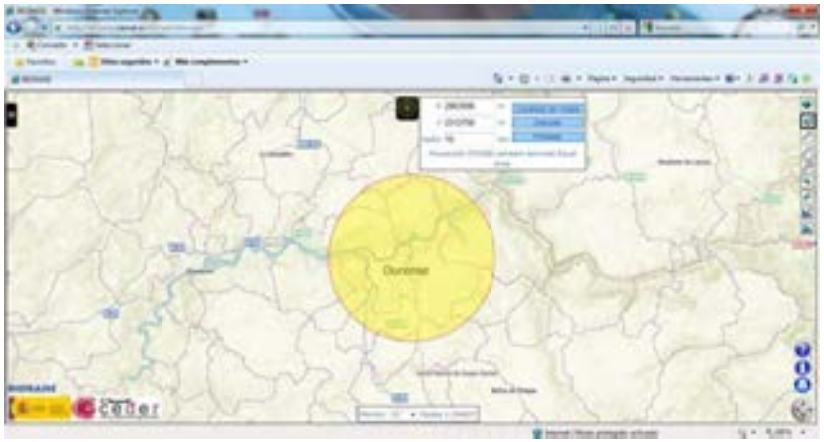
Main products and results from the Project

- Improvement of the BIOmasud Quality and Sustainability certification:
  - More solids biofuels. Now Olive stones, Wood chips, nut shells → adding prunings, more nut shells
  - Reviewing the Sustainability Criteria (PEFC Spain in the Consortium)
  - Spreading to other countries
  - Online platform for verifying traceability and measuring GHG

- Update of the BIORAISE GIS Online tool
- Standards for solid biofuels with big potential
- Guidelines for combustion devices developers



This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Project Acronym: **BIOMASUD PLUS** Project Number: 691763 Call: LCE 14 – 2014/2015: MARKET UPTAKE OF EXISTING AND EMERGING SUSTAINABLE BIOENERGY Topic: SECURE, CLEAN AND EFFICIENT ENERGY
Project title: **Developing the sustainable market of residential Mediterranean solid biofuels**

Specific Challenge: Actions are still needed to foster the development of the bioenergy sector and to ensure its sustainability. One way to do it is to use more and sustainable bioenergy. However, the EU needs to expand the supply of bioenergy produced […]

- Ensuring development and / or implementation of quality and sustainability standards for bioenergy […]
- Development of methodologies for the traceability of biomass feedstocks from which bioenergy is produced

Technological approach of the Project: Developing Standards for solid biofuels (Olive Stones, Olive tree Prunnings, Walnut / Pistachio shells). Assessment and Guidelines for combustion equipment manufacturers

Expected Impact: Increasing the share of sustainable bioenergy in the final energy consumption

Contribution of the Project: developing and implementing certified sustainable frameworks that will increase the use of Mediterranean residential heating biofuels with reduced environmental impact. Overcome important barriers that are hampering the development of the sustainable market of these biofuels.

Highlights (technological/non-technological): Improvement of **BIOmasud,** Certification of the Quality and Sustainability of Mediterranean Biofuels.
Update of the Online Platform BIORAISE that can calculate biomass potential and cost on regions
Guidelines and standards that will be helpful to design and configure combustion devices for solid biofuels with great potential

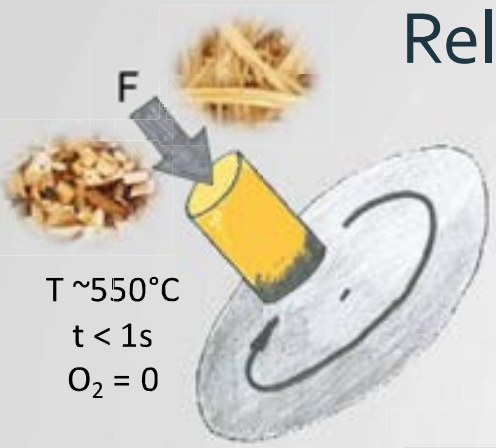
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691763

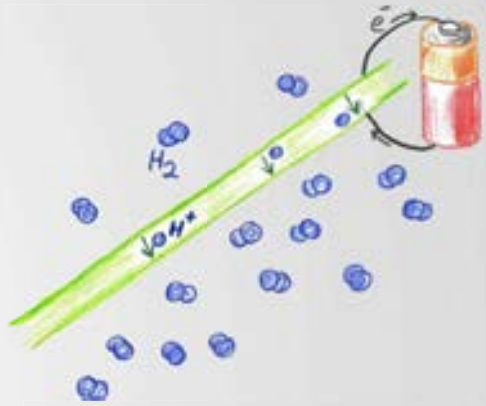
BioMates

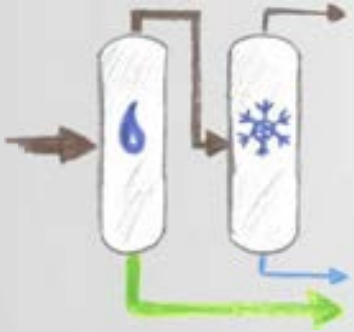
Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727463

Reliable Bio-based Refinery Intermediates - BioMates







Straw, Miscanthus

2G-Biomass

Ablative Fast Pyrolysis

In-Line-Catalysis

Fractionated Condensation

Rail & Road

Mild Hydrotreatment

Renewable H_2

BioMates Innovations

Fossil Resources

Crude Oil

Road Fuel

Jet Fuel

Bunker Fuel

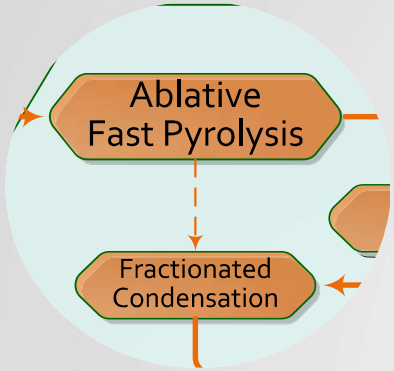
Main Bio-Refinery Steps

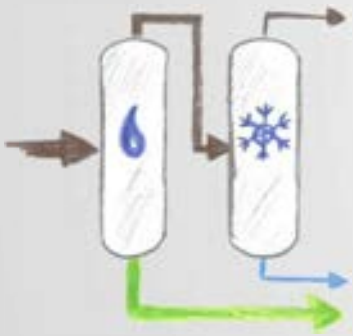
Supplementary Bio-Refinery Steps

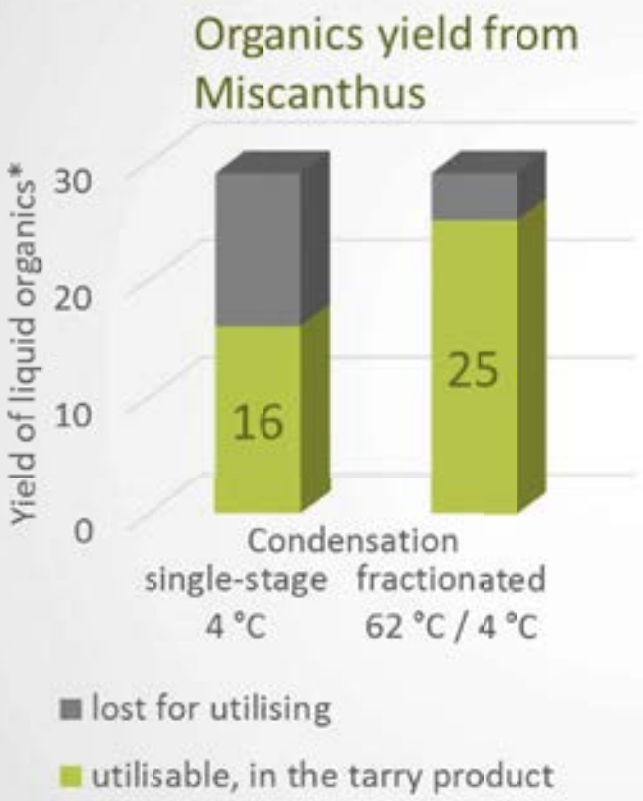
Innovative Bio-Intermediates

Refinery Co-processing Steps

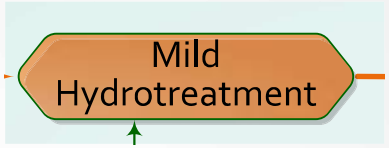
First basic results:



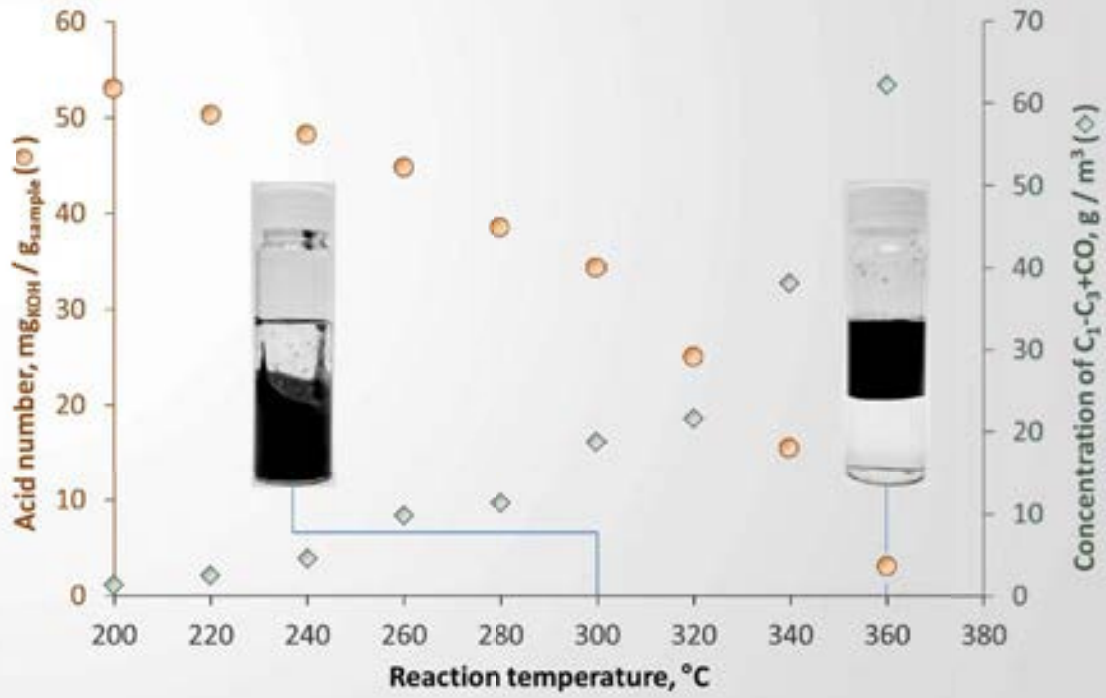




* basis: total biomass input
overall liquid organics yield: 29 wt.-%



Straw-based
(50 % wheat, 50 % barley)



Project Acronym: **BioMates** Project Number: **727463**

Call: H2020-LCE-2016-RES-CCS-RIA Topic: LCE-08-2016-2017

Project title: **Reliable Bio-based Refinery Intermediates**

Specific Challenge: New sustainable biofuels technologies need to be developed that improve […] the technology competitiveness by upgrading the conversion efficiency and possibly diversifying the technology […].

Technological approach of the Project: *Ablative fast pyrolysis (AFP)* produces bio-oil exemplary from straw and Miscanthus. The bio-oil (separated from its aqueous phase) is *mildly hydrotreated* into an intermediate with reliable properties to be *co-fed into conventional refineries*. *Hydrogen* can be either derived from the refinery's excess-H_2 or produced sustainably, and is *compressed* with an innovative *electrochemical* technology. *Catalysts* are tailor-made, and AFP is supplemented *by staged condensation* and *in-line catalysis*.

Expected Impact ⇨ Improve the economic, environmental and social benefits of biofuels. ⇨ Favorable energy and GHG balances. ⇨ Significant cost reduction, [permitting] these fuels to compete […] with conventional biofuels. […] ⇨ secure and affordable energy supply; diversified, cheap feedstock supply. ⇨ enhancing Europe's competitiveness.

Contribution of the Project: BioMates provides *European refineries* with high-quality *intermediates*, made from diversified, affordable, *Europe-grown feedstock* and involving a highly *integrated energy supply*. Producing an *intermediate* instead of a blendstock *optimises economics and sustainability* of the final product.

Highlights (technological/non-technological): *AFP* allows *decentral* operation, minimising transport and strengthening rural areas, while *mild hydrotreating* can *synergise* with close-by refineries. AFP *in-line catalysis* and *electrochemical H_2-compression* are highly innovative. *Catalyst development* assures independency from dominating catalyst providers and optimises performance. *Sustainability* is an integral part of the project with feedback loops to engineering. Co-processing of intermediates will be *validated in a pilot-scale refinery*.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727463

BIOSURF

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646533

The BIOSURF Project

Horizon 2020 Workshop on Bioenergy, Advanced Biofuels and Renewable Fuels

Brussels, 10-11 April 2018

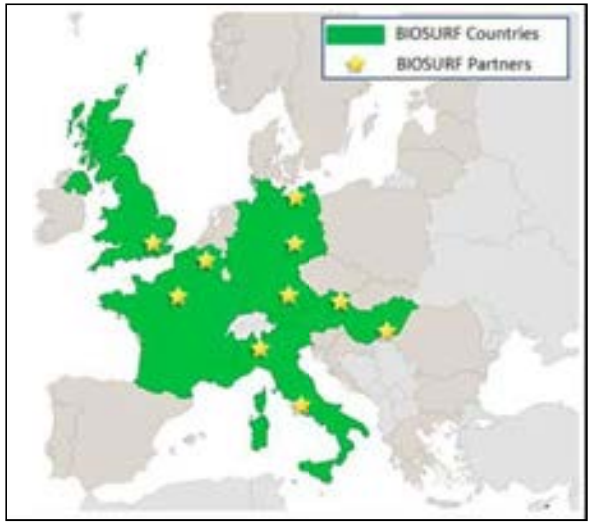
Attila Kovacs, **EBA**

Stefano Proietti, **ISINNOVA**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 646533.

Project Summary

- **BIOSURF**: **BIO**methane as **SU**stainable and **R**enewable **F**uel **(HORIZON 2020);**
- **36** months (since January 2015);
- **11** partners in 7 countries: ISIS, CIB (IT), EBA (BE), REA (UK), GBA, FNR, DBFZ (DE), HBA (HU), AKB, AGCS (AT), ATEE (FR);
- **1.873.000** € of EC funding (**100%**);
- **Activities**:
  - National/domestic biomethane **registries**
  - **Cooperation** among the national biomethane registries
  - European **mass balancing system** for biomethane
  - Free market biomethane **trade**
  - **Sustainable** raw material supply
  - Methodology for entitlement to **CO2 certificates**
  - **Regional** specificities (IT, AT, FR);
  - **Networking** and **cooperation**;
  - **Transferability** of results beyond the project countries
  - Dissemination & Communication.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 646533.

Project Acronym: **BIOSURF** Project Number: **646533** Call: **H2020-LCE-2014-3**

Topic: **LCE-14-2014** Project title: **BIOmethane** as **SU**stainable and **R**enewable **F**uel

Specific Challenge: Need to foster the development of the bioenergy sector and to ensure its sustainability. In order to achieve the EU targets set out in the RES and Fuel Quality Directives, and to address concerns regarding indirect and direct environmental impacts, sustainable bioenergy technologies (both existing and emerging) need to further penetrate the market.

Technological approach of the Project:

- Establishment of **national biomethane registries**
- **Cooperation** among the national biomethane registries: establishment of the European Renewable Gas Registry (**ERGaR**)
- European **mass-balancing system for biomethane**: recognize the European natural gas network as one single balance-circle

Expected Impact: Increasing the share of sustainable bioenergy in the final energy consumption. Substantial and measurable reductions in the transaction costs for project developers as well as for the permitting authorities, whilst still fully addressing the needs for environmental impact assessments, including considerations for indirect impacts and energy balance, and public engagement. Development of better policy, market support and financial frameworks, notably at national, regional and local level.

Contribution of the Project:

No direct impacts but the establishment of a common European biomethane market will indirectly contribute to the growth of biomethane production.
Austria, France and Italy were chosen for establishing bilateral and trilateral agreements among the national registries and thus, allowing the exchange of GoOs. Realisation of a "virtual" exchange of biomethane (through exchange of GoO), as "embryonic" **European common biomethane market.**

Highlights (technological/non-technological): the establishment of the **European Renewable Gas Registry aisbl (ERGaR)** is the direct result of the project. In the meantime ERGaR already got 16 members from 10 European countries and keeps growing. In December 2017 ERGaR has applied to the European Commission for the recognition of its **„ERGaR RED"** voluntary scheme under the RED. Subsequent to the project, ERGaR continues the work aimed at establishing the European trade-centre for biomethane Guarantees of Origin (certificates).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 646533.

Thank you for attention!

Contact Details

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www.biosurf.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 646533.

ButaNexT

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640462

BUTANEXT
Next Generation Biobutanol

The ButaNexT Project

DATE: 10-11 April 2018

AUTHOR: Tim Davies, Project Coordinator

The ButaNexT project has received funding from the European Union Horizon 2020 Research and innovation Programme under grant agreement n° 640462

ButaNexT

Optimising the biobutanol production value chain

- Sustainable Feedstock
  - wheat straw, miscanthus, municipal solid waste
- Biomass Pre-treatment
  - mechanical and thermo-chemical processing
  - Enzymatic optimization
- Fermentation
  - optimizing the biocatalyst and redesigning the manufacturing process
- Downstream Processing
  - Separation of biobutanol by pervaporation
- Fuel Blending Performance and Emissions
  - combinations with gasoline, diesel and ethanol
- Environmental, Resource, Techno-economic and Socia Impacts
  - investigating waste reduction, environmental benefits and wealth creation

GreenBiologics COORDINATOR

C-Tech INNOVATION

METGEN

E4tech

zabala innovation consulting

Greenovate!

CENER

vito

UCLM

The ButaNexT project has received funding from the European Union Horizon 2020 Research and innovation Programme under grant agreement n° 640462

The ButaNexT project has received funding from the European Union Horizon 2020 Research and innovation Programme under grant agreement n° 640462

Key Advancements

Progressing the state of the art

Commercial 1st generation biobutanol production is a reality

Advancements in key technical challenges – feedstock utilization and conversion, biocatalyst tolerance, in-situ product recovery

Biobutanol fuel blends shown to have performance and environmental benefits

Introducing biobutanol to the fuel supply chain will have positive environmental and societal benefits

BUT

Economics are still a challenge

The ButaNexT project has received funding from the European Union Horizon 2020 Research and innovation Programme under grant agreement n° 640462

CHO TIPER

Project presentation

CHO Power

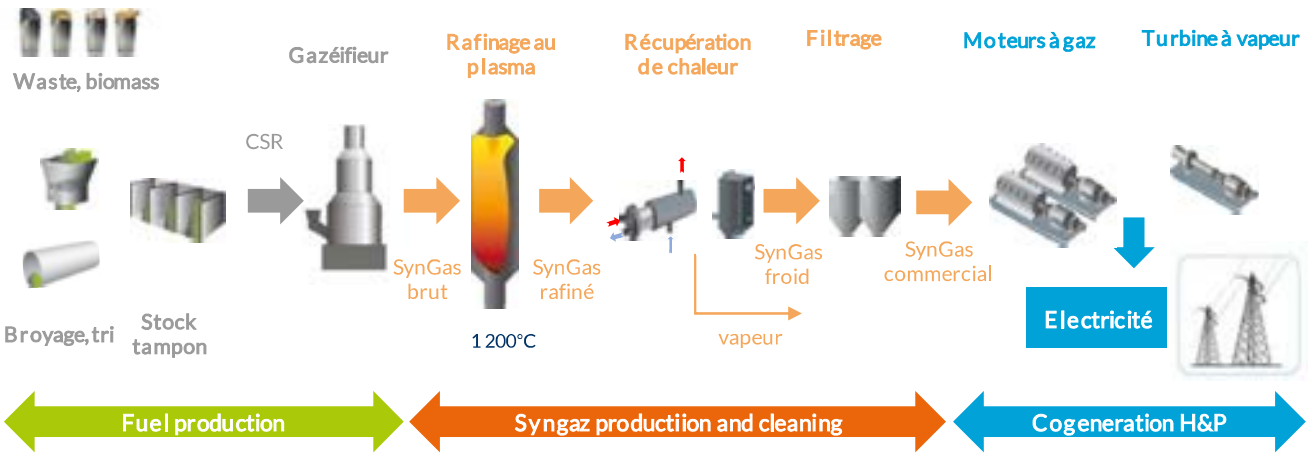
CHO Power designs, builds and operates waste and biomass power plants based on its proprietary gasification process

- Gasification is a process where fuel is heated in very low oxygen atmosphere. Output is a hot and calorific gas, the syngas, composed mainly of CO and H_2.

- Gasification turns the calorific potential of a solid compound into gaseous form, which optimizes its potential for energy recovery.

- Gasification has been largely used over the 20th century to produce gas from coal for homes and industry. This technique went out of use when natural gas appeared from the 60's.

The CHO Power process



Twice more power produced than a conventional process based on combustion and steam.

Usage of a waste based fuel, without harmful emissions

Small and local power plants , of reasonable size for a better social acceptance

The prototype plant

- CHO Power has deployed the process at the Morcenx plant
- Gross production of 10 MWe electricity sold under a specific feed in tarif at EDF
- From 60 000 t/an of industrial and commercial waste and wood waste from local waste collectors.
- 18 MWth of hot water feeding a large wood dryeer
- Final acceptance of the plant in June 2017
- Good results, commercially viable. Some improvements need to be implemented

The demonstration plant: CHO Tiper

Industrial and commercial waste

Waste wood

69 000 t/y

RECYCLING, SORTING

14 000 t/an

Recycling (metals), inerts, refusals

Fuel (Solid Recovered Fuel)

55 000 t/an

SYNGAS PRODUCTION CLEANING

COGENERATION HEAT & POWER

22 MWth hot water => wood dryer

10,5 MWe

- 56m€ investment
- 65 local and permanent jobs
- Local tax resources
- 45 000 tons of waste diverted from landfill
- 28 000 t/y CO2 emissions avoided
- Very good local politic and economic support
- But very low banks support…

Funding structure

CHO TIPER

Transaction and funding costs: 6 400 k€

Construction and other capex: 56 100 k€

Equity from CHO Power and Partners: 20 800 k€

Senior loan from IEB – InnovFin EDP - 30 000 k€

Banque européenne d'investissement

Grant from Region Nouvelle Aquitaine - 2 000 k€

Nouvelle-Aquitaine

Reimbursable advance from Ademe - 12 000 k€ - (9700k€ used)

INVESTISSEMENTS D'AVENIR

Very positive outcome despite the large cultural gap between EIB and such an entrepreneurial project, thanks to the support from EC-RTD.
Excellent 70/30 gearing
Managed by the "Infrastructure, New Products and Special Transactions" team, headed by Ms Pilar SOLANO
Intensive. They are now ready for more challenges

COMSYN

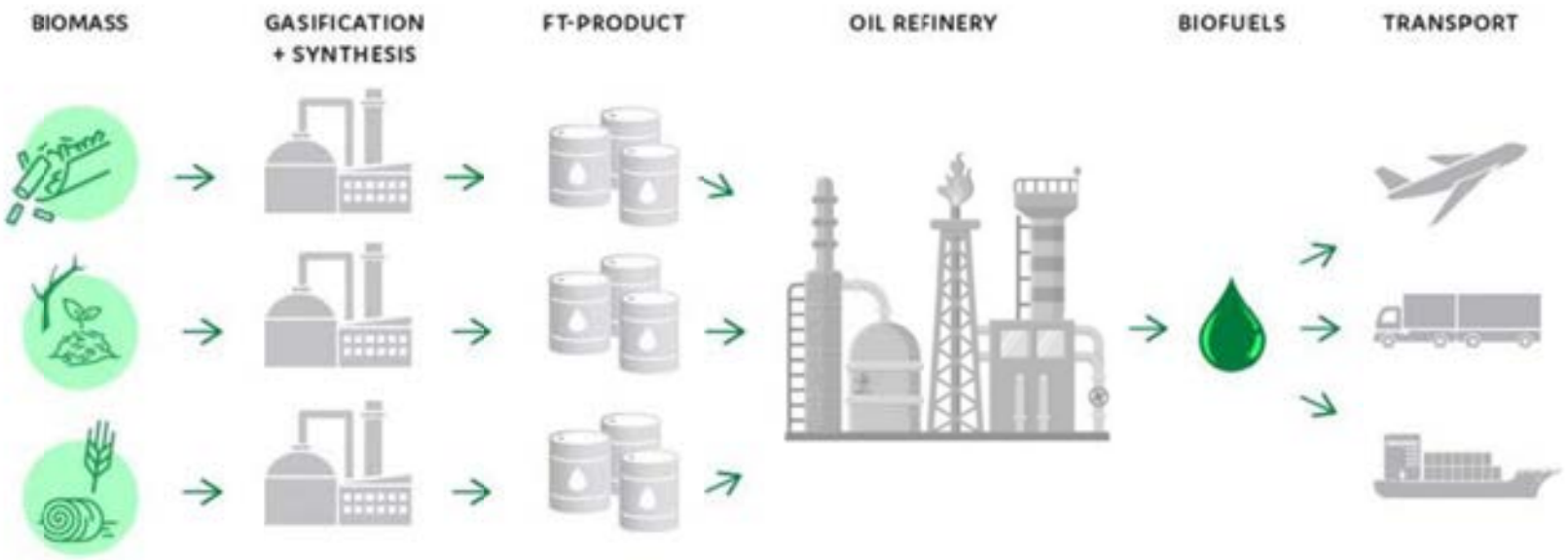
Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727476

Compact Gasification and Synthesis process for Transport Fuels

COMSYN

www.comsynproject.eu



PROJECT FACTS

2017 – 2021

7 partners

3 pilot campaigns from biomass to biofuels

400 kg of biofuels will be produced for research and demonstration.

Decentralized primary conversion of biomass in 30 – 150 MW units.

Technology development for primary conversion, Fischer-Tropsch synthesis and oil refinery feeding systems.

Target reduction of the biofuel production cost is up to 35% compared to alternative routes.
=> Less than 0.80 €/l production cost for diesel.

Technology development

COMSYN

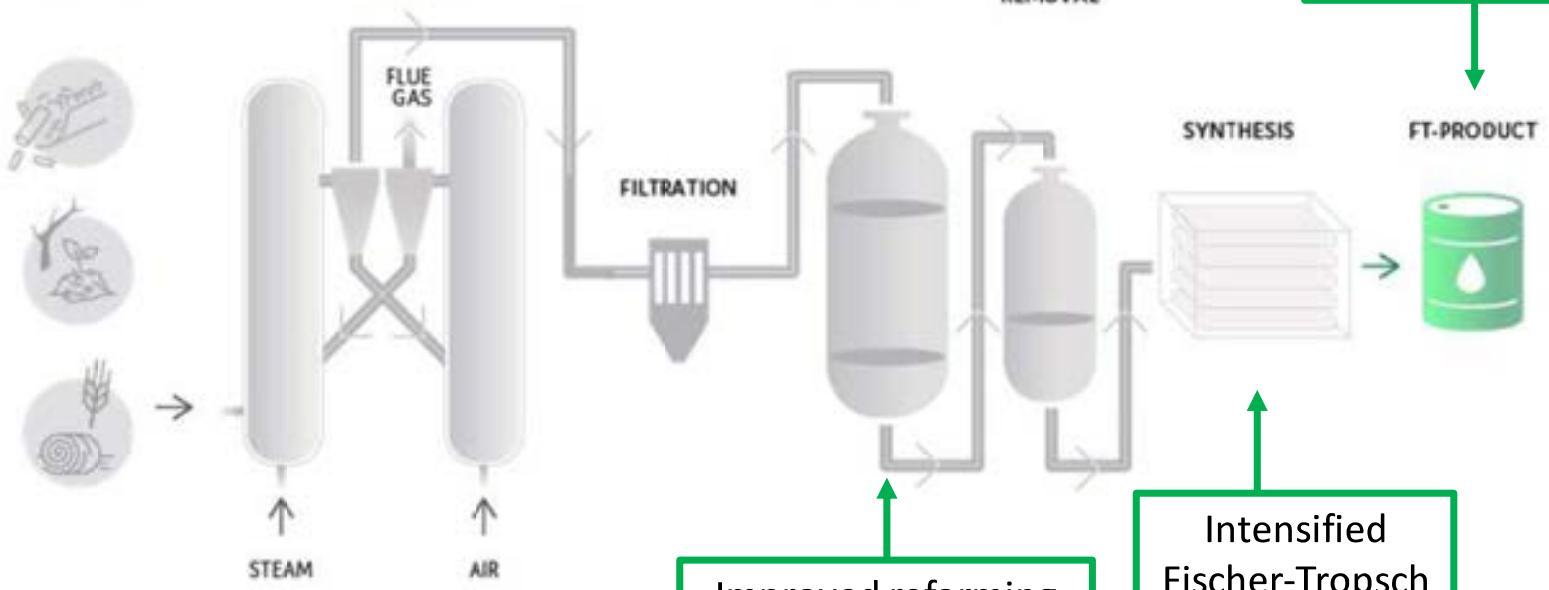
www.comsynproject.eu

Diversified feedstocks for DFB gasifier by VTT

High temperature filtration by VTT and GKN

Sulfur removal with adsobents by VTT

Product upgrading by UniCRE



Process design & techno-economic studies & environmental assessments by DLR and Wood

Market studies and business cases by ÅF Consult

Improved reforming by VTT

Intensified Fischer-Tropsch by INERATEC

VTT INERATEC GKN SINTER METALS UniCRE DLR Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center wood. Making Future.

Project Acronym: **COMSYN** Project Number: **727476** Call: **H2020-LCE-2016-RES-CCS-RIA**
Topic: **LCE-08-2016-2017 Development of next generation biofuel technologies**
Project title: **Compact Gasification and Synthesis process for Transport Fuels**

Specific Challenge: New sustainable biofuels technologies need to be developed that improve performance, notably with regards to the following sub-challenges: a) improving the technology competitiveness by upgrading the conversion efficiency and possibly diversifying the technology; b) improving the feedstock supply by reducing the supply costs and possibly diversifying the biomass feedstock

Technological approach of the Project: COMSYN aims to develop a concept for competitive bio-based fuels by means of a compact gasification and synthesis process. The concept is based on distributed primary conversion of diverse biomass residues to liquid intermediate products at 30–150 MW (biomass feed) units located close to biomass resources.

Expected Impact: The developed technology should: improve the economic, environmental and social benefits of biofuels; have favourable energy and GHG balances; have a significant cost reduction; be secure and affordable energy supply; have diversified, cheap feedstock supply; enhance Europe's competitiveness.

Contribution of the Project: The target reduction of the biofuel production cost is up to 35% compared to alternative routes, which translates to less than 0.80 €/l production cost for diesel. The biomass feedstock is diversified by utilizing low-cost materials, such as demolition wood and agricultural waste.

Highlights (technological/non-technological): The syngas cleaning efficiency is improved by developing filtration, reforming and sulfur removal technologies. The synthesis process utilizes a modern intensified Fischer-Tropsch reactor, specially designed for decentralized biofuel production.

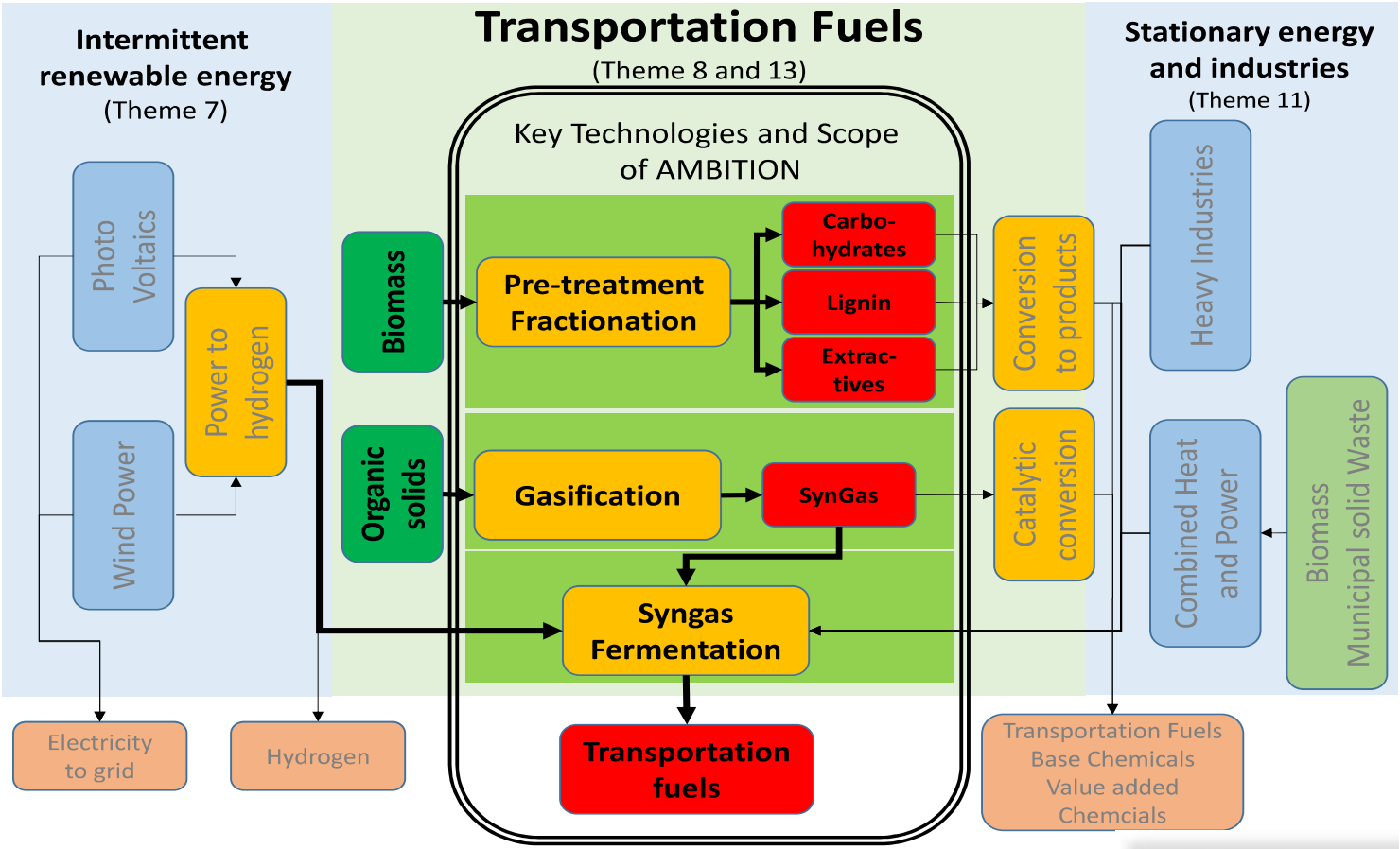
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727476

ECRIA1 (Ambition)

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731263

AMBITION: Advanced biofuel production with energy system integration



AMBITION – Objectives

- **Creation of a strong, focused and sustainable research partnership:**
  - develop a **long-term research agenda and strategy**, which defines research priorities, technology development and innovation in a transnational setting,
  - develop of **joint projects/programmes**, including **researcher exchanges** and **joint use of installations**.
- **Development of innovative key unit operations in biofuels production**:
  - Biomass pre-treatment,
  - Gasification and gas cleaning and conditioning,
  - Biochemical syngas conversion to liquid biofuels (syngas fermentation)
  - Facilitate their integration along a value chain as well as across value chains
- **Evaluation** of the **technical, economic** and **environmental feasibility** of **integrating biofuels production** from lignocellulosic biomass **into today's energy system**

Project Acronym: **AMBITON** Project Number: **731263** Call: **LCE-2016-2017** Topic: **LCE-33-2016**
Project title: **Advanced Biofuel Production with Energy Integration**

Specific Challenge: Profound changes being made in the EU energy system, therefore; support and encourage the coordination and convergence of national and EU efforts in addressing research and innovation activities. The SET plans Integrated Roadmap identifies priority areas for collaborations in EU and associated states through joint projects or programmes.
Technological approach of the Project: The AMBITION project covers an ECRIA which rely on three key unit operations in the production of next generation liquid biofuels (biomass pre-treatment and fractionation, gasification and syngas fermentation) and on subsequent linking of energy systems (grid electricity and biofuels in particular) to improve overall efficiencies.

Expected Impact: ECRIAs this support the development of the common research and innovation agendas of the SET Integrated Roadmap, develop a critical mass of research capacity in Europe to address integration aspects of the energy system. ECRIAs target the coordination of national efforts in order to develop synergies and improve the impact of public investment in emergent sectors.
Contribution of the Project: The AMBITION project will develop generic technologies and expertise, which is broadly applicable within the whole bioeconomy and especially on bio- and renewable energy sources. The academic community will profit from a common innovation agenda, which enables efficient use of available resources such as staff and facilities. The efficient transfer of the joint R&D to companies and SME's to further deploy expertise and knowledge enables European industries to stay on the forefront of the transition from a fossil to a renewable based society and economy.

Highlights (technological/non-technological): Based on an existing comprehensive co-operation of the consortium through participation in joint projects (BRISK, BRISK2) and programs (EERA-Bioenergy) the partners form an alliance to develop the initial research and innovation agenda, namely the AMBITION project and set it into action. AMBITION is relevant for the topics Energy System integration and performs research on identified bottlenecks in two currently insufficiently integrated biomass-to-biofuel conversion technologies (namely biochemical and thermochemical conversion). The inherent deficiency of hydrogen of biomass will be counteracted by integration of the Energy Systems to sustainable biofuels, electricity-to-hydrogen from renewable sources such as wind or solar power. Further, alternative carbon sources of CO_2 from CO_2 capture application will be explored in the proposed project. The project will provide both proof-of-concept (TRL 2-3) as well as laboratory/small pilot scale research (TRL 4-5) on the primary bottlenecks of and between the key technologies for the conversion of biomass to liquid biofuels.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *[number]*

ECRIA2 (BALANCE)

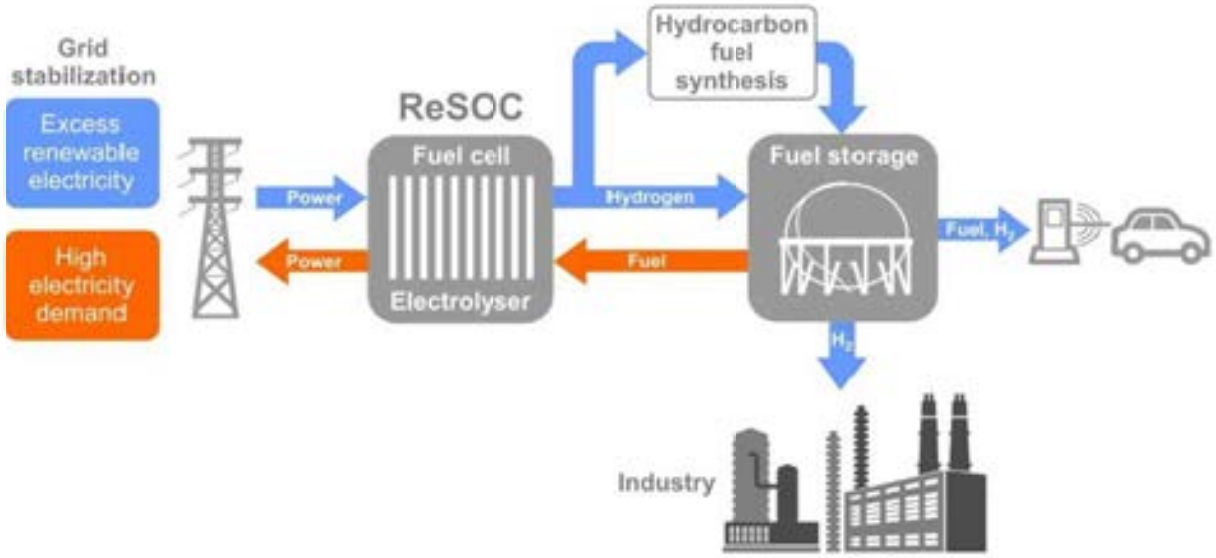
Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731224

BALANCE

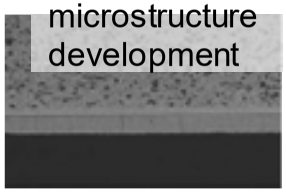
balance-project.org

Coordinated by VTT



Technical development

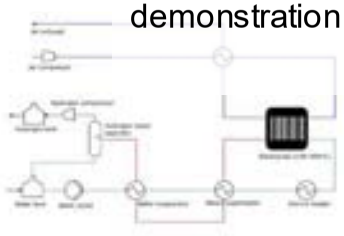
Material and microstructure development



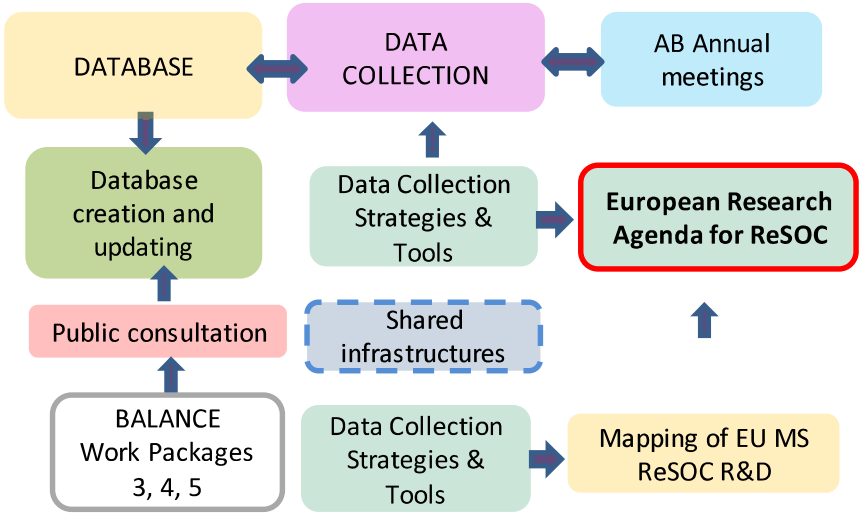
Electrochemical unit cell

Cell assembly for large production

Full system demonstration



Drafting a technology Agenda



Project Acronym: **BALANCE** Project Number: 731224 Call: H2020-LCE-2016-ERA Topic: LCE-33-2016

Project title: **Increasing penetration of renewable power, alternative fuels and grid flexibility by cross-vector electrochemical processes**

Specific Challenge: ECRIA (European Common Research and Innovation Agendas) will bring together ongoing national efforts to achieve critical mass at a European level in sector crucial to the energy transition.

Technological approach of the Project: Electrochemical device that can convert electricity to hydrogen and hydrogen to electricity. Bridge the gap between chemical fuel and power sector.

Expected Impact:

1. Targeting specific problems where significant short-term progress can be achieved by integrating research activities.
2. Identifying gaps to decide the new topics that will be supported by the EU.

Contribution of the Project: Build on the large effort in Europe in fuel cell and power-to-gas to deliver a truly reversible technology.

Highlights (technological/non-technological):

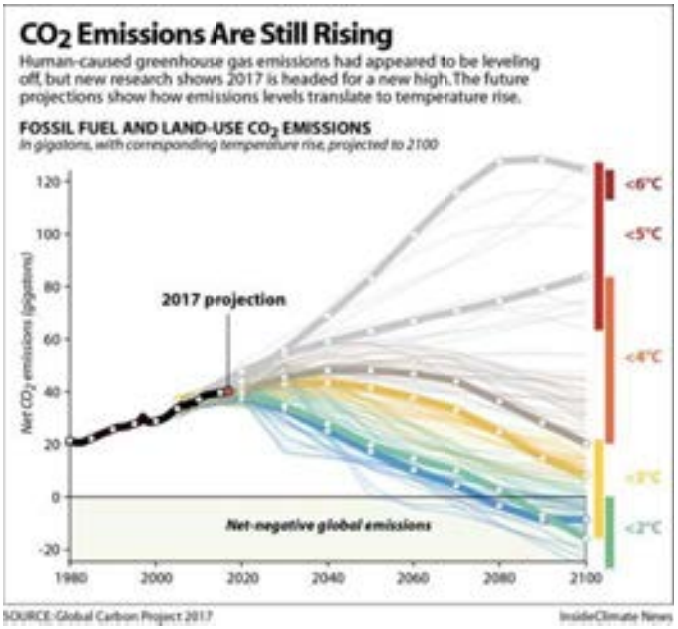
1. Development from nano-scale (electrocatalyst) up to demonstration (reversible power plant).
2. Technological agenda drafting.
3. Building on inputs from institutions outside of the consortium: IEC, EERA, IEA, Jülich FZ

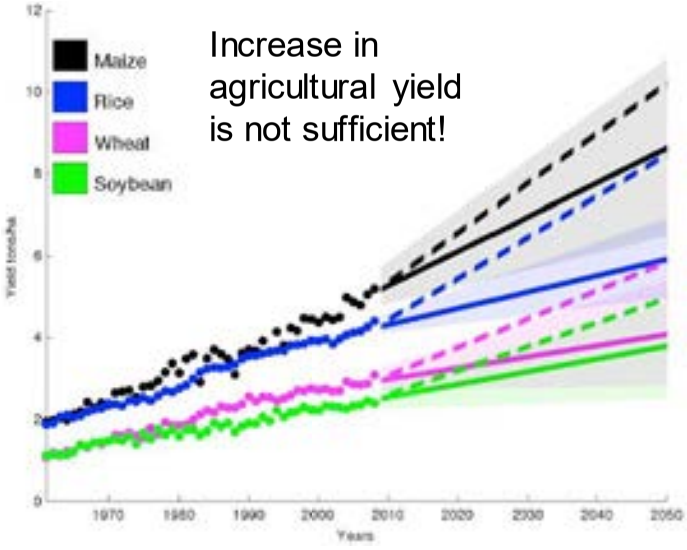
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731224.

eForFuel

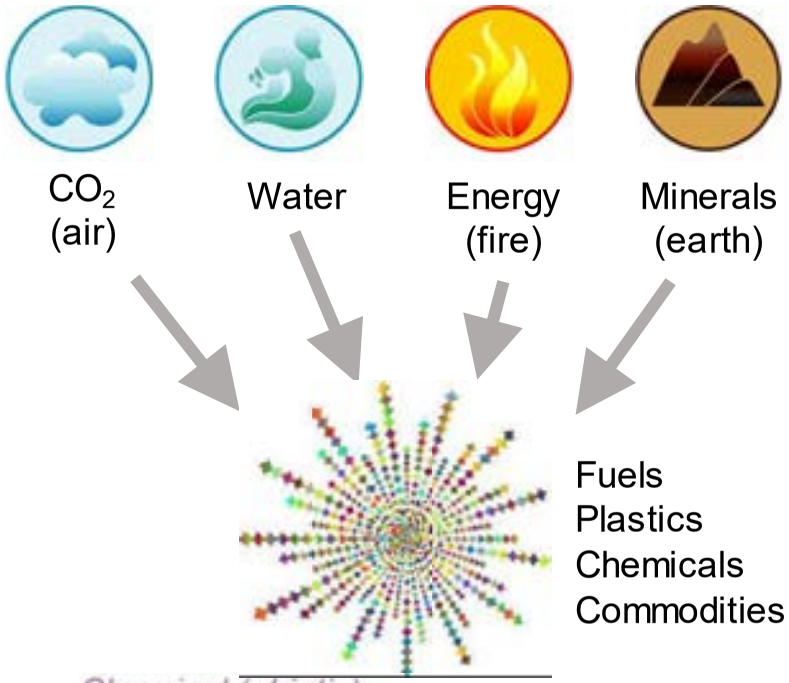
Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 763911



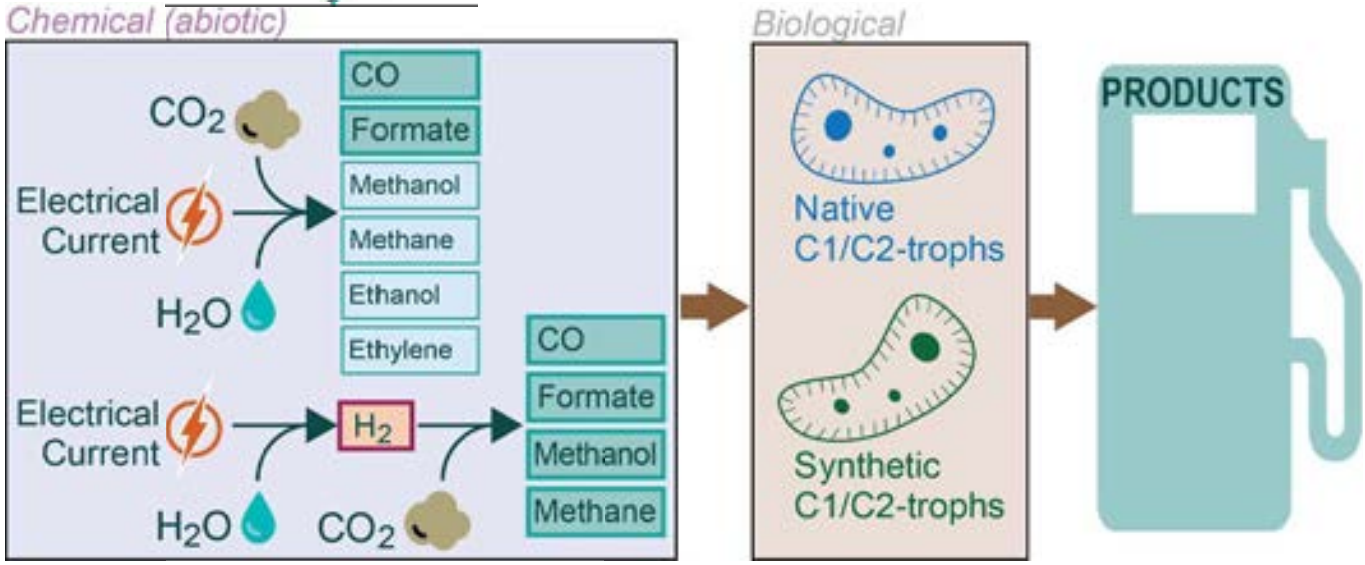


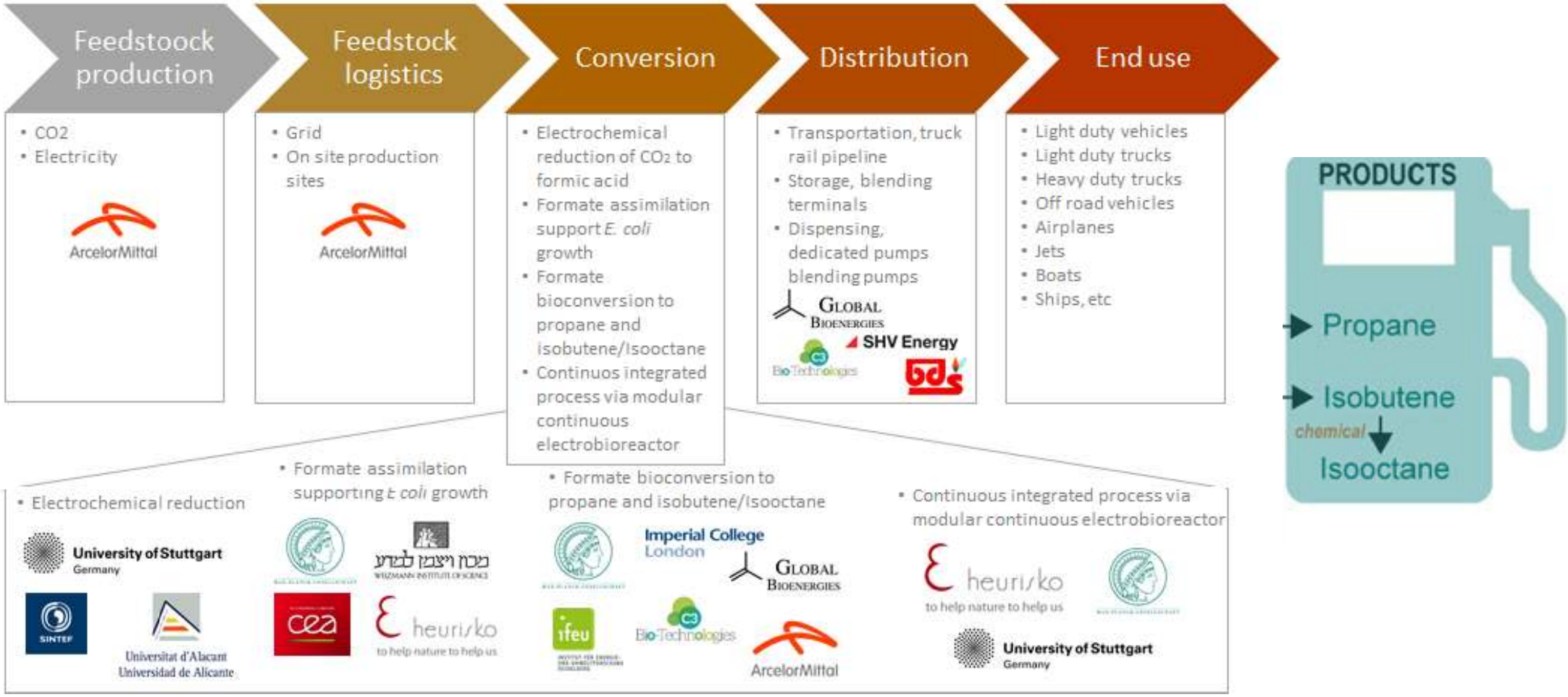
Increase in agricultural yield is not sufficient!



New a carbon bio-economy – Production from the elements

Harnessing the potential of two fields: abiotic carbon activation & biotic synthesis




Feedstoock production
• CO2
• Electricity
ArcelorMittal
Feedstock logistics
• Grid
• On site production sites
ArcelorMittal
Conversion
• Electrochemical reduction of CO2 to formic acid
• Formate assimilation support E. coli growth
• Formate bioconversion to propane and isobutene/Isooctane
• Continuos integrated process via modular continuous electrobioreactor
Distribution
• Transportation, truck rail pipeline
• Storage, blending terminals
• Dispensing, dedicated pumps blending pumps
Global Bioenergies
SHV Energy
Bio-Technologies
bds
End use
• Light duty vehicles
• Light duty trucks
• Heavy duty trucks
• Off road vehicles
• Airplanes
• Jets
• Boats
• Ships, etc
PRODUCTS
Propane
Isobutene
chemical
Isooctane
• Electrochemical reduction
University of Stuttgart
Germany
SINTEF
Universitat d'Alacant
Universidad de Alicante
• Formate assimilation supporting E coli growth
cea
heuri/ko
to help nature to help us
• Formate bioconversion to propane and isobutene/Isooctane
Imperial College London
Global Bioenergies
ifeu
Bio-Technologies
ArcelorMittal
• Continuous integrated process via modular continuous electrobioreactor
heuri/ko
to help nature to help us
University of Stuttgart
Germany

Project Acronym: **eForFuel** Project Number: **763911** Call: H2020-LCE-2016-2017 Topic: New knowledge and technologies

Project title: **Fuels from electricity: de novo metabolic conversion of electrochemically produced formate into hydrocarbons**

Specific Challenge: The technologies that will form the backbone of the energy system by 2030 and 2050 are still under development. Promising technologies for energy conversion are being developed at laboratory scale and need to be scaled up in order to demonstrate their potential value in our future energy system.
Technological approach of the Project: eForFuel develops an industrial biotechnology solution that uses electricity and microorganisms to convert CO_2 from waste flue gas into hydrocarbon fuels, thus providing a sustainable replacement of fossil carbons. eForFuel uses different disciplines to establish an efficient process: carbon dioxide activation via reduction to formic acid is performed via electrochemical means while production of hydrocarbons is carried out in engineered formatotrophic microbes using synthetic, optimized pathways.

Expected Impact: The results of this research are expected to move the technology involved to TRL 4 and to provide better scientific understanding and guidance enabling the players concerned to frame strategic choices concerning future energy technologies and to integrate them in the future energy system.
Contribution of the Project: eForFuel provides flexibility to the renewable electricity infrastructure, converting excess electricity to drop-in fuels and storing energy to be used when needed. The use of CO_2 from waste flue gases as sole feedstocks for fuel production offsets the use of fossil fuels and thus help in mitigating climate change.

Highlights (technological/non-technological): ► Formate, highly soluble electron mediator, produced from CO_2 reduction at very high rate and efficiency ► Employing a model organism that can be engineered to produce various commodities ► Products are hydrocarbons suitable with existing fuel infrastructure ► Products are gaseous, enabling product separation at a minimal cost ► Synthetic, optimized pathways, which integrate metabolic and enzyme engineering ► An automatic integrated electrobioreactor, optimizing different parts of the process simultaneously.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No **763911**

ETIP Bioenergy-SABS

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727509

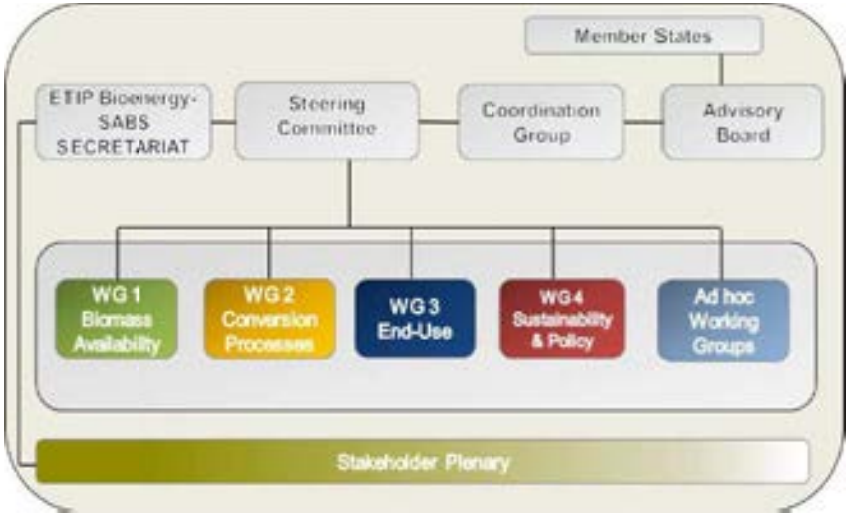
ETIP Bioenergy
European Technology and Innovation Platform

H2020 Workshop on Bioenergy, Advanced Biofuels and Renewable fuels

Name: Sophie Kruse/Birger Kerckow, FNR

Date: 10 – 11 April 2018

ETIP Bioenergy
European Technology and Innovation Platform



- Bases on the European Commission's Energy Union strategy
- Is a continuation of
  - the European Biofuels Technology Platform (EBTP, launched 2006) and
  - the European Industrial Bioenergy Initiative (EIBI, launched 2010)
- Established in April 2016

The role of ETIP Bioenergy:

- to bring together relevant actors from academia, industry and civil society engaged in the development of sustainable bioenergy and competitive biofuel technologies
- to represent the unbiased, united, and consolidated view of the biofuels and bioenergy industry in Europe
- to act as the main interlocutor for DG RTD to implement the Strategic Energy Technology Plan in the field of biofuels and bioenergy

The Mission of ETIP Bioenergy:

- to develop cost-competitive world-class bioenergy and biofuel value chains,
- to create a healthy bioenergy industry with well articulated goals as well as links to societal challenges and industrial transformation,
- to accelerate the sustainable deployment of biofuels and bioenergy in the EU,
- to promote knowledge based research, technology development and demonstration in the field of bioenergy, and
- to assist in joint coordination of research and technology development for low carbon technologies

ETIP Bioenergy
European Technology and Innovation Platform

Role of ETIP Bioenergy SABS: Support the ETIP Bioenergy Platform in all its activities:

- Support of the SET Plan Implementation – current focus TWG8 Renewable Fuels and Bioenergy
- Mapping of research projects, reports, pilot and demo plants
- Stakeholder Plenary Meetings (7 so far; no. 8 11-12 Apr 2018)
- Launch and update of the Strategic Research and Innovation Agendas (2008/2010/2016)
- Specific working group activities
- Fact sheets
- Position papers (iLUC, RED, SET Plan Key Action 8, etc.) & consultations
- Cooperation with other ETIPs (RES&Bioeconomy)
- Main communication tool: website www.etipbioenergy.eu

Project Acronym: **ETIP Bioenergy-SABS** Project Number: **727509** Call: **H2020-LCE2016-2017**
Topic: **LCE-36-2016**

Project title: **European Technology and Innovation Platform Bioenergy-Support of Advanced Bioenergy Stakeholders 2016- 17**

Specific Challenge: Major investments in research and innovation are needed to develop and deploy the technologies needed for the transformation towards a decarbonised energy system. To address such a significant investment challenge, it is fundamental that public and private stakeholders involved in the relevant sectors join their forces, agree on common objectives and align strategies for achieve them.
Technological approach of the Project: CSA: Website, workshops/conferences

Expected Impact: increase cohesion of stakeholders (website as key instrument), strong cooperation between bioenergy stakeholders, increased communication between research, industry and civil society actors , synergies and cooperation with other platforms and networks from the bioenergy sector, contribution to the SET- Plan
Contribution of the Project: organise activities of ETIP Bioenergy; in particular regarding SET-Plan – Action 8; mobilise actors towards implementation activities; provide strategic advice to the EC; prepare and update Strategic Research and Innovation Agendas (including cross-cutting issues); identify innovation barriers; report on the implementation of R&I activities at European, national/regional levels to support the work of SETIS; develop knowledge-sharing mechanisms that help bringing R&I results to deployment.

Highlights (technological/non-technological): website (as Platform), extensive stakeholder database, SRIA 2016 (update 2018), Stakeholder Plenary Meetings, Publications (position papers, factsheets), successful cooperation with other initiatives

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *727509*

FLEDGED

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727600

FLEXIBLE DIMETHYL ETHER PRODUCTION FROM BIOMASS GASIFICATION WITH SORPTION ENHANCED PROCESSES

Matteo Romano, Politecnico di Milano

HORIZON 2020 WORKSHOP ON BIOENERGY, ADVANCED BIOFUELS AND RENEWABLE FUELS

BRUSSELS, BELGIUM
10-11 APRIL 2018

The FLEDGED project

The ***FLEDGED*** project will deliver a process for ***Bio-based dimethyl Ether (DME)*** production from **biomass** gasification, validated in ***industrially relevant*** environment (TRL5).

NOVEL FLEDGED PROCESS

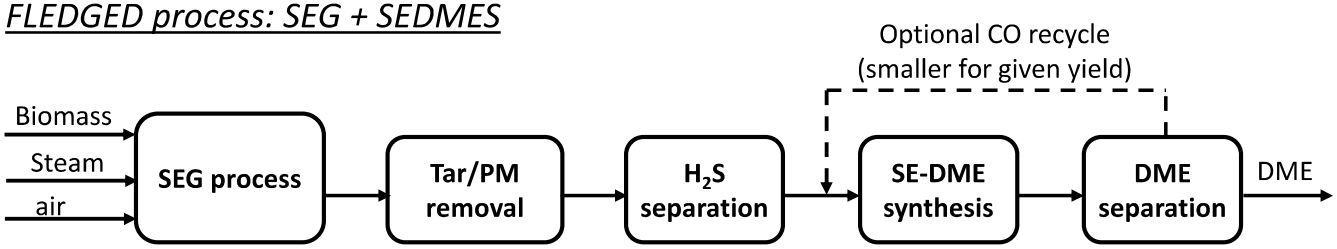
Flexible sorption enhanced gasification (SEG) process

+

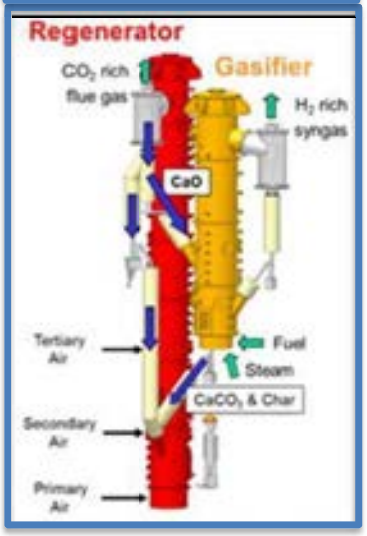
Sorption enhanced DME synthesis (SEDMES) process

- Process intensification
- Efficiency improvements
- Cost reductions
- Process flexibility

FLEDGED process: SEG + SEDMES



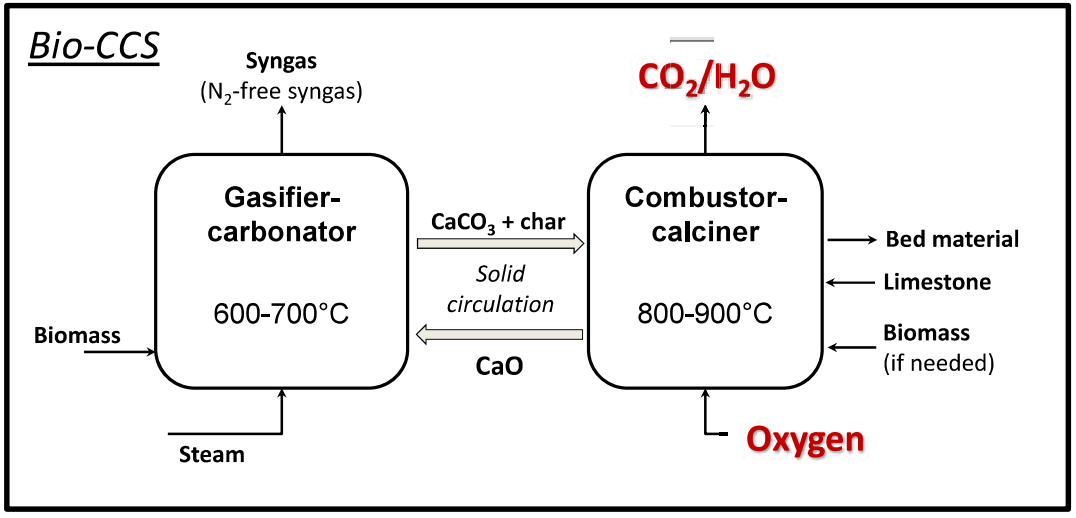
Flexible SEG process will be demonstrated at TRL5 in the 200 kW dual fluidized bed facility at University of Stuttgart.

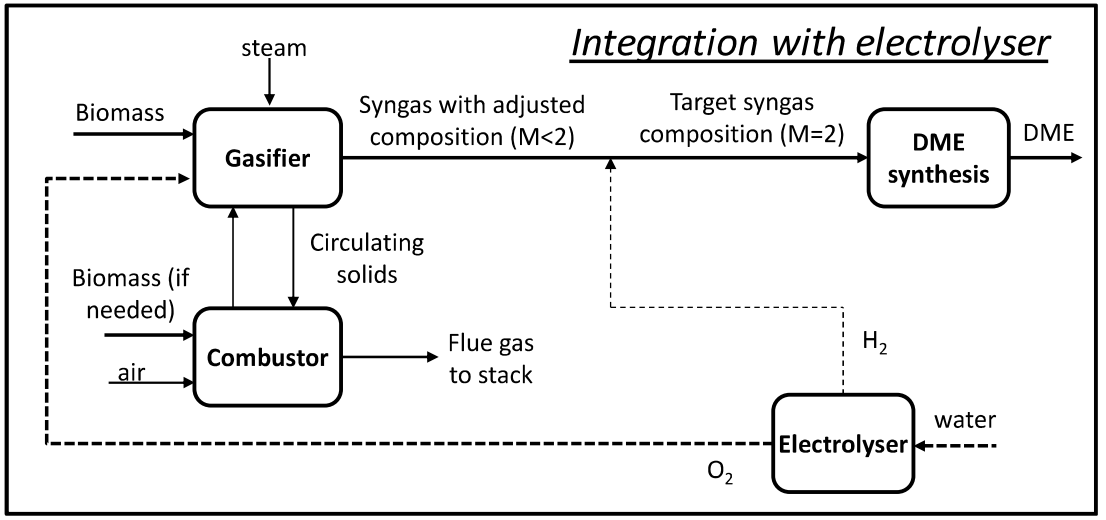


SEDMES process will be demonstrated at TRL5 in multi column PSA rig at ECN

Process flexibility

- Gasification tests with different types of biomass
- Gasification tests under oxyfuel combustion for bio-CCS
- Gasification and DME synthesis tests with adjusted process parameters for integration with electrolyser
  - ➡ Contribution to electric grid stability by power-to-liquid





Project Acronym: **FLEDGED** Project Number: **727600** Call: LCE-2016-RES-CCS-RIA Topic: LCE-08-2016-17

Project title: **FLExible Dimethyl ether production from biomass Gasification with sorption enhancED processes**

Specific Challenge: New sustainable biofuels technologies need to be developed that improve performance, notably with regards to the following sub-challenges: (i) improving the technology competitiveness by upgrading the conversion efficiency and possibly diversifying the technology; (ii) improving the feedstock supply by reducing the supply costs and possibly diversifying the biomass feedstock.

Technological approach of the Project: FLEDGED project aims at developing sorption enhanced gasification (SEG) and sorption enhanced DME synthesis (SEDMES), leading to a new intensified process with high efficiency, improved flexibility and economically competitive.

Expected Impact: The new developed technology pathways should improve the economic, environmental and social benefits of biofuels. Favourable energy and GHG balances are expected, as well as a significant cost reduction, which would permit these fuels to compete favourably with conventional biofuels. A favourable performance on secure and affordable energy supply and diversified, cheap feedstock supply are expected.

Contribution of the Project:

- Decarbonisation of the transport sector: provision of renewable transportation fuel with possible negative WTW CO_2 emissions (if coupled with CCS) and favouring diffusion of intermittent electric renewables thanks to power to liquid.
- Flexibility with respect to the fuel to be processed: FLEDGED process allows converting different types of biomass feedstocks, including cheap waste biomass.

Highlights (technological/non-technological):

- TRL5 demonstration of two key sorption-enhanced processes for biomass gasification and DME synthesis
- Overall process characterized by process intensification, high efficiency, flexibility in feedstock and operation.
- Thermodynamic and economic analysis, WTW LCA, risk analysis, socio-economic analysis.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727600

FLEXCHX

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 763919

Project Acronym: **FLEXCHX** and Number: 763919 Call: LCE-07-2017 Topic: Combined Heat and Power

Project title: **FLEXIBLE COMBINED PRODUCTION OF POWER, HEAT AND TRANSPORT FUELS FROM RENEWABLE ENERGY SOURCES**

Specific Challenge: Combined Heat and Power: Transforming renewable energy into intermediates

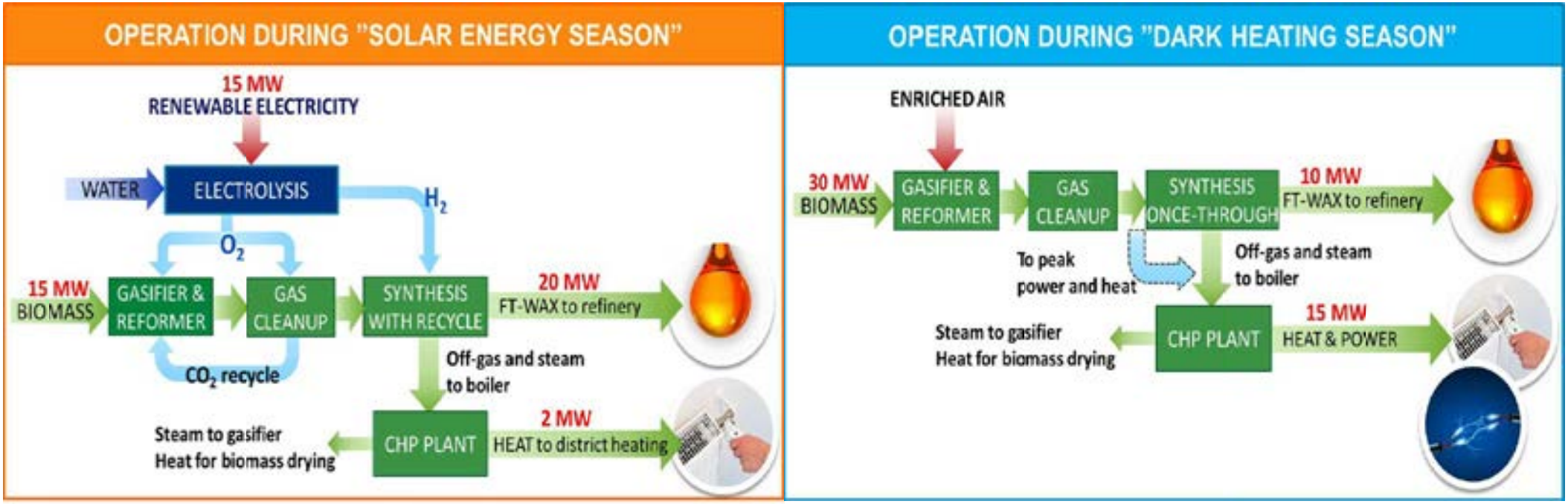
Technological approach of the Project:
FLEXCHX presents an economical way to utilize combined heat and power plants and district heating networks as part of the future European energy system. Tri-generation of power, heat and intermediate product (FT wax) for the transport sector is used to address the challenge of the poor match between the availability of solar energy and the demand for heating.

Expected Impact: The FLEXCHX project relates to the topic LCE-07-2017 "Developing the next generation technologies of renewable electricity and heating/cooling" and more specifically to the subtopic h) Combined Heat and Power production - transforming renewable energy into intermediates.
Contribution of the Project: The key goal of the FLEXCHX project is to develop a process concept that will enable flexible co-generation of heat, power and 2nd generation biofuels in the small-to-medium size range (5-50 MW biomass and 0-30 MW electricity input) using various low-cost biomass feedstocks and excess electricity during the sunny season.

Highlights: In this project, a **flexible and integrated hybrid process, which combines electrolysis of water with gasification of biomass and catalytic liquefaction, will be developed**. This process produces heat, power and an intermediate energy carrier (FT wax),which can be refined to transportation fuels using existing oil refining equipment. **The key enabling technologies will be developed and validated to TRL5 enabling follow-on demonstration activities.**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 763919

The key idea of FLEXCHX project



The **vision** is to realise a process for optimal use of the seasonal solar energy supply and available biomass resources to satisfy the seasonal demand for heat and power, and to simultaneously produce low-GHG fuels for the transport sector.

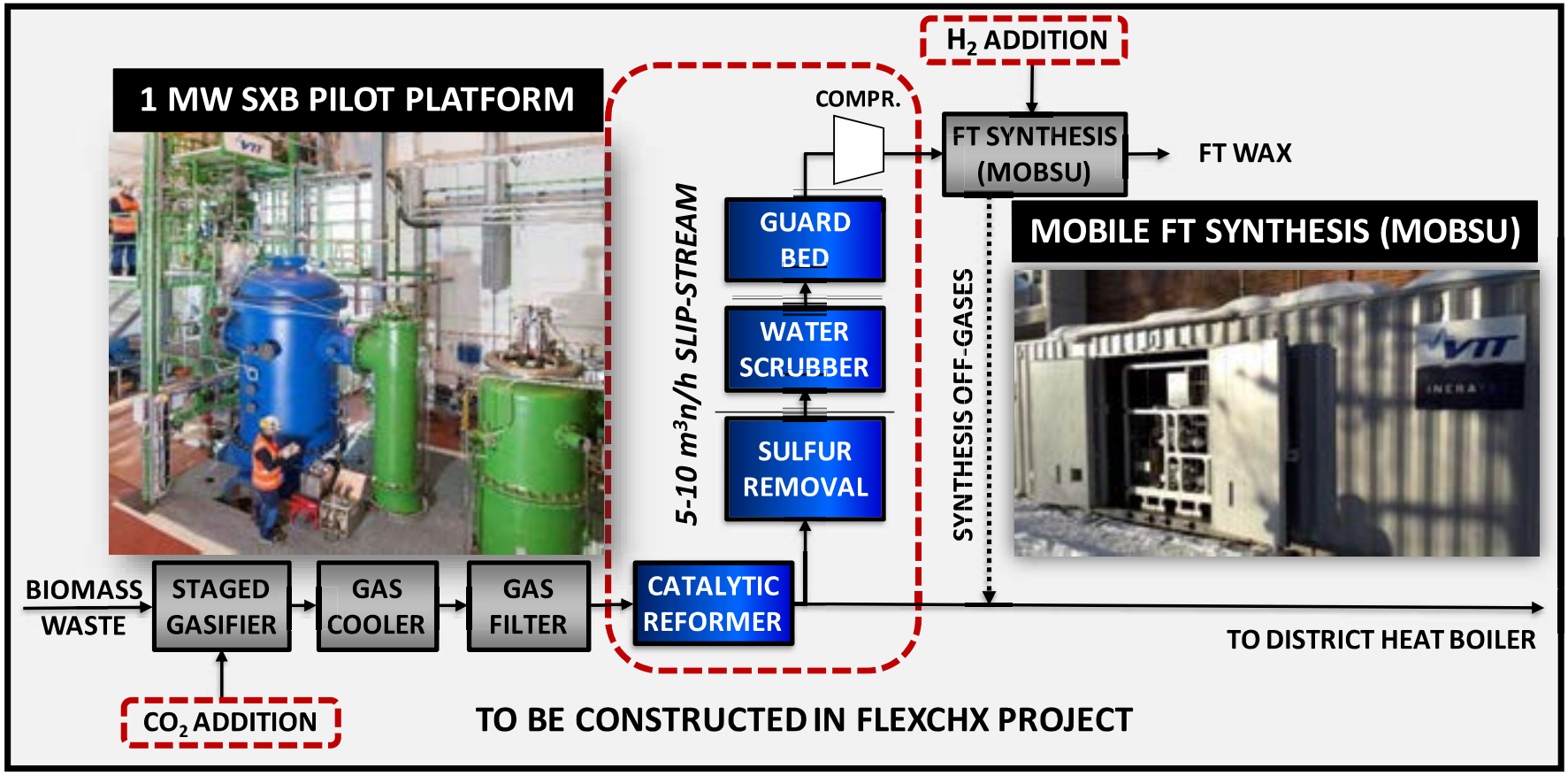
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 763919

FLEXCHX

Flexible combined production of power, heat and transport fuels from renewable energy sources
Duration: 1.3.2018 – 28.2.2020; EU contribution: 4 489 545 €

Partners:

VTT
ENERSTENA
INERATEC
German Aerospace Center
DLR
HELEN
LITHUANIAN ENERGY INSTITUTE
AB KAUNO ENERGIJA
NESTE
Johnson Matthey
Grönmark



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 763919

FlexiFuel-CHX

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654446

Fuel flexible ultra-low emission biomass boiler with flue gas condensation

FlexiFuel CHX

New and innovative residential-scale biomass heating system

- fuel flexible operation
- flue gas condensation
- highly efficient
- low-NO_x gas burner
- almost zero emissions

windhager
Wuppertal Institut
Universiteit Utrecht
fml
BIOS BIOENERGIESYSTEME GmbH
EVOPLAN technik & energie
Ciemat

Fuel Flexibility

Advantages

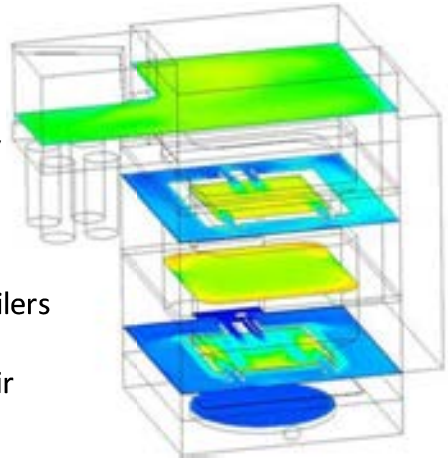
For single users:

- Increased flexibility regarding the biomass fuel purchase.
- Lower heat generation costs due to the high overall efficiency and also high annual utilisation rate.
- Very low emissions (demanding for no secondary emission control measures such as ESPs).

From a European point of view:

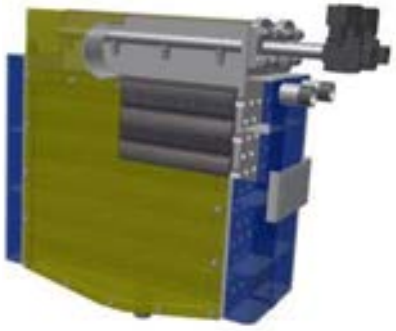
- Huge potential impact of the new technology on the European energy system (about 8 million small-scale biomass boilers installed; about 300,000 new installations per year).
- Enhanced European competitiveness in the field of green technology.
- Contribution to achieve EU greenhouse gas (GHG) mitigation as well as general emission reduction targets.
- Support of the energy goals of the EU by saving raw materials (due to the increased annual utilization rate) and thus enlarge the bioenergy application potential.
- Contribution to achieve the targets of the EU “Clean Air Policy Package”.

Low-NO_x Burner



- Design and optimization supported by CFD simulations.
- High gas phase burnout quality.
- Low-NO_x emissions (by 50% reduced compared with present grate-fired boilers – also for N-rich fuels).
- Operation at very low overall excess air ratios (increased efficiency).

Condenser



- Novel fuel flexible flue gas condensation technology.
- Innovative coating technology applied to reduce fouling and corrosion and to increase performance.
- Automatic cleaning system to keep a high performance level.
- Integrated condensate neutralisation stage.
- Tailored to the demands of condensing flue gases from the combustion of a wide fuel spectrum also comprising fuels with elevated S and Cl contents.
- Efficiencies of up to 110% (related to the NCV).

Project Acronym: **FlexiFuel-CHX** Project Number: **654446** Call: H2020-LCE-2015-1-two-stage
Topic: LCE-02-2015, Developing the next generation technologies of renewable electricity and heat./cooling
Project title: **Development of a fuel flexible and highly efficient ultra low emission residential-scale boiler with coupled heat recuperation based on flue gas condensation**

Specific Challenge:
Improving efficiency of low emission biomass heating systems while widening the feedstock base.
Technological approach of the Project: Biomass fuel selection and characterisation; high-temperature thermodynamic equilibrium calculations; CFD simulations; design, manufacturing and test of prototypes; accompanying techno-economic evaluations, impact and risk assessments and market studies to support the development of a technologically, environmentally and economically feasible solution.

Expected Impact: New flexible and robust residential-scale low emission heating boilers need to be developed using not only one type of feedstock but also a wider range of sustainable feedstock (including mixtures) with high ash content such as agricultural and forest residues.
Contribution of the Project: The FlexiFuel-CHX technology shall distinguish itself by high fuel flexibility (utilisation of wood and non-wood fuels), high thermal efficiencies (up to 110% related to fuel NCV) and almost zero gaseous and PM emissions. It shall be an economically attractive residential biomass heating technology in the capacity range of 20 to 130 kW without secondary emission reduction measures.

Highlights (technological/non-technological):
- Performance of test runs with: olive stones, poplar, almond shells, miscanthus, agropellets, forest residues.
- A stable operation of the testing plant with very low emissions has been proven at full and part load.
- Performance data already achieved: O_2 content in the flue gas 3.5-5.6 vol% (dry flue gas) for full and part load; efficiencies of up to 108%; dust emissions < 6 mg/MJ for all fuels (without use of any filters)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654446

FlexiFuel-SOFC

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641229

Fuel flexible highly efficient biomass gasifier coupled with a SOFC

FlexiFuel SOFC

New and innovative micro-scale biomass CHP

fuel power: 25 to 150 kW
(related to the NCV of the fuel)

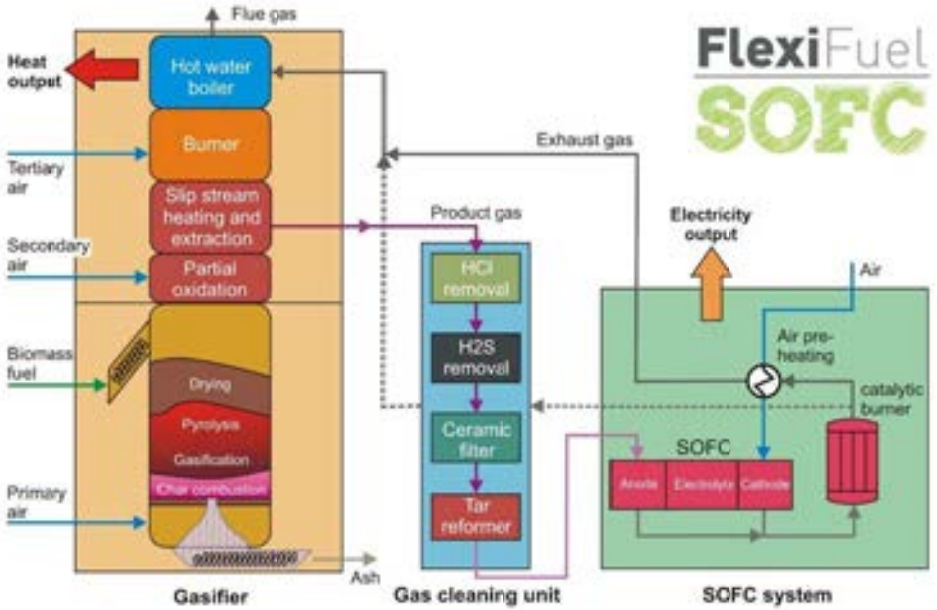
- **fuel flexible operation**
- **compact gas cleaning**
- **highly efficient solid oxide fuel cell**
- **thermal and electric power generation**
- **almost zero emissions**

windhager · Wuppertal Institut · Universiteit Utrecht · Fraunhofer IKTS · BIOS Bioenergiesysteme GmbH · TU Delft · HYGEAR · AVL

Concept

Gasifier

- Fuel flexibility
  (wood and selected non wood fuels)
- Flexible thermal power adaption
- Product gas extraction to GCU and integrated product gas heating
- High thermal efficiency
- Very low emissions of the downstream gas burner



Gas cleaning unit (GCU)

- Novel and compact gas cleaning system
- Ensure acceptable gas quality for the SOFC
- Optimised thermal management by utilising off-heat from the SOFC system for GCU heat-up

SOFC system

- High electric efficiency
  (stack efficiency of >40%)
- Robust SOFC stack
- High availability and operational safety

Advantages

For single users:

- Increased flexibility regarding the biomass fuel purchase.
- Lower heat and power generation costs due to the high overall efficiency
- Very low emissions (demanding for no secondary emission control measures such as ESPs).

From a European point of view:

- Huge potential impact on the European energy system (about 8 million small-scale biomass boilers installed; about 300,000 new installations per year).
- Enhanced European competitiveness in the field of green technology.
- Contribution to achieve EU greenhouse gas (GHG) mitigation as well as general emission reduction targets.
- Support of the energy goals of the EU by saving raw materials (due to the increased annual utilization rate) and thus enlarge the bioenergy application potential.
- Contribution to achieve the targets of the EU “Clean Air Policy Package”.

Project Acronym: **FlexiFuel-SOFC** Project Number: **641229** Call: H2020-LCE-2014-1
Topic: LCE-02-2014, Developing the next generation technologies of renewable electricity and heat./cooling
Project title: **Development of a new and highly efficient micro-scale CHP system based on fuel flexible gasification and a SOFC**

Specific Challenge: Improving efficiency of biomass CHP systems while widening the feedstock base

Technological approach of the Project: Thermodynamic and electro-chemical calculations; CFD simulations; development, design and manufacturing of testing plants; performance of test runs at these testing plants; accompanying techno-economic evaluations, impact assessments and market studies to support the development of a technologically, environmentally and economically feasible solution

Expected Impact: Cost effective, robust and environmentally friendly micro and small-scale CHP systems with high thermal and electrical efficiency need to be developed allowing the use of solid, liquid or gaseous sustainable biomass feedstock, such as agricultural and forest residues
Contribution of the Project: The FlexiFuel-SOFC technology shall distinguish itself by enhanced fuel flexibility (utilisation of wood and selected non-wood fuels), high electric efficiencies (>40% related to the gas entering the stack module), an overall efficiency of >90% and close to zero emissions.

Highlights (technological/non-technological):
- A first testing plant with a 6 kW_{el} SOFC has been developed, designed, constructed and tested
- With this plant for the first time stable CHP operation of a system combining a biomass updraft gasifier and a SOFC could be achieved. The design target of 6 kW_{el} could be achieved under real operating conditions.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641229

FlexJET

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 792216

Sustainable Jet Fuel from flexible Waste Biomass

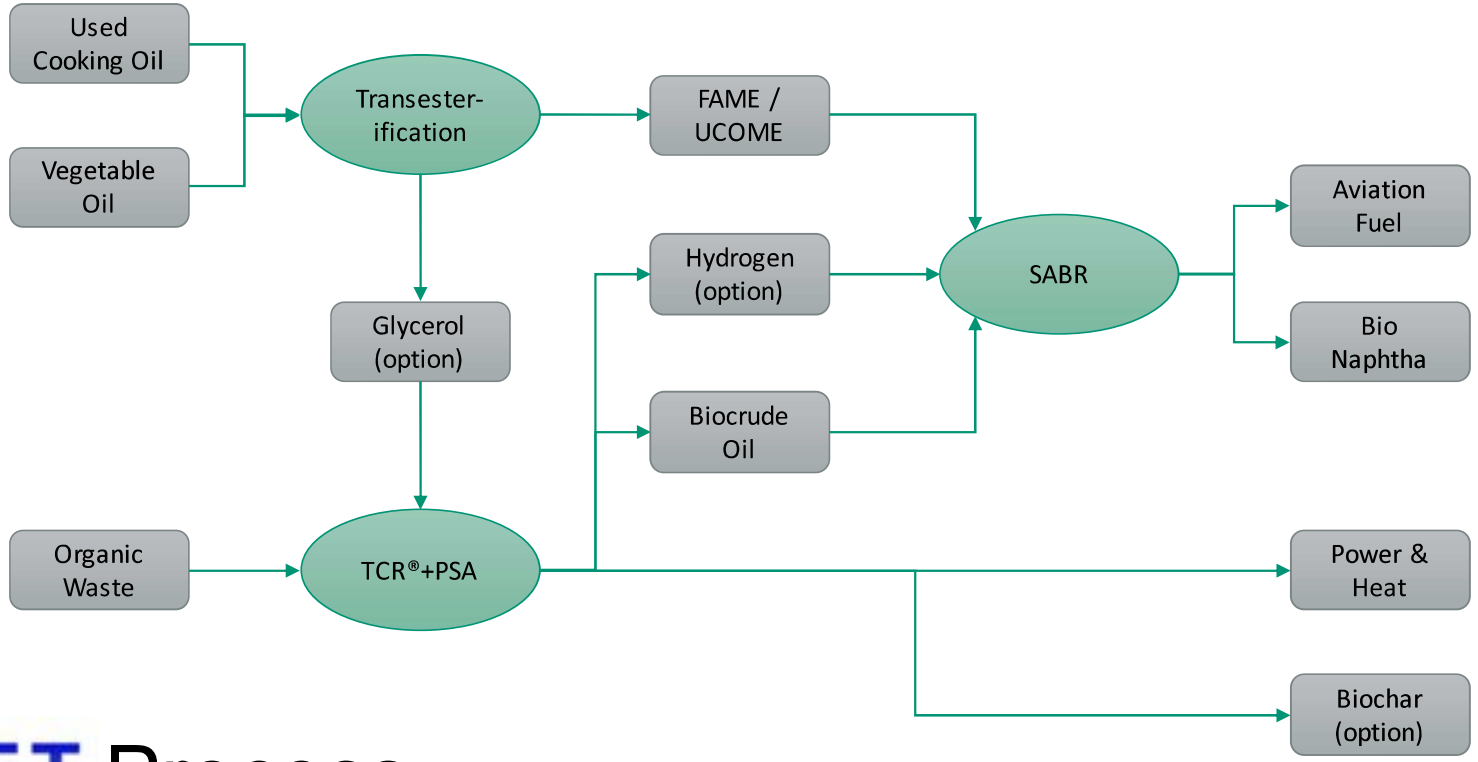
EU Horizon 2020 Project flexJET

Block Diagram

This project was awarded funding from the European Union's Horizon 2020 research and innovation programme. Grant agreement under negotiations.

Combing Greenfuels Research & Susteen Technologies

Co-refining of FAME and Biocrude Oil



flexJET Process

Project Acronym: **FlexJET** Project Number: 792216 Call: LCE-20-2016-2017
Topic: Enabling pre-commercial production of advanced aviation biofuel

Project title: **Sustainable Jet Fuel from Flexible Waste Biomass**

Specific Challenge: (Decarbonisation of the aviation transport sector and reducing its dependence on fossil fuel requires liquid biofuels even in the longer term. Accelerating the deployment of advanced biofuel technologies for use in aviation will allow competitive production of biojet fuels on commercial scale, increase their attractiveness and facilitate achievement of the EU Biofuel FlightPath[1] targets.)

Technological approach of the Project: The specific challenge is to enable commercial production of sustainable and cost-competitive advanced biofuels aimed for use in the aviation sector. In particular, supporting the accomplishment of a pre-commercial plant(s) for advanced biofuels for aviation based on Trans esterification of waste Veg oil combined with Thermo catalytic reforming of food waste

Expected Impact: (Demonstrating advanced biofuel technologies for aviation at large industrial scale will respond to the EU FlightPath objectives for commercial deployment and realisation of aviation biofuels and its target of using 2 million tons aviation biofuel by 2020.)

Contribution of the Project: The outcome of the project will produce over 1000 tonnes of aviation fuel as a pre commercial exemplar leading to a full understanding of techno economic and environmental performance leading to rapid commercial uptake of the technology.

Highlights (technological/non-technological):

Over 1000 tonnes of aviation fuel produced
Rapid uptake and commercial deployment
Full sustainable demonstration of technology.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *[number]*

FORBIO

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691846

FORBIO
Fostering sustainable feedstock production for advanced biofuels on underutilised land in Europe

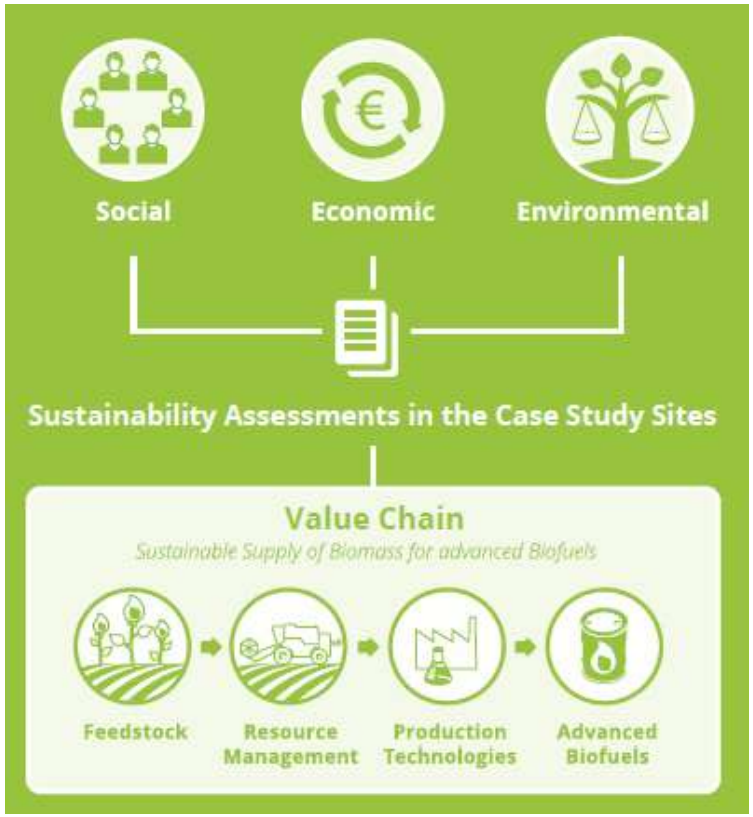
10-11 April 2018
Brussels, Belgium

Rainer Janssen, Cosette Khawaja
WIP Renewable Energies
Sylvensteinstr. 2
81369 Munich
www.wip-munich.de

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No691846.

FORBIO objectives

- ✓ Identify social, economic, environmental and governance-related **opportunities and challenges**
- ✓ Evaluate **agronomic and techno-economic potential** of the selected bioenergy value chains
- ✓ Assess environmental, social and economic **sustainability**
- ✓ Analyse economic and non-economic **barriers to the market uptake**
- ✓ **Encourage** European **farmers** to produce sustainable biomass feedstock
- ✓ **Build capacity** of stakeholders for setting up sustainable bioenergy supply chains



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No691846.

FORBIO case studies

CASE 1

ITALY
Sulcis, Portoscuso

Contaminated land from industrial activities

22,000 ha

CASE 2

UKRAINE
South of Kiev

Underutilised marginal agricultural land

Over 10,000 ha

CASE 3

GERMANY
Metropolis region
Berlin & Brandenburg

Sewage irrigation fields & lignite mining

1,140-3,917 ha and 7,295-11,795 ha

Agronomic, techno-economic and sustainability assessments of the case studies

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No691846.

Project Acronym: **FORBIO** Project Number: **691846** Call: **H2020-LCE-2015-3** Topic: **CSA**

Project title: **Fostering sustainable feedstock production for advanced biofuels on underutilised land in Europe**

Specific Challenge

- Foster the development of the bioenergy sector and to ensure its sustainability
- Setting up or strengthening sustainable local bioenergy supply chains that meet highest environmental criteria and quality standards, including consideration for indirect impacts and energy balances
- Encouraging European farmers and foresters to produce non-food bioenergy or bioenergy carriers alongside food, feed and other products
- Exchange of information on best practices for bioenergy policy, regulations and support schemes to allow the most sustainable and energy efficient use of bio-resources

Technological approach of the Project

Several EU and Associated countries have relevant surfaces of land that are currently largely underutilized. These lands cannot be used for food/feed production, but bioenergy crops have the potential to be grown profitably on them offering a source of income to local communities while contributing to achieving the targets of the Renewable Energy Directive.
In FORBIO, agronomic and techno-economic feasibility studies were conducted in 3 case study regions and a sustainability assessment on the most promising value chains was performed with the aim of demonstrating the viability of using underutilised land for bioenergy production.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691864

Expected Impact

- Increasing the share of sustainable bioenergy in the final energy consumption
- Addressing the needs for environmental impact assessments, including considerations for indirect impacts and energy balance
- Development of better policy, market support and financial frameworks, notably at national, regional and local level

Contribution of the Project:
Through the provision of feasibility studies, stakeholders will gain insights on the viability of bioenergy production in the target countries. Strategic partnerships between potential biomass producers, potential biomass buyers and other actors along the supply chain will be established and promoted in each of the partner countries. The project will offer state-of-the-art sustainability impact assessment and monitoring tools & methodologies and will contribute to developing better policy and market support at the national and sub-national level by identifying the barriers to the deployment of modern bioenergy and presenting strategies and best practices for overcoming such barriers.

Highlights (technological/non-technological):

- Agronomic potential of selected promising (energy) crops evaluated for three case study regions
- Tecno-economic opportunities for bioenergy value chains identified
- User-friendly and tailored set of sustainability indicators developed (based on GBEP criteria)
- Capacity building events and training of stakeholders organised in case study regions

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691864

Project Consortium

WIP Renewable Energies
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University of Limerick
Contact: JJ Lehay

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No691846.

greenGain

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646443

GREENGAIN: BIOMASS FROM LANDSCAPE CONSERVATION AND MAINTENANCE WORK FOR RENEWABLE ENERGY PRODUCTION IN THE EU

H2020 Workshop

Brussels

10-11 April 2018

Christiane Volkmann/Birger Kerckow, FNR

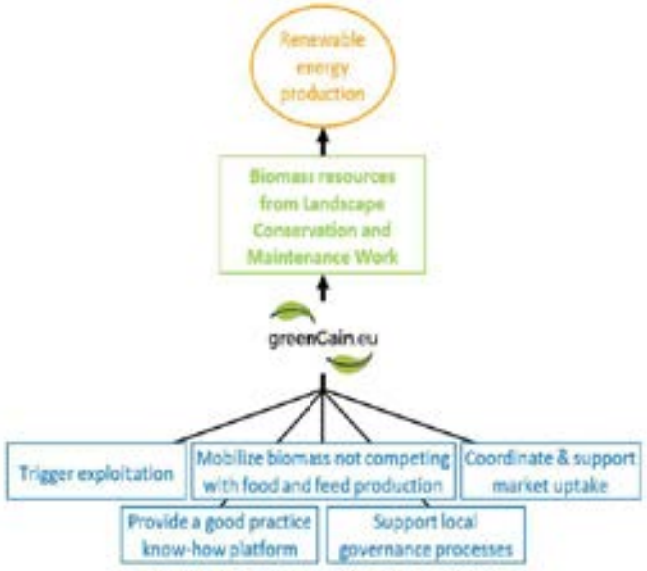
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646443

The greenGain Project: Biomass from Landscape Conservation and Maintenance Work for Renewable Energy Production in the EU

Duration: 01/2015 – 12/2017

Funding: Horizon 2020

Partner countries: ES, IT, DE, CZ



Aim: Increase energy utilization of biomass from landscape conservation and maintenance work (LCMW) carried out in the public interest to meet the EU's demand for renewable energy.

Biomass: Woody and herbaceous from maintenance of urban green areas, public parks, roadsides, waterways, hedgerows on banks, ravines, firewalls, vineyards and olive groves etc.

Means: Contribute to identification of sustainable sources of biomass by cooperating with regional and local players to learn more about existing and implementing new utilisation pathways.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646443.

Benefits

- by-product of regular management of public areas
- local and renewable energy source
- regional and local benefit
- no competition with food production

Disadvantages

- scattered & seasonal supply
- low quality
- no clear responsibilities
- no clear legal requirements of waste management
- little sharing of knowledge and best practices
- insufficient information on supply, demand & logistics

Table 1: Sustainable potentials refer to fresh matter only and to a whole NUTS3 area (county or province).

Country	LCMW (w=woody, h=herbacious)	Sustainable potential (t/km^2 *year)
ES	Track cleaning (w)	1,06
	Fire belts (w)	0,31
	Abandoned land restoring (w)	0,59
IT	Olive Groves (w,h)	0,98
	Parks maintenance (w,h)	0,56
	Riverside cleaning (w.h)	0,26
DE	Hedgerows on banks (w)	3,03 – 16,62
	Roadside cleaning (w)	0,13 – 0,70
CZ	Maintenance urban areas (w)	0,16 – 0,53
	Maintenance urban areas (h)	2,64 – 11,19
	Roadside cleaning (w,h)	0,45 – 1,84

Use by integration

- Use of LCMW feedstock for energy still exceptional
- most frequent treatment is composting.
- greenGain biomass assessment showed that LCMW biomass potential limited
- Key: Integration in local and large-scale supply chains and larger logistic solutions.

www.greengain.eu
www.greengain.eu/platform/

Project Acronym: **greenGain** Project Number: **646443** Call: H2020-LCE-2014-3
Topic: LCE-14-2014 - Market uptake of existing and emerging sustainable bioenergy
Project title: **Supporting Sustainable Energy Production from Biomass from Landscape Conservation and Maintenance Work**

Specific Challenge: Foster the development of the bioenergy sector and ensure its sustainability. One way to do it is to use more and sustainable bioenergy. The EU needs to expand the supply of bioenergy produced in the EU, by encouraging the EU farmers/foresters to produce also energy and energy intermediaries.
Technological approach of the Project: CSA - The approach is to identify the quantity and quality of the kinds of LCMW matter relevant and available and to support the conversion into bioenergy.

Expected Impact: Increasing the share of sustainable bioenergy in the final energy consumption. Substantial and measurable reductions in the transaction costs for project developers as well as for the permitting authorities, whilst still fully addressing the needs for environmental impact assessments, including considerations for indirect impacts and energy balance, and public engagement. Development of better policy, market support and financial frameworks, notably at national, regional and local level.
Contribution of the Project: analyse the potential and occurrence of biomass LCMW; examine the whole utilization pathways of the feedstock; assess the economic, environmental, social and legal aspects of its use; identify possible limitations and barriers to the energy use of this feedstock and provide recommendations to a wide range of stakeholders in the EU; cooperate with seven regions in four European countries; foster the exchange of information, good practices and expertise, and connect experts; help implement actions and measures to establish new value chains

Highlights (technological/non-technological): knowledge platform, website, business models, best practice guidelines, handbook on LCMW biomass value chain, strategy paper, implementation of pilot cases, achievements by external stakeholders to implement project results in their region, conferences & workshops

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *646443*

Heat-To-Fuel

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 764675

Heat to Fuel

Horizon 2020 Workshop on Bioenergy, Advanced Biofuels and Renewable fuels

10-11/04/2018, Brussels

This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement n° 764675

Data

Heat-to-Fuel is a Horizon 2020 EU-funded project carried out by 14 partners from across Europe that aims to deliver the next generation of biofuel production technologies supporting the de-carbonisation of the transportation sector.

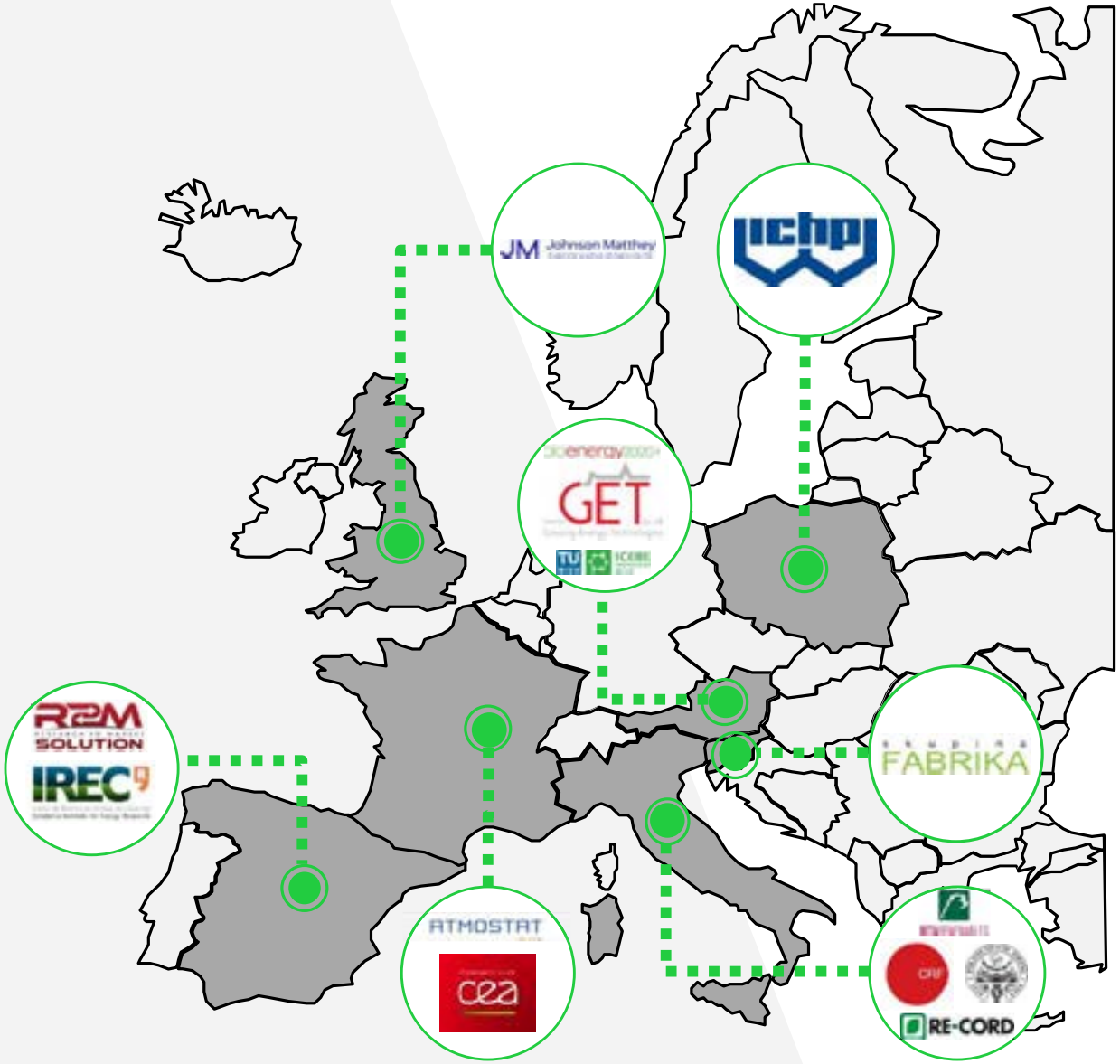
Acronym: Heat-to-Fuel

Budget: € 5.896.987,50

Type of action: RIA

Duration: Started in September 2017 and will last until August 2021.

Consortium map



Coordinator - Güssing Energy Technologies (Austria)
Fundacio Institut de Recerca de l'Energia de Catalunya (Spain)
Consorzio per la Ricerca e la Dimostrazione sulle Energie Rinnovabili (Italy)
Commissariat à l'Énergie Atomique et aux Énergies Alternatives (France)
Johnson Matthey (UK)
Skupina Fabrika Raziskave in Razvoj (Slovenia)
Politecnico di Torino (Italy)
Technische Universität Wien (Austria)
Bioenergy 2020+ (Austria)
Instytut Chemicznej Przeróbki Węgla (Poland)
Beta Renewables (Italy)
Atmostat (France)
Centro Ricerche Fiat (Italy)
R2M Solution Spain (Spain)

Project Acronym: **HEAT-TO-FUEL** Project Number: **764675** Call: H2020-LCE-2017-RES-CCS-RIA Topic: LCE-08

Project title: **Biorefinery combining HTL and FT to convert wet and solid organic, industrial wastes into 2nd generation biofuels with highest efficiency**

Specific Challenge: New sustainable biofuels technologies need to be developed that improve performance, notably with regards to the following sub-challenges:
- improving the technology competitiveness by upgrading the conversion efficiency and possibly diversifying the technology;
- improving the feedstock supply by reducing the supply costs and possibly diversifying the biomass feedstock.

Technological approach of the Project: Novel technologies used in Heat-to-Fuel together with innovative activities on design, modelling, development of hardware and processes, testing and life cycle analysis of a fully integrated system. Prove the technological feasibility and its economic worthiness of the concept acting as a catalyst of future industrial units. Increasing the share of local resources used for producing energy, and thus reducing EU's dependency of energy's imports.

Expected Impact: The new developed technology pathways should improve the economic, environmental and social benefits of biofuels. Favourable energy and GHG balances are expected, as well as a significant cost reduction, which would permit these fuels to compete favourably with conventional biofuels. A favourable performance on secure and affordable energy supply and diversified, cheap feedstock supply are expected. In addition, positive impacts on enhancing Europe's competitiveness should be anticipated where appropriate.

Contribution of the Project: Deliver cost-competitive technologies achieving biofuel prices below €1 per litre. This is achieved by a 20% reduction in the operation costs of the biofuel production processes; Increase the quality of the biofuel resulting in 5% life-cycle green-house gases emissions reduction from biofuel production;

Highlights (technological/non-technological):

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *764675*

THANK YOU

HiEff-BioPower

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727330

Project objectives

- **Development of a new innovative, highly efficient and equal-zero-emission medium-scale biomass CHP technology based on**
  - a gasifier with an integrated partial oxidation stage and a high-temperature heat exchanger for the reduction of tars in the product gas
  - a novel compact high temperature gas cleaning unit for S and Cl removal and tar reforming and
  - a solid oxide fuel cell (SOFC)
- **Capacity range: 1 MW (600 kW thermal and 400 kW electric output) up to 10 MW total power output**
- **Targeted efficiencies: gross electric efficiency >40% and overall efficiency >90%**
- **Within the project a testing plant consisting of a 500 kW gasifier, a full stream gas cleaning unit and a 6 kW_{el} SOFC system, operating in a side stream extracted downstream the gas cleaning unit, shall be developed, designed and constructed**
- **Based on test runs at this testing plant the performance of the main system components shall be evaluated and stepwisely improved**
- **At project end a TRL of 5 should be reached**

Results achieved so far and outlook

- **Project duration: 10/2016 – 09/2020**
- **Results achieved at the end of the first project period (actual status with end of 03/2018)**
  - System design for the CHP technology developed
  - Further development and system integration of the gasifier
  - Development and manufacturing of a compact high-temperatur gas cleaning unit (GCU) to remove HCl, sulfur components and tars accompanied by lab-scale pre-tests regarding sorbent and catalyst selection
  - Development and manufacturing of a 6 kW_{el} SOFC system
  - Manufacturing and assembly of a first testing plant (ongoing work)
  - Preliminary market studies, techno-economic analyses and impact assessments
- **Outlook on remaining work**
  - Test runs at the testing plant as a basis for the evaluation and the stepwise further development of the technology
  - Development of a second optimised testing plant and performance of test runs at this plant
  - Final system design including scale-up
  - Final market studies, techno-economic analyses and impact assessments of the new technology

Project Acronym: **HiEff-BioPower** Project Number: **727330** Call: H2020-LCE-2016-2017
Topic: LCE-07-2016-2017
Project title: **Development of a new highly efficient and fuel flexible CHP technology based on fixed-bed updraft biomass gasification and a SOFC**

Specific Challenge: Development of highly-efficient, low-emission medium-scale biomass-based CHP systems.
Technological approach of the Project: Development of a new highly efficient biomass CHP technology consisting of a gasifier, a newly developed tar reforming unit, a novel compact gas cleaning system and a solid oxide fuel cell (SOFC) for a capacity range of 1-10 MW (total energy output). Within the project a testing plant consisting of a 500 kW gasifier, a full stream gas cleaning unit and a side stream 6 kW_{el} SOFC system shall be developed, tested and improved. Modelling and experimental R&D shall therefore be employed.

Expected Impact: Significantly increased technology performance and reduced life-cycle environmental impact; nurturing the development of the industrial capacity to produce components and systems and opening of new opportunities; contribution to the strengthening of the European industrial technology base; contribution to solving the global climate and energy challenges.
Contribution of the Project: CO_2 emission reduction potential of 1.3 million tons/year if 20% of the yearly newly installed biomass CHP units are based on the new technology; almost zero CO, OGC, NO_x and PM emissions; high efficiencies and almost zero emissions shall lead to an efficient market transformation; the whole development work and manufacturing is done by European R&D institutions and companies.

Highlights (technological/non-technological):
The design phase of the testing plant has already been finalized and the first testing plant is under construction

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *727330*

HyFlexFuel

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 764734

HyFlexFuel

Hydrothermal Liquefaction: Enhanced performance and feedstock flexibility for efficient biofuel production

Arne Roth

Bauhaus Luftfahrt e.V.
Munich (Taufkirchen), Germany

Call: H2020-LCE-2016-2017

Topic: LCE-08-2016-2017: Development of next generation biofuel technologies

http://www.hyflexfuel.eu

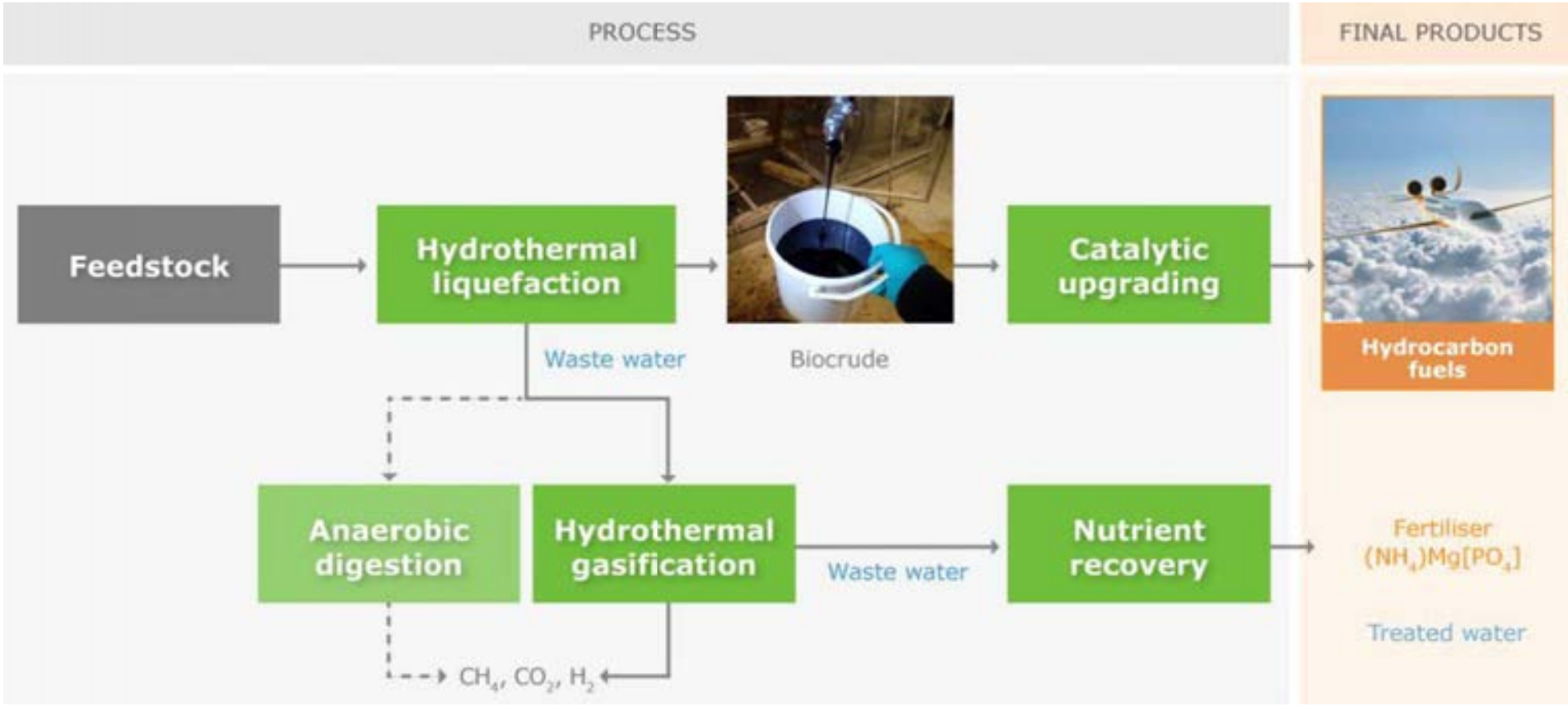
HyFlexFuel

HyFlexFuel works on the development of a process chain to produce sustainable liquid fuels based on hydrothermal liquefaction of various biomass feedstocks.

Specific objectives:

- Demonstrate compatibility of HTL-based fuel production with a diverse biomass feedstock portfolio, including algae and waste streams, such as sewage sludge
- Increase energy and carbon efficiency of HTL through improved heat integration and product recovery
- Valorise organic and inorganic components in residual process streams
- Upgrade biocrude from HTL conversion by catalytic hydrotreatment into fuel products and demonstrate their drop-in capability
- Assess technical, socio-economic and environmental performance potentials

HyFlexFuel


PROCESS
FINAL PRODUCTS
Feedstock
Hydrothermal liquefaction
Biocrude
Catalytic upgrading
Hydrocarbon fuels
Waste water
Anaerobic digestion
Hydrothermal gasification
Waste water
Nutrient recovery
Fertiliser $(NH_4)Mg[PO_4]$
Treated water
CH_4, CO_2, H_2

Project Acronym: **HyFlexFuel** Project Number: **764734** Call: H2020-LCE-2016-2017
Topic: LCE-08-2016-2017: Development of next generation biofuel technologies
Project title: **Hydrothermal Liquefaction: Enhanced performance and feedstock flexibility for efficient biofuel production**

Specific Challenge: Develop new sustainable biofuel technologies that improve performance with regards to a) increased technology competitiveness through enhanced conversion efficiency and b) improved feedstock supply by reducing supply cost and diversifying feedstock base
Technological approach of the Project: HyFlexFuel develops a process chain to produce sustainable liquid fuels based on hydrothermal liquefaction (HTL) of various biomass feedstocks, without the requirement of prior energy-intensive drying. The project aims at developing all individual process steps and at demonstrating their viability under relevant operational conditions.

Expected Impact: The new developed technology pathways should improve economic, environmental and social benefits of biofuels; show favourable energy and GHG balances and reduced cost; support a secure and affordable energy supply and enhance Europe's competitiveness
Contribution of the Project: HyFlexFuel develops a low-cost fuel pathway with high GHG reduction potential through efficient conversion of virtually any type of biomass, including wastes (e.g. sewage sludge), lignocellulosics and algae, without prior drying.

Highlights: HyFlexFuel is not limited to HTL as primary conversion technology, but includes all key technologies along the value chain, i.e. hydrothermal liquefaction (HTL) and catalytic upgrading, but also the valorisation of residual process streams through catalytic hydrothermal gasification (cHTG), anaerobic digestion and nutrient recovery. All technologies are examined under relevant conditions in continuous operation mode at pilot-scale, supported by extensive process modelling and assessment activities.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 764734

ISAAC

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

Aim of ISAAC project: to overcome non technological barriers to the diffusion of biogas/biomethane in the Italian market

Social	Economic	Legislative
• Lack of information among citizens, farmers, breeders • NIMBY syndrome • Lack of interaction between different stakeholders • Reluctance of farmers to cooperate n energy plants management	• Lack of specific and efficient scheme of financing • Low profitability of small biogas plants and uncertainty about future incentive schemes	• Lack of a clear national legislation for gas grid injection and for digestate use • Fragmentation and multiplicity of regulatory framework on authorization and installation procedures

Call: H2020-LCE-2015-3; **Type of Action:** CSA; **Duration:** Jan 2016/ June 2018
Partners: AzzeroCO2; Legambiente; CNR; CIB; Chimica Verde

Tools/channels, target groups: ISAAC's approach & results

Social: citizens	Economic: farmers	Legislative: technicians and legislators
• Participatory Processes in 2 regions (pilots linked to planned biogas plants); • Information campaign in 7 regions; • Meeting with experts for school, public administrators • Visit to biogas plants • Use of small AD prototype for schools; Buck Bradley Comic Adventure • Website and Facebook	• Use of a calculation tool for residual biomass availability assessment and potential definition; • Use of innovative funding schemes; • Socio-economic study on plants • Analysis of existing plants' criticalities • Visit to biogas plants • Social economic surveys	• Law proposal on Participatory Processes; • Law proposals on biomethane injections; • Technical roundtables on by-products/co-products/waste; • Improvement of the Italian regulation on biomethane; • Training courses for municipal and regional technicians

Project Acronym: **ISAAC** Project Number: **681875** Call: H2020-LCE-2015-3 Topic: LCE-14-2015

Project title: **Increasing Social Awareness and ACceptance of biogas and biomethane**

Specific Challenge: to foster the development of the bioenergy sector and to ensure its sustainability, removing non-technical barriers to widespread production and use of biogas/biomethane

Technological approach of the Project:

- Encouraging European farmers to cooperate
- Ensuring sustained public acceptance with Participatory Processes
- Exchanging information with calculation tool, visit to biogas plants, event with experts, hands-on AD prototype for schools, use of a game

Expected Impact:

1. Increase of the share of biogas in the final energy consumption
2. Development of a better policy at national and regional level
3. Socio-economic and environmental impact assessments

Contribution of the Project:

1. Reducing NIMBY and increasing cooperation, as non-technical barrier to new AD plant installation
2. Producing clear and concrete proposals for laws improvement and regulatory framework organization
3. Using socio economic methodologies; survey; crowdfunding

Highlights (technological/non-technological):

- 2 participatory process in 2 Italian regions (more than 200 citizens involved)
- Telephonic surveys in 2 Italian regions (3 series for each area for around 800 citizens each)
- Tutorials in schools (around 700 students) in 7 different Italian regions
- Development of a game for mobiles (downloaded more than 5000 from google play and 800 from apple store)
- Involvement of around 150 farmers

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *691875*

ISABEL

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691752

powered by your local community

Project Overview

Mr Simone De Ioanna
White Research SPRL

Mr Iakovos Delioglanis
Q-PLAN INTERNATIONAL ADVISORS PC

TriggerIng
SustainAble Biogas
Energy
Communities
through SociaL
Innovation

Duration: Jan 2016 – Dec 2018

ISABEL has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691752

Project identity

Type	CSA
Duration	36 months *(Jan 2016 – Dec 2018)*
Coordinator	Q-PLAN INTERNATIONAL ADVISORS

UNIVERSITY OF SURREY
UK
Global Biotechnology Transfer Foundation

WhiteResearch
BELGIUM

FNR
Bodensee Stiftung
GERMANY

INSEAD
The Business School for the World
FRANCE

Q-PLAN INTERNATIONAL
EuroEnergy
GREECE

Key outputs & Lessons learned

3 on-line tools

Digital on-line map highlighting areas with additional/special requirements for building power plants based on biogas in Northern Greece according to the national legislation

"Validation of biogas plant's viability" tool (customised for Greece) providing a rough estimation of a) the energy potential of a given type and quantity of available feedstock and b) the Internal Rate of Return (IRR) on the Investment

e-Library with relevant legislation (GR, DE, UK) constantly updated

Lessons Learned

- Individual approach and best practices (examples) are valuable
- Solid social structure is necessary, but villages usually have already structures of involvement (chance OR barrier)
- Triggering motivation in a creative way
- Small barriers can cause great effect (e.g. negative voice of a single person)
- Social issues are more urgent rather than technical and economical ones, especially in the first phase
- Work with a variety of stakeholders AND well-adjusted support services depending on the stakeholders

Project Acronym: **ISABEL** Project Number: **691752** Call: H2020-LCE-2015-3 Topic: LCE-14-2015

Project title: **Triggering Sustainable Biogas Energy Communities through Social Innovation**

Specific Challenge: … to foster the development of the bioenergy sector and to ensure its sustainability […] by encouraging the EU farmers and foresters to produce also energy and energy intermediaries…

Technological approach of the Project: Inform, stimulate and support local stakeholders to set up biogas energy initiatives and strengthen the development of sustainable biogas production and consumption systems around Europe.

Expected Impact: "Increasing the share of sustainable bioenergy in the final energy consumption"

Contribution of the Project:

- Supported the setting up of more than 10 regional biogas energy communities in DE, UK and GR
- Engaged more than 20 regional communities

Highlights (technological/non-technological):

- Analysis on the energy potential of a biogas plant (analysis of the available biomass),
- Investigation of potential location for building a biogas plant,
- Techno-economic analysis (implementation/operational costs, Internal Rate of Return, etc.),
- Review of national legislation (licensing procedures, incentives schemes, funding schemes, etc.),
- Environmental impact assessment studies and requirements,
- 3 online tools

Isabel

Visit.
http://www.isabel-project.eu
Contact: info@isabel-project.eu

Find us.

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Duration: Jan 2016 – Dec 2018

ISABEL has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691752

KeepWarm

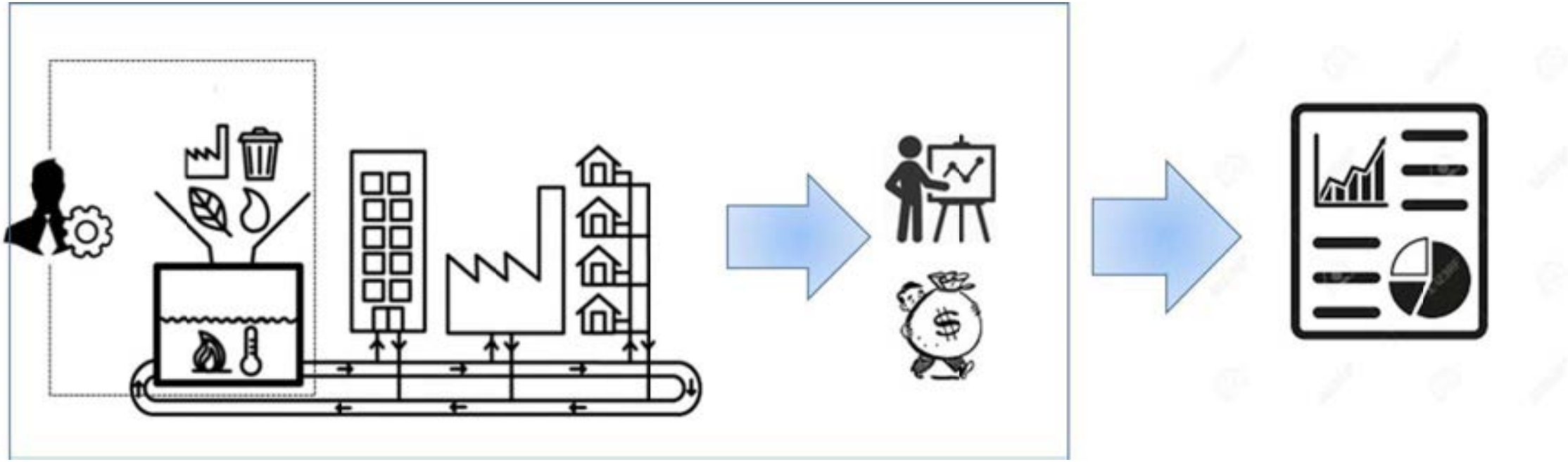
Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 784966

KeepWarm

Improving the performance of district heating systems in Central and East Europe

KeepWarm – in one picture



Project Acronym: **KeepWarm** Project Number: **784966** Call: **EE-02-2017** Topic: **district heating**

Project title: **Improving the performance of district heating systems in Central and East Europe**

Specific Challenge: Actions are needed to accelerate the cost effective and energy efficient retrofitting existing, inefficient district heating networks

Technological approach of the Project: Holistic approach, covering plant, energy input, grid, consumers. Also: local and regional energy planning.

Expected Impact: (i) Primary energy savings and GHG emission savings; (ii) Increased share of renewable sources of heat; (iii) Scale of the replicability potential; and (iv) Number of retrofitting approaches

Contribution of the Project: At least 23 Business plans for the modernization of district heating systems developed and investment in at least 15 cases. Primary energy savings: 500 GWh/year. RES production triggered: 1250 GWh/year. Reduction in Greenhousegas emissions

Highlights (technological/non-technological): Strong emphasis on dissemination and exploitation with twinning district heating systems throughout Europe

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *784966*

KEROGREEN

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 763909

Requirements:
UNFCCC CoP 2050 agreement and EC Directives
CO_2 emission 80% to 95% below 1990 level
Transportation: 60% CO_2 emission reduction
Aviation: 40% sustainable fuel by 2050
UN-ICAO: CO_2 emissions 50% below 2005 level

Business as Usual:
Aviation 2-3% of global CO_2 emission to date.
Kerosene consumption, currently 5Mb/day, set to grow between 2.5 and 3.5%/yr over next 30 yrs.
Hence, CO_2 emissions more than doubled in 2050.
This number accounts for efficiency improvements.

Challenge to meet CO_2 reduction target of Transportation
Aviation being a case in point

What are sustainable alternatives?
Hydrogen – too low energy density
Batteries – too heavy
Hybrid – range limited
Bio-fuel – Current EC policy. However, no CO2 reduction and resource limited: fuel vs. food/flora trilemma

KEROGREEN Consortium
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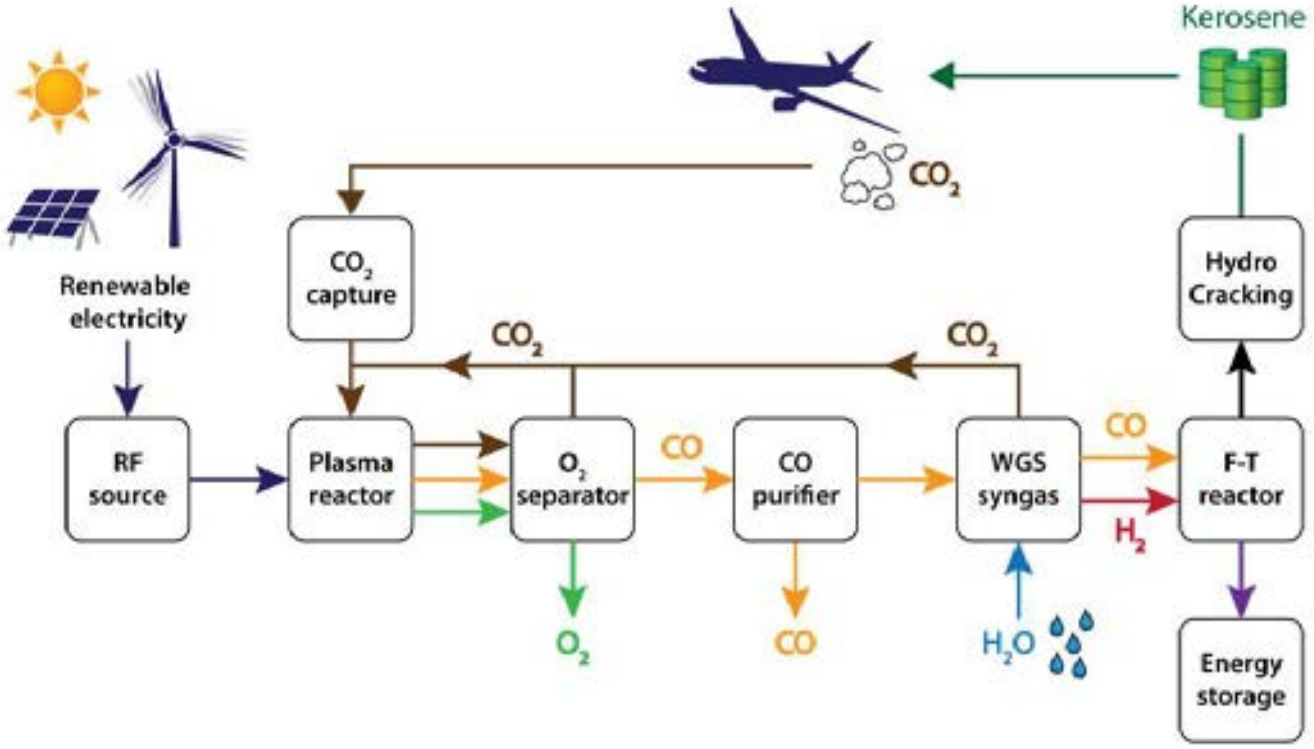
DIFFER Dutch Institute for Fundamental Energy Research
vito vision on technology
KIT Karlsruhe Institute of Technology
CerPoTech Ceramic Powder Technology
HYGEAR
INERATEC Innovative Chemical Reactor Technologies

KEROGREEN



Production of Sustainable aircraft grade Kerosene from Water and Air powered by Renewable Electricity through the splitting of CO_2, formation of Syngas and Fischer-Tropsch synthesis.

Project Acronym: **KEROGREEN** Project Number: **763909**
Call: **H2020-LCE-2017-RES-RIA-TwoStage LCE-06-2017** Topic: **Competitive Low-Carbon Energy**
Specific Challenge: *"New Knowledge and Technologies - Sustainable Fuels" Diversification of renewable fuel production through novel conversion routes and novel fuels*
Project title: ***Production of Sustainable aircraft grade Kerosene from Water and Air powered by Renewable Electricity through the splitting of CO_2, formation of Syngas and Fischer-Tropsch synthesis.***

Technological Challenge: *Novel conversion route to sustainable aviation fuel synthesised from H_2O and CO_2 powered by renewable electricity. Conversion by plasma driven CO_2 dissociation, electrochemical oxygen separation and Fischer-Tropsch (F-T) synthesis of kerosene.*
Expected Impact: *Modular technology is scalable and relies on existing, inexpensive infrastructure for storage, transport and distribution. The combined technology will be up-scalable and applied to distributed container sized plants for on-site production of CO and jet grade kerosene.*

Contribution of the Project: *KEROGREEN technology offers advantages over electrolysis in the upscaling of CO_2 splitting, because of its higher power density yielding higher production rates. As a result CO productivity is an order of magnitude higher than that for alkaline, proton exchange membrane (PEM) or Solid Oxide Electrolyser Cells. The plasma technology has been demonstrated in the lab. Oxygen separating membranes have been demonstrated at lab scale. The FT technology has been demonstrated at industrial scale. Integration poses a technological challenge. The technology is generic and enables a future energy system based on renewable electricity driven climate neutral transportation fuel. Jet-grade aviation fuel emits less soot and no sulphur, meeting future aviation air pollution standards.* ***KPI*** *kerosene production 1kg/hr.*

Highlights (technological/non-technological): *Generic Technology: P2X sector coupling for E-Fuels*

This project has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement No *763909*

Macrofuels

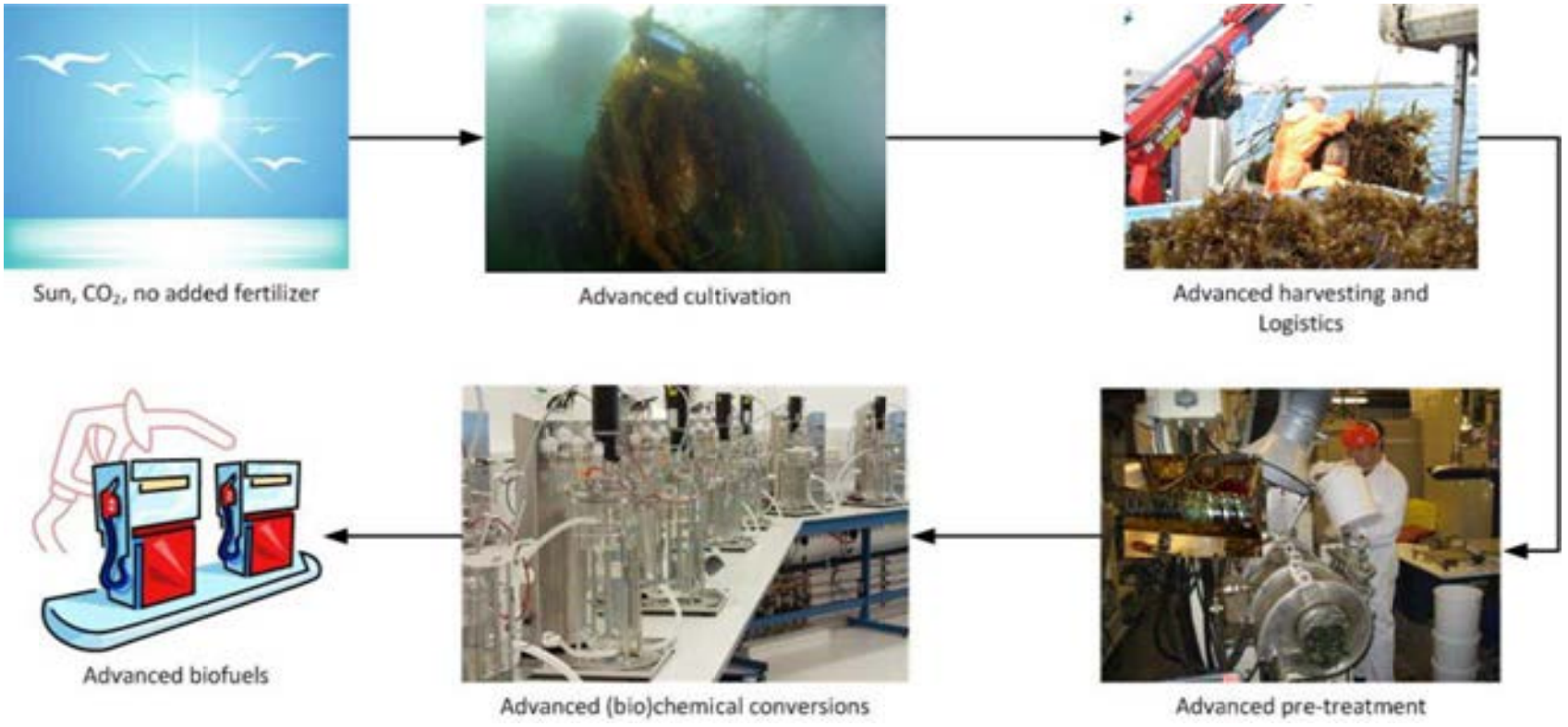
Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654010

MacroFuels

MacroFuels aims to achieve a breakthrough in biofuel production (i.e. ethanol, butanol, furanics and biogas) from macroalgae (seaweeds) by developing advanced cultivation, storage, pre-treatment and biorefinery processes

MacroFuels' seaweed to biofuels route



MACROFUELS

Sub-objectives:

1. Advanced cultivation (high yield; rotating crops; mechanization of seeding and harvesting)
2. Storage and logistics (at sea and/or on land; ensilage)
3. Pretreatment and fractionation (enzymatic or chemical)
4. High yield conversion of sugar derivatives into ethanol, butanol and methane
5. Thermochemical conversion into furan derivatives
6. Fuel assessment
7. Valorization of side and waste streams
8. Economic viability study
9. Multi-criteria evaluation of sustainability (technological, environmental, economic, social, health & safety)

Expected impacts:

1. New feedstock that does not compete with food/feed production
2. Efficient biorefinery of seaweeds into biofuels
3. Processes that can compete with those for fossil fuels and 1st/2nd generation biofuels
4. Robust data on environmental and social benefits for policy making and stakeholders engagement

Consortium:

11 partners (RTD's, SME's and LE's) from 6 countries

Duration:

48 months (January 2016 – December 2019)

MACROFUELS

Project acronym: MacroFuels Project number: 654010 Call: Energy LCE-11-2015 Topic: Developing next generation technologies for biofuels

Project title: Developing the next generation macroalgae based biofuels for transportation *via* advanced bio-refinery processes

Specific Challenge: new technologies for sustainable biofuels and alternative fuels - radically improve the state-of-art - use of new and sustainable resources - improving the economic, environmental and social benefits relative to fossil fuels and currently available biofuels

Technological approach of the Project:

MacroFuels aims to achieve a breakthrough in biofuel production from macroalgae (seaweeds) by developing advanced cultivation, storage, pre-treatment and biorefinery processes

Expected Impact: the use of new feedstock sources that do not compete directly or indirectly with food or feed production - significant potential for cost reduction - environmental and social benefits

Contribution of the Project:

1) Seaweed as feedstock: no land use – no use of fresh water – no use of fertilizers – CO2 capture – excess nutrient capture (bioremediation) – positive impact on biodiversity
2) Apart from multiple technical impacts also focus on environmental and social aspects of large scale seaweed cultivation

Highlights at M24:

1) High yield cultivation of brown seaweeds on advanced cultivation substrates
2) Well controlled stabilization of harvested seaweeds by means of ensilage
3) Routes identified for controlled conversion into ethanol, butanol and furanics
4) Environmental and social impact assessment of large scale seaweed cultivation

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Photofuel

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640720

Photofuel –

