



# Meeting Minutes

---

## Meeting title

*Date:* 09-11-2017  
*Time:* 13.00-14.30  
*Location:* Phone meeting

## Participants

Rita Clancy, EURIDA  
Søren Ugil, DTI  
Anne-Belinda Bjerre, DTI  
Wolfgang Stelte, DTI  
Jaap van Hal, ECN  
Joanna Fry, ERM  
Ana Lopez Contreras, DLO  
Bert Groenendaal, SIOEN  
Benny Pycke, SIOEN

## Agenda

- Welcome
- Status of WPs
  - Presentation of Søren Ugilt Larsen, DTI who will be the new WP2 leader
- Advisory board
- Other

## Minutes of meeting

Anne Belinda Bjerre opened the meeting and welcomed all participants. This meeting should serve the purpose to prepare for the upcoming MacroFuels General Assembly end of November. There have been some administrative changes at DTI and Søren Ugil has been appointed as the new WP leader of work package 2. He



will present himself under WP2 later this meeting. He is new to the project and Anne-Belinda Bjerre asked all WP leaders to briefly introduce themselves when presenting their WPs.

## **WP1 Year round cultivation, automated harvesting, and storage/transportation of seaweed**

### **WP leader: Benny Pycke (SIOEN)**

Benny Pycke introduced himself and explained the objectives of WP1. This work package targets the advanced, large scale and year round cultivation of red, green and/or brown seaweeds as raw material for the advanced onshore biorefinery processes towards the next generation of transportation biofuels

The key task of WP1 is to produce biomass to be used for the MacroFuel processes in close cooperation with AU and SAMS, as well as long term sourcing beyond the projects lifetime. Technical textiles for seaweed cultivation, originating from the previous AT-SEA project are used for cultivation.

#### Progress:

- 2<sup>nd</sup> genuine growing season running
- More than 200 m<sup>2</sup> of nets in the water
- 8 t of biomass to be produced for fuel conversion and subsequent engine testing (SAMS)
- AU deployed in Sep/Oct
- Right now they are in the process to identify the best season for deployment
- With the current trials, we are pushing science within biomass production
- Lacking discussion about ebullition of harvested biomass

#### Discussion:

Anne-Belinda Bjerre asked whether the project milestone M1.1 “Yield of 25 kg(ww)/m<sup>2</sup>/year demonstrated at 200 m<sup>2</sup>” which is due in M24, and if it has been fulfilled already and if yes how this has been reported. Benny Pycke responded that more than 200 m<sup>2</sup> have been deployed at SAMS and that the figures for winter and summer crop are added up. The final data about the yield will be available next summer. Bert Groenendaal remarked that partners in WP1 meet on a three week basis to discuss the progress in the WP. Anne Belinda Bjerre asked whether the data from cultivation trials can be published. Jaap van Hal suggested the “Journal of applied phycology” for publishing cultivation trials. Benny Pycke explained that lots of different experiments running right now that could be used for publication. Bert Groenendaal added that they are targeting to publish results from 200 m<sup>2</sup> trials. Anne Belinda Bjerre mentioned that it is better to go for one high impact publication that split in several low impact papers. Benny Pycke agreed on that. Rita Clancy mentioned that from a WP7 point of view guideline for seaweed cultivation are required and she asked what is going on in that direction. Bert Groenendaal replied that



SIOEN is working on that as well. However project partners should keep in mind that September to December are deploying season and very busy months. From January on there is more time for working on the guidelines.

## **WP2 Conditioning, pre-treatment and storage**

### **WP leader: Søren Ugil (DTI)**

Anne-Belinda Bjerre presented the objectives of WP2 which are the processing of fresh/stored seaweeds for the production of intermediates to be converted to fuels i.e. develop methods for conditioning, pre-treatment and storage of harvested seaweed for conversion to liquid biofuels components (e.g. ethanol, butanol, furans in WP3 and WP4).

#### **Progress:**

She introduced Søren Ugil from DTI as the new WP leader. Søren Ugil gave a short presentation about himself. Søren has a background as agronomist and has worked with different plant biomass from agriculture. He has done a couple of project on ensiling of biomass (straw / wet biomass) at different scales. Lab scale ensiling at DTI is done in vacuum bags (750 g) and pilot scale (up to 2 t of biomass) is made in special designed tanks, allowing the monitoring of DM loss and effluents, and sample taking on the way. Søren thinks that these methods could be used in the project. He will first get active after New Year busy with many other project.

A number of experiments have been made at lab scale at DTI in the past year and lots of data has been collected. Dimitar Karakashev from DTI has made numerous tests on on dewatering and lab scale ensiling (biological and chemical).

Focus right now is on the planning of a new series of experiments i.e. development of an assay for testing “ensilability” of seaweed . Test are made with fresh and dry seaweed. These assay will enable an evaluation how well this seaweed can be ensiled.

Next year we go further into scale up together with other WPs. Quantities need to be discussed As WP leader Søren Ugil is aiming to arrange a WP2 meeting and have bilateral talks with all WP2 participants soon.

