (task 2.2) and additional companies interested in the project BIOGAS³.

As a result of pilot cases application, all the partners have prepared a list of remarks and comments regarding functionality of the tool, as well as suggestions for modifications. The remarks and suggestions have been - where possible – applied for the tool improvement.

In addition to that, it is possible to identify small-scale AD viable scenarios. Next, it has been included the main conclusions related to viability of small-scale AD in **Poland**.

In case of Poland, in terms of investment profitability, the Pilot study 1: Farm - plant production (244) – a ca. 20 kW_{el} biogas plant with CHP, based on relatively highly energetic plant substrate has proved a reasonable payback period of 6,3 years in case of self consumption scenario and 30% subsidy to the investment (which is viable in Poland). However, the second pilot case – based on smaller amounts of available substrates or lower biogas potential of the substrates, the biogas plants of ca. 5-7 kW_{el} have shown very long payback periods in case of energy sale scenario; in case of energy self consumption the needs were bigger than the energy production from the biogas (in this case the software does not provide solutions or economic analysis). It maybe concluded that agro-food companies having so small amounts of substrates available (or poorly energetic substrates) should consider cooperative solutions or search for co-substrate providers in order to reach an economically feasible size of a biogas plant.

The detail of each pilot case will be presented one by one in the annexes of this document. All are available in Polish language.

Annexes: Results of the application of `smallBIOGAS` to 3 pilot case studies in Poland (pdf-files)

As a result of the application of `smallBIOGAS`, two pdf-files for each pilot case study have been created. The reference file number includes also the letter 'S' in case of pdf-file with the summary of substrates used for the process of biogas production.

The reference file numbers for Poland are 244-BG3, 244-BG3S, 542-BG3, 542-BG3S, 546-BG3 and 546-BG3S. Below it has been included a description of the pilot case studies carried out for Poland.

Table1. Description of the case studies and agroindustry addressed

Case study						Agroindustry addressed	
Ref. Nr.	Location	Objective	Comments	Substrates	Biogas use	Farm	AFI
244-BG3	Żwiartów (Lublin Voivodeship)	The objective was to evaluate the sustainability of a biogas plant based on own substrates originating from a plant farm, without external substrates.	So far, the sugarbeet leaves have been composted or handed over (for free) to some neighbouring farms. The farm owner would like to check the possibility of making use of this residue in order to produce thermal and electric energy for self consumption. Biogas unit can be located on the farm (enough space). No additional costs of substrate and digestate transport. Digestate applied on own fields as fertiliser. The sustainability analysis has shown reasonable payback period of 6,3 years in case of 30% subsidy to the investment (which is viable in Poland).	Sugarbeet leaves silage Total amount: 750 t/year	CHP engine 21 kW	x	
542-BG	Kaleń (Lublin Voivodeship)	The objective was to evaluate the sustainability of a biogas plant based on own substrates of a small dairy farm (cattle solid manure and slurry), without external substrates, in order to produce energy for self-consumption.	So far, the cattle manure and slurry have been applied on own fields as natural fertiliser. The farm owner would like to check if it's feasible to produce energy based on the animal excrements and further use the digestate as natural fertiliser. The biogas unit can be located on the farm (enough space). No additional costs of substrate and digestate transport. The owner would like to check 2 possibilities: energy sale and energy self consumption in order to check which one is most profitable for him. The sustainability analysis has shown a very long payback period in case of energy sale scenario; in case of energy self consumption the needs were bigger than the energy production from the biogas (in this case the software does not provide solutions or economic analysis). It maybe concluded that in case of so small amounts of substrates available (or poorly energetic substrates) an owner could consider cooperative solutions or search for co-substrate providers in order to reach an economically feasible size of a biogas plant.	Cattle manure (solid) and cattle slurry Total Amount: 375 t/year	CHP engine 5 kW	x	

Case study						Agroindustry addressed	
Ref. Nr.	Location	Objective	Comments	Substrates	Biogas use	Farm	AFI
546-BG3	Radzyń Podlaski (Lublin Voivodship)	The objective was to evaluate the sustainability of a biogas plant based on the waste from a small fruit processing company, without dependence on external substrates, in order to produce electric energy for own production processes and this way to achieve the energy self-sufficiency.	The sustainability analysis has shown that the energy needs of the company are much higher than the energy production from the biogas based on own substrates - and in this case the software smallBIOGAS did not provide an economic analysis. Therefore, another scenario was analysed: energy sale (both thermal and electric). In this case, the financial analysis has shown a ca. 3-year payback period, which was very encouraging (assuming 30% of investment subsidy).	Fruit waste Total amount: 400 t/year	CHP engine 20 kW		x