All-gas Newsletter 12/2015

All-gas main facts

The **All-gas Project** demonstrates the sustainable large-scale production of biofuels based on the low-cost cultivation of microalgae. The complete process chain is designed for a cultivation area of 10 hectares, with the goal of wastewater treatment becoming energy self-sufficient.

The Project (nº ENER/FP7/268208) is co-financed by the EU FP7 program with € 7,1 million.

Project participants

FCC Aqualia (Spain) as coordinator, BDI-Bio Energy International (Austria),Fraunhofer-Umsicht (Germany), HyGear (The Netherlands), University of Southampton (United Kingdom), Volkswagen (Germany).

SEVENTH FRAMEWORK PROGRAMME

More info:
www.all-gas.eu
innovacion@aqualia.es

Co-financed by the EU Commission within the FP 7 programme: "ENERGY.2010.3.4-1: Bio-fuels from algae"

The objective of the project is to develop a novel process to produce algae biofuel from wastewater and demonstrate it the full process chain on a scale of up to 10 Ha with a capacity of around 90 t/ha year.

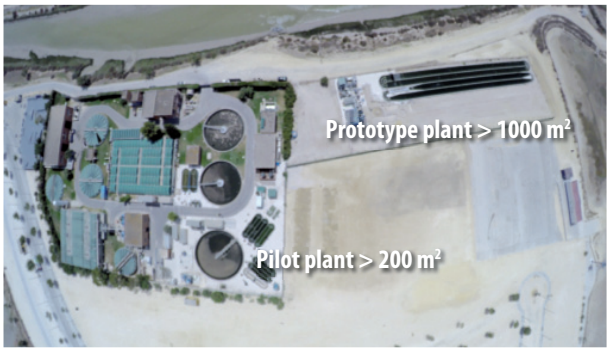
Third period approved by the EC

In July 2015 the third period report (from January 2014 to April 2015) was submitted and fully approved by the EC for a total budget requested around 1.1M€.

Prototype long term operation

Since September 2014, a full 1000m2 prototype plant is under continuous operation, the full chain of the All-gas project is implemented at this scale: from cultivation in two different raceways ponds to harvesting in dissolved air flotation plant and finally biogas production in anaerobic digesters.

Long term operation and optimization of both pilot and prototype plants decreases the economic risks implied in construction of the demo plant of various hectares, and allows to optimise the process and improve the efficiency of the production chain. Productivity above 25 g /m2 / d was confirmed, and harvesting with a concentration of 4 % with a simultaneous delivery of reuse water in retention times of less than 3 d.



Gas station ready for refuelling

During August 2015, a large anaerobic digester (25m3 effective volume) and a biogas pre-treatment plant coupled to a gas station was installed at the prototype plant, generating the biomethane needed for 1 VW car with an average consumption of 20,000 km per year.

aqualia BDI Fraunhofer HYGEAR University of Southampton

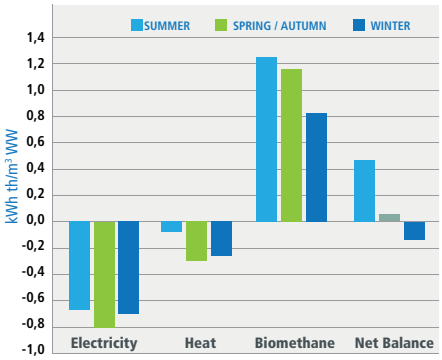
All-gas Newsletter 12/2015

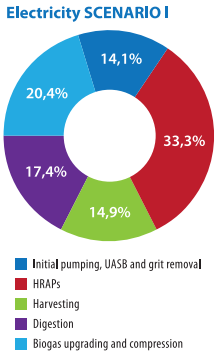
Energy balance and LCA analysis

Considering that the prototype is a representative unit of 0.1 ha, a carbon mass balance and energy balance was calculated. The electrical consumption terms are represented in the next charts to show the electric demand distribution among the different process.

Climate conditions play an important role on the process performance and efficiency. In summer conditions, algae productivity in HRAPs increases more than 3 times and HRT decreases to below 3 days. With warmer temperatures, more biogas is obtained from anaerobic pre-treatment (UASBs) and from anaerobic digestion since more algae is harvested.

A full energy self-sufficiency can be reached with a net energy output of almost 0.5 kWh th/m3. Therefore, the process presents an important potential to be implemented in warmer climates where temperatures remain high and constant along the year.

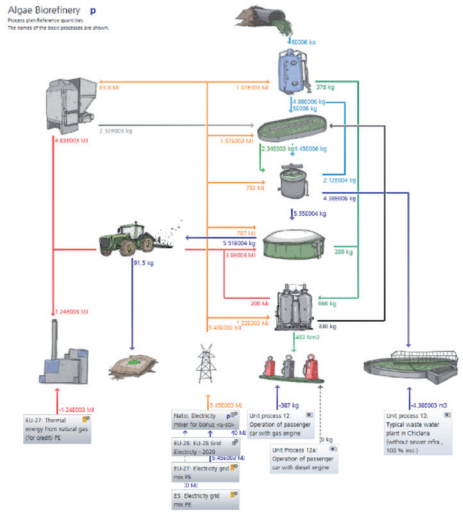




LCA analysis

Comprehensive work was done to collect reliable data of the All-gas pilot plant and to complement it with credible data from literature and engineering models as far as possible. Based on this data a first evaluation of energy, water, and land use was carried out. First results were presented in joint papers between the three projects of www.algaecluster.eu .

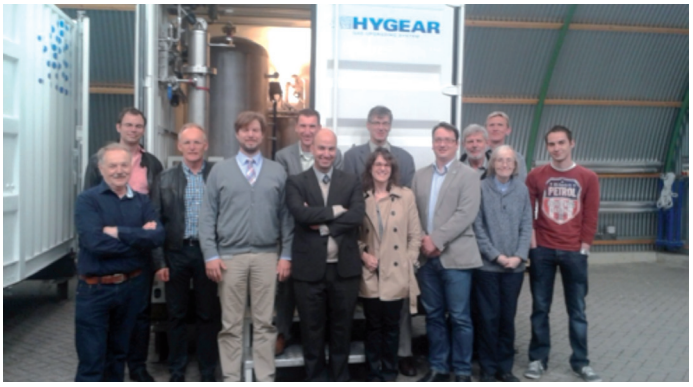
Real data was collected in cooperation with the project partners, and extrapolated to a 10 ha plant using the engineering design developed within the All-gas project. A positive energy and environmental balance can be achieved.



LCA model of the All-gas approach realized in the LCA software Gabi 6.5

General Assembly in Arnhem at HyGear facilities

The consortium held its annual technical meeting in Arnhem in May 2015 in order to conclude the 3rd period report and evaluate new results obtained by the partners. The Gas Upgrading System with Pressure Swing Adsorption (PSA) for the Demo plant is assembled for delivery to Chiclana de la Frontera.

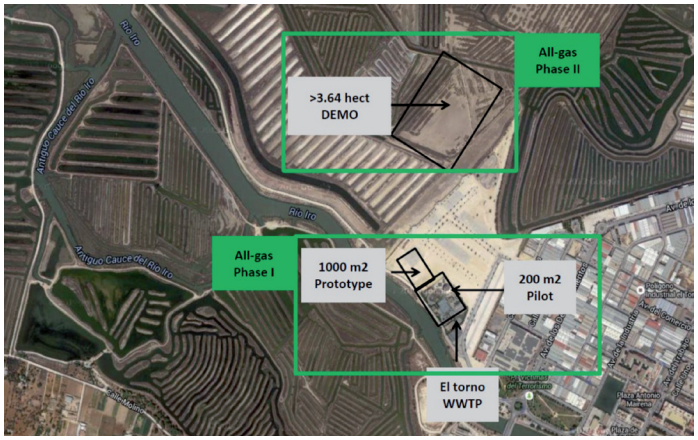


GA held Arnhem, The Netherlands May 21st 2015

Final DEMO design and construction

Permits obtained for the Representative Unit and (Demo Scale)

In September 2015, a permit for the occupation of the area necessary for the whole downstream plant (harvesting, anaerobic digestion and biogas upgrading and refueling) was received. FCC Aqualia finished the detailed engineering at the beginning of June, and the civil works are about to start. Also, a 10 year lease of a 30 ha plot in Santa Maria Teresa saline was secured, located on the right bank of the Iro river in Chiclana de la Frontera, just 800 m from the Wastewater Treatment Plant (WWTP) of El Torno, where the phase I (pilot and prototype) of the project is currently ongoing.



The first phase of the demonstration plant will be composed mainly by the following elements:

- **36 000 m² cultivation area**", using 6 conventional raceways of **5200 m²** and 1 Low Energy Algae Reactor ® **(LEAR) of 4600 m²**, with an average biomass production of 90 t/ha/year and peak production of 125 t/ha/year.
- **Harvesting:** located near the prototype next to the WWTP of El Torno.
- **Anaerobic digestion: between 2000 and 3000 m³ reactor**
- Raw biogas pretreatment and upgrading
- **VW fleet vehicles**