#### **Discussion:**

Anne-Belinda Bjerre mentioned that there is a milestone M2.1 Safe storage method for macroalgae that is due in M18. This is defined as a storage method were less than 5% of the sugars are lost under storage. Different storage methods have been looked upon such as drying, freezing, screw-pressing and ensilation. Freezing looks most promising (no loss) but not feasible for fuel production (too expensive).



WP 2 is in progress to test how efficient ensiling process for different algae types can be. Previous tests made by Dimitar Karakashev have shown that chemical ensiling might be a feasible way to preserve the sugars under storage. Although the task has not been finalized, the Milestone can be regarded as fulfilled. Freezing has been identified as the best way to preserve the sugars under storage. This is an expensive process and therefore further work looking on more cost competitive alternatives (i.e. ensiling) is needed.

### **WP3 Biochemical fuel production**

#### **WP leader: Ana Lopez (DLO)**

Ana Lopez presented the objectives of WP3. WP 3 focusses on improving the fermentative conversion of seaweeds to ethanol, acetone, butanol and ethanol mixes (ABE) and biogas. The sugar-rich fractions produced in WP2 will be used as feedstock for the fermentation processes to biofuels. The fermentability of these fractions will be tested, and feedback will be given to WP 2. Sufficient fuels will be produced for WP5 for fuel and engine testing.

Discussion: Ana Lopez asked when fermented sugar sugar hydrolysates from WP2 are available for conversion into ethanol and butanol. SAMS will produce methane.

Anne-Belinda Bejrr asked how much is needed and when. The ensiling period is at least here weeks. Ana Lopez replied that at least 1 kg of sugar is needed and that it should be calculated how much material is needed to obtain 1 kg of sugars. Anne-Belinda Bjerre stated that a production of ensiled seaweed could be possible in then first two months of 2018. Jaap van Hal remarked that Jens Legarth from FEX is doing it on larger scale and that this might be a good start. Ana Lopez thinks that FEX is using a different process – fermentation is not the same as ensilation – and that she is not sure if this is the optimal material for her tests. Anne Belinda said that DTI will send about 5 kg (dry weight) of ensiled algae biomass and that chemical and biological ensiled material is available. Ana Lopez continued that MATIS is working on organisms and that fermentation tests from alaria hydrolysate have been finished. Data can be shared with other WPs. Wageningen is making preparations for upscaling of the process.

Ana Lopez asked what the status on ethanol production scale up at DTI is?

Anne Belinda Bjerre replied that there is no update right now . The colleague working on this is currently on parental leave and do this when returning to DTI beginning of next year. It might be possible to rent equipment at DTU for ethanol production.

Jaap van Hal suggested that WP 1,2,3 and 5 should meet separately during the GA meeting in Denmark later this months to discuss the status and scale up. Anne Belinda Bjerre asked him to send input to Randi to add this into the agenda



Anne Belinda Bjerre asked about the milestone M3.2 First results on Butanol production by anaerobic fermentation. Verification is needed for milestone. Was due in M12. Jaap van Hal remarked that the Milestone should be part of a deliverable. Milestone report is in the deliverable report.

## **WP4 Thermochemical fuel production**

### **WP leader: Jaap v. Hal (ECN)**

Jaap van Hal introduced himself as the Scientific Coordinator and Project Executive officer of MacroFuels, responsible for the coordination between WPs.

The objectives of WP4 are to convert the seaweed fractions and isolated sugar into furanics based fuels, fuel additives and precursors thereof. Specifically, we aim to produce furfural based fuels from alginates and xylose, rhamnose based furanics fuels as well as demonstrate the suitability of kelp derived glucose to produce HMF based fuels. Suitable amounts of fuel will be produced of each fuel to determine which of the fuels produced is most suitable for an engine test (WP5). Based on this assessment, one of the fuels will be selected for an engine test (WP5).

He explains that he has taken over the WP4 lead from Wolter and that ECN is currently in the process to hire a new person to take care of the MacroFuels project. Regarding the The 24M Deliverable on pyrolytic conversion of sugars. All experimental work has been done apart from catalytic conversion of alginate. Not all sugars work equally good. The conversion of alginate does not seem to work that well.

Regarding the amendment of WP4: Text has been rewritten, right now under review by Avantium. All deliverables for this year in WP4 are on track.

Anne Belinda Bjerre asked whether these results, especially the ones about the alginate conversion could be reported in a publication? Jaap van Hal needs to think about it – better make it part of a bigger, more comprehensive paper. He will talk to Avantium how they feel about it.

## **WP5 Fuel suitability and by-product application tests**

### **WP leader: Jaap v. Hal (ECN)**

Jaap van Hal continued with the presentation of WP5. The objectives of this work package are: To determine the suitability of the produced fuels in the use of combustion engines To perform a combustion engine test with selected fuels from WP 3 and 4 To assess the use of the residues from the fractionation and fermentation processes, specifically the protein and the mineral fractions.



Jaap van Hal requested that an expert from DTI responsible for the engine testing should be invited to the November meeting. They should be aware when things arrive for testing.

