SET-PLAN IMPLEMENTATION

The Steering Group of the SET-Plan in its last meeting on October 28th, 2010 agreed to speed-up the execution of activities of the Implementation Plans (IPs) of the European Industrial Initiatives (EIIs). It was decided to collectively identify the possibilities for launching joint actions between Member States and/or Member States and the European Commission.

The mapping exercise carried out through this questionnaire builds upon this decision of the Steering Group. It aims to identify topics for leveraging best ongoing efforts with complementary joint actions, as prioritized by the Implementation Plans. In this phase the mapping will focus on projects and activities with a total budget higher than 1 M€.

We trust that you also consider the success of this exercise important for the immediate implementation of the SET-Plan.

MAPPING OF PROJECTS, ACTIVITIES, RESOURCES AND INVESTMENTS

To which EII(s) is your project, activity, resource or investment relevant? (multiple choices are possible)

<table>
<thead>
<tr>
<th>WIND</th>
<th>SOLAR</th>
<th>GRIDS</th>
<th>CCS</th>
<th>NUCLEAR</th>
<th>BIOENERGY</th>
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A. PROJECTS AND ACTIVITIES

GENERAL INFORMATION

Name of project:  
Second generation bioethanol process: demonstration scale for the step of lignocellulosic hydrolysis and fermentation

Acronym:  
BIOLYFE

Location:  
Location of the second generation 40.000 ton/y BIOETHANOL demonstration plant: Crescentino (VC) – Italy

Project partners:  
1) Chemtex Italia – M&G (Coordinator) – Italy
2) Novozymes – Denmark
3) ENEA (Italian National Agency for New Technology, Energy and Sustainable Economic Development) – Italy
4) Lunds Universitet – Sweden
5) Agriconsulting – Italy
6) WIP Renewable Energy – Germany
7) IUS (Institut für Umweltstudien, Weibel & Ness) – Germany

Project website: www.biolyfe.eu

Contact details:
Name, affiliation and contact details of the project coordinator
Alessandra Frattini
Chemtex Italia (M&G)
alessandra.frattini@gruppomg.com
Tel. +39 0131 882839, Mobile +39 338 6471204

Start date: 01/01/2010
Duration: 4 (four) years

**SHORT PROJECT DESCRIPTION**

*Provide a short abstract of max. 100 words*

The benefits of second generation biofuels production from lignocellulosic materials include higher per hectare lignocellulosic biomass productivities, better GHG performance and avoidance of direct competition with the food market. In order to make this technology competitive with fossil fuels, significant cost reductions and technological developments are needed while the sustainability of the overall process has to be ensured.

The **BIOLYFE project** aims at improving critical process steps (hydrolysis and fermentation) and demonstrating the whole supply chain, from feedstock sourcing via fuel production to product utilisation. The main result will be the construction of an efficient 2nd generation industrial demonstration facility with an annual output of about 40.000 tons of lignocellulosic bioethanol, which can then be used for process optimization through extensive testing.

BIOLYFE is co-funded by the European Commission in the FP7 (Project No. FP7-239204).

Project duration: January 2010 - December 2013

**PROJECT GOALS & OBJECTIVES**

Goals:
*Indicate main qualitative goals*
- Development of novel industrial-scale technologies for lignocellulosic bioethanol production
- Development and demonstration of the hydrolysis and fermentation steps of the lignocellulosic ethanol process at industrial scale
- Construction of an efficient 2nd generation industrial demonstration unit with a capacity of about 40.000 ton/y of lignocellulosic bioethanol and process optimization through extensive testing
- Distribution and use of products under real operational
### Objectives:
Indicate quantitative objectives (similar to KPIs of the IPs of the EIIs). Also indicate intermediate milestones where applicable.

