Advanced biomethane production from microalgae grown in digestate from biogas plants. Project partners:

The University of Manchester	**UK (Administrative Lead, Technology Lead)** Professor Theodoropoulos at UM will be administrative and technical project lead. UM will perform microalgae cultivation at laboratory and pilot scale, cultivation process modelling and optimization and techno-economic analysis.
ALGAECYTES LIMITED	**(UK commercial partner)** Algaecytes will conduct microalgae cultivation experiments at a range of scales and will be leading bioprocess scale-up and demonstration in large-volume photobioreactors.
PrJSC “MHP EKO ENERGY”	**(UA commercial partner)** MHP will be responsible for AD experiments and scale-up and demonstration of the integrated solutions proposed.
Public Union “Bioenergy Association of Ukraine” (UABIO)	**(UA scientific partner)** UABio will be responsible for highly-productive microalgae cultivation in flat-plate photobioreactors, co-digestation of microalgae with agricultural wastes and integrated process scale-up at a specially designed green house.

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Project tasks

#	Task	Lead partner
1	An optimized cultivation process in a tubular photo-bio reactor (PBR)	UM
2	An optimized cultivation process in flat-plate PBR	UABIO
3	A validated predictive model for microalgae cultivation in PBRs	UM
4	A high productivity microalgae anaerobic digestion (AD) process for biomethane production	MHP
5	A high productivity AD process using an optimal microalgae-straw mix	UABIO
6	A robust scaled-up microalgae-to-biomethane process	MHP-Algaecytes
7	A TEA tool for validated analysis of microalgae-to-biomethane processes	UM
8	Market analysis report	MHP
9	Dissemination Activities	MHP, UABIO, UM, Algaecytes

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What is the innovation and what problem doing the project solve?

- The idea of the work is based on the hypothesis of the possibility of effective cultivation of microalgae in digestate from biogas plants, which contains the macro- and microelements necessary for the microalgae growth, with the addition of concentrated CO_2 obtained from the upgrading of biogas to biomethane, and the subsequent conversion of the harvested microalgae into biogas and biomethane. As a result, this will allow, with the help of the process of photosynthesis, to achieve a more complete conversion of organic carbon contained in raw materials for biogas production into gaseous energy carrier - CH_4.
- Microalgae containing effluent are promised to be the good co-substrate for anaerobic digestion with such substrates as straw, what in turn can stipulate further wider involvement of straw for biomethane production.

An optimized cultivation process of microalgae in a tubular and flat-plate photo-bio reactors (PBRs)

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What are the expected outcomes of the project?

- An optimized cultivation process in a tubular and flat-plate photo-bio reactors (PBRs)
- A high productivity microalgae anaerobic digestion (AD) process for biomethane production
- Pilot scale demonstrators for cultivation of microalgae and AD processes (50-100 L)
- Patent application to protect generated IP
- Validated process models
- Detailed report on process economics
- High impact publications