Anne Belinda suggested that it is possible to visit the DTI engine facilities in the November meeting. She will ask Sten Frandsen to present the test stand. Only unit in Denmark for these kind of test.

Ana Lopez suggested that Monday is best day for the engine experts to join the meeting to have discussion on the requirements (WP5 meeting is important that they join)

Jaap van Hall asked about the status of the Advisory board and whether they will be invited to the meeting. Søren Kjærulff formerly working for Novozymes and now working for FEX need to be replaced with a new candidate. The advisory board should be invited at the latest for the May 2018 meeting.

He has talked with Wageningen about the analysis of residues and minerals. In January, initial fuel tests will be made. Once we get all the samples we can get going.

Follow up end of the month during the GA meeting.

## **WP6 Techno-economic and sustainability assessment**

### **WP leader: Joanna Fry (ERM)**

The WP leader Joanna Fry explained the objectives of WP6. The main objective of WP6 is to provide an economic viability assessment and a multicriteria assessment of the sustainability of substituting conventional (fossil-based) transportation fuels and currently available biofuels with seaweed-derived fuels. The sustainability assessment will take into account economic, environmental, social, health and safety, and risk aspects and will consider the entire value chain of the transportation fuels using a life cycle comparison approach.

Regarding the Techno Economic assessment, Jan Wilco from ECN is well progressing and working on modelling of hydrolysis and syrup conditioning right now. He will send a model for commenting to DLO and DTI soon. The modelling will also be presented at a seaweed conference Tuesday next week.

With respect to Social assessment, Rita Clancy is progressing well. Interviews have been prepared and industry and policy workshops are under preparation and will be arranged at ECN in December this year and at the MacroFuels conference next May. For the Environmental assessment: ERM has started modelling, awaiting input from other partners. Presented a poster at Luxembourg conference in September 2017 together with Jan Wilco from ECN. Initiating the next data collection steps. Will meet with Randi Neerup from DTI after the GA in November for further discussion

For the Risk assessment for environment, SAMS and AU are progressing as planned, register environmental impact in water, data collection at off-shore sites at AU.



Anne Belinda Bjerre asked whether the milestone M6.1 “Sustainability analysis criteria” has been fulfilled and how it has been reported. Joanna Fry replied that the milestone has been fulfilled. Jaap van Hall remarked that by accepting deliverable you accept the milestone. Milestones and deliverables are connected. Anne-Belinda Bjerre emphasized that milestones need to be specifically named in Deliverable reports . For the future it need to be written down in the deliverable that with this the deliverable fulfills a milestone.

Jaap van Hal suggested that in the upcoming progress report it should be stated how the milestones have been accomplished. The other participants agree on this solution.

## **WP7 Dissemination, communication and exploitation**

### **WP leader: Rita Clancy (EURIDIA)**

The WP leader Rita Clancy explained the objectives of WP7. The objectives of this work package are: Manage and protect the intellectual property generated in the project, Guide the exploitation of research, Generate market demand for the products or services developed, Enhance the project visibility at the local, national and international level, Show how outcomes are relevant to public, e.g. by creating jobs, positive environmental impacts, Work towards the European knowledge base on energy, blue economy and alternative fuels via targeted knowledge and data transfer, Ensure that the project results are taken up by decision-makers to influence policy-making, by industry to secure market uptake and sustainable growth of the ‘blue economy’ Connect with the scientific community to ensure project follow-up, Contribute to skills development via trainings and seminars, Maximize support and acceptance and minimize risks towards project outputs via stakeholder Engagement.

Progress:

Rita Clancy stated that we are in M18 of the project and we need to present hard results to public, scientific publications needed. Meeting in Brussels went well and EU was satisfied with dissemination so far. Need shift focus to exploitation now. What is our definition for a successful exploitation of the project results. Policy support for growing and using seaweed (license etc.) is needed.

Future users need to be convince them of economic and technical viability of seaweed based fuels.

Another focus is to secure public support and acceptance of the people for biofuels from algae.

A major shortcoming today is the Lacking policies for large seaweed cultivation.

Combining seaweed farms with other uses i.e. wind farms could be a promising scenario for integration of seaweed farming into existing businesses. Working on a roadmap (Strategy paper) is a milestone (M7.2) and due in M24. It should focus on how to maximize impact and policy support. Stakeholder meeting in December.



#### Discussion:

Bert Groenendaal is lead beneficiary for milestone M7.2. He thinks that exploitation should be seen from a broader perspective. It cannot be expected that companies come out of project. Look on individual technologies and results and how they can be exploited. He will ask WP leader for input how this report.

Anne-Blinda Bjerre reminded that input from industrial end-users is important too. Rita Clancy remarked that the projects advisory board need be included in this discussion – If possible the Advisory board should be invited to the stakeholder meeting in December.

#### **WP8 Project management**

**WP leader: Anne Belinda Bjerre (DTI)**

#### **WP8 Anne-Belinda**

Anne-Belinda Bjerre reported that the 18M mid term report has been accepted by the commission. The project officer Laura was satisfied with the progress of the project. She had a list of questions that have been answered already. Everything has been accepted by the commission.

The meeting ended at 14:30