- Selection, supply and pretreatment of lignocellulosic feedstock
- Development of enzyme cocktails and improvement of fermentation technology with a subsequent optimization at demo scale
- Development of enzyme cocktails and improvement of fermentation technology with a subsequent optimization at demo scale
- Plant design, construction and testing
- Vehicle fleet test programme and creation of a functioning distribution infrastructure
- Integrated sustainability assessment

Milestones achieved so far: Realization of the Web site

### PERFORMANCE OF THE PROJECT

**Assumed state-of-the-art:**
Describe quantitatively the state-of-the-art that the project objectives are based upon

The enzymatic hydrolysis and fermentation step have been tested on pilot scale.
The main innovative approaches of the Biolyfe project, with respect to the state of the art, are:
- improvement of the total ethanol yield
- use of an innovative biomass pretreatment
- new and improved enzyme mixture
- use of hybrid SHF/SSF approach for an efficient co-fermentation
- up-scaling of hydrolysis reactor and set up definition
- co-fermentation of both C5 and C6
- modelling analysis for the improvement of single equipment and operative conditions
- reduction of operative and capital cost in prevision of the future industrial installation (200.000 ton/y ethanol)

**Achievements so far:**
If intermediate results are available, please indicate the current achievements (qualitative and/or quantitative)

- Evaluation of the lignocellulosic biomass to be cultivated at demonstration scale.
- Feedstock characterization.
- Lab development and pilot test on enzymes samples.
- Hydrolysis and fermentation experimentation through continuous long run pilot scale trials
Difficulties and potential risks:

*Indicate briefly problems encountered or to be encountered in the short term (e.g. overall legislative context, public acceptance, permitting, etc.)*

The permitting phase of the Italian ethanol facility is an advanced phase. During the authorization procedure, public consultations were held on 2010 with the Italian authorities and the stakeholders through four “Conferenze dei Servizi” meetings.

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**FUNDING & BUDGET**

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<tr>
<th><strong>Funding programme:</strong> Give the name of funding programme</th>
<th>7th Framework Programme</th>
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<tr>
<td><strong>Funding public entity:</strong> Indicate which public entity is in charge of /manages the programme</td>
<td>European Commission</td>
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<tr>
<td><strong>Total (public &amp; private) project budget (€):</strong></td>
<td>15,632,472.0 €</td>
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<td><strong>Public funding (€):</strong></td>
<td>8,599,461.0 €</td>
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<td><strong>Total effort (person-months):</strong></td>
<td>690.8 men/month</td>
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**DISSEMINATION OF PROJECT RESULTS**

*Publications, presentations in conferences and workshops, and other dissemination means: Give highlights only*

- Web site ([www.biolyfe.com](http://www.biolyfe.com)) and leaflet
- Development of marketing material
- Stakeholder database
- Electronic newsletter
- Publication & Presentation
- Handbook on 2nd generation bioethanol production process
- Organisation of three conference on 2nd gen. bioethanol (next 6-10 June 2011 in Berlin within the European Biomass Conference)
- Public event at the demonstration plant
- Energy crops demonstration on field
- Training
- Interaction with other EU project and Commission activities
- Recommendation paper on follow up activities and RTD needs
- Elaboration of a dissemination and exploitation plan

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**TOWARDS COMMERCIALISATION**

*Indicate (new) products and/or services expected from the project. Are new business models required for commercialisation of the project results?*
Highlight expected commercialisation benefits, e.g. patents, spin-offs, new products, business partnerships

Products/process:
- Bioethanol from lignocellulosic biomass through a second generation innovative technology never tested at demonstration scale.
- High performance enzymes for the conversion of both cellulose and hemicellulose into simple sugars.
- Improvement in fermentation technology for the co-fermentation of both C5 and C6 sugars into ethanol.

The Biolyfe project results are evaluated for patentability by the Exploitation and Dissemination Management Committee.

These products/process could lead to the creation of new business partnership.

It is the intention of M&G/Chemtex to enter the biofuel market with the technology proposed. A key factor in determining the relative success of the ethanol from biomass conversion is the ability to achieve process efficiencies, optimizing ethanol yields while minimizing by-product production, raw material and utilities consumption. In this regard, an economic analysis is provided to demonstrate the feasibility of an industrial scale facility (200,000 ton/y of ethanol) that deploys the proposed technology.

SYNERGIES WITH THE IMPLEMENTATION PLANS OF THE EUROPEAN INDUSTRIAL INITIATIVES – NETWORKING – KNOWLEDGE SHARING

Contribution to/Relevance with the IPs: To your opinion, to which activities of the IPs of the EIIs is this project related to? Indicate contributions / complements.

Please note that reference here is made to the activities of the IPs as published in http://setis.ec.europa.eu/activities/implementation-plans

BIOLYFE project is strictly related to IPs of the EIIs, in particular to IPs for the European Industrial Bioenergy Initiative. The BIOLYFE project will develop and build an industrial demonstration unit for the step of hydrolysis and fermentation in the second generation ethanol process, integrating it in a complete lignocellulosic bioethanol industrial demo plant (which includes biomass feeding, pretreatment, hydrolysis, fermentation, separation and distillation). This activity is strictly connected with the core activities of the EIBI. EIBI is focused on innovative bioenergy value chains which are not yet commercially available, and which could bring significant contribution to the bioenergy markets by large scale deployment (large single units or larger number of smaller units), whilst complying with the sustainability requirements of the RES Directive (2009/28/EC).

Potential synergies with other projects and activities: Can you identify any other project(s) in your country, another MS or at European level that could be synergetic with this project?

The Biolyfe consortium will seek cooperation with the following initiative:
- The European Biofuels Technology Platform
- The European Platform for Sustainable Chemistry (SusChem)
- International Cooperation platforms and networks such as COMPETE (FP6) and BioTop (FP7) or Canebiofuel (FP7)
- Project related to feedstock production such as Sweetfuel (FP7)
- FP7 project related to conversion technology research, e.g. NEMO and HYPE
- FP7 related to bioethanol end-use in vehicles such as BEAUTY
**B. RESOURCES AND INVESTMENTS**

**RESOURCES AND INVESTMENTS**

Describe in short any RD&D infrastructures that your project relies on. Are these available or do they need to be developed?

The R&D activities of the Biolyfe project were developed on several Public (Lund University, ENEA) and Private Research Centers (Chemtex and Novozymes) that have increase their experience in the biofuel area also through this project.

Further improvement are foreseen not only during the project execution (e.g. the construction of a complete bioethanol facility with the integration of the hydrolysis/fermentation unit in a complete sustainable process), but also for new possible technology applications (e.g. lignocellulosic-to-biomolecules conversion, valorisation of the lignin co-product).

If these are to be developed, what is the corresponding investment required? What is the allocated budget (€) for this investment in your project?

The second generation ethanol facility, whose start up is foreseen during 2012, will require a total investment of 140 million €.

European funds (such as FP7 and Industria 2015) will support only the R&D activities of some steps of the whole second generation technology.

*Absence of existing cellulosic ethanol plants worldwide* – This major commercial challenge will be met, as
this lignocellulosic-to-ethanol conversion is expected to be highly techno-economic sustainable, energetically integrated, and also compatible for integration into existing ethanol production at a low additional capital and operating cost.

OTHER INFORMATION

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<th>Alessandra Frattini</th>
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<tr>
<td>Give the name and affiliation of the contact person for the questionnaire. If you are the project coordinator, check the box</td>
<td>Chemtex Italia (Gruppo M&amp;G)</td>
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<tr>
<td></td>
<td><a href="mailto:alessandra.frattini@gruppomg.com">alessandra.frattini@gruppomg.com</a></td>
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<td>Phone +39 0131 88.28.39 – Mobile +39</td>
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<td>Biolyfe Coordinator</td>
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Please send the completed form to set-plan-secretariat@ec.europa.eu preferably by FEBRUARY 15.

Thank you for your cooperation!