Development of macroalgae as a substrate for biogas production

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Aim and Deliverables

To develop technical and logistical guidelines for biogas production from marine macroalgae addressing topics of harvesting, storage and processing.
The potential methane content of different algae species from the North Sea will be determined and linked to their specific growth stage. In addition, the feasibility of a full scale system for cultivation and anaerobic digestion (AD) of macroalgae will be investigated to guarantee the sustainability and the economics of the system.

Objectives

Phase 1
Macro algae biomass availability

On going

- Identification of macroalgae available in the North Europe environment;
- Chemical composition of different algae species;


Laminaria hyperborea


Laminaria saccharina


Ascophyllum nodosum


Palmaria palmata


Alaria esculenta

In collaboration with SINTEF Fisheries and Aquaculture (Trondheim, Norway).

Phase 2
Batch digestion and pre-treatments

On going

- Biomethane potential (BMP) of different algae species;
- Impact of the algae growth season on the methane yields (1 year monitoring);
- Digestion pre-treatments (mechanical and enzymes);

320ml bottles maintain at 37° C for 60 days.

Phase 3
Long term digestion (pilot plant)

Starting July 2014

- Continuous digestion performance (8-10 months);
- Mesophilic vs Thermophilic digestion condition;
- Biogas and digestate composition;

5L digester maintained at 37° C or 52° C with online biogas production.

Phase 4
Energy output and feasibility study

Starting August 2015

- Full scale energy/costs analysis;
- Optimal flowsheet configuration: cultivation – harvesting – biomass processing – anaerobic digestion – digestate utilisation/disposal;

End March 2016

Benefits

The outcome of this work will support the implementation of macroalgae cultivation facilities for biogas fuels production in Europe. The understanding of the key challenges on macro-algae digestion will help companies on develop and design efficient integrated AD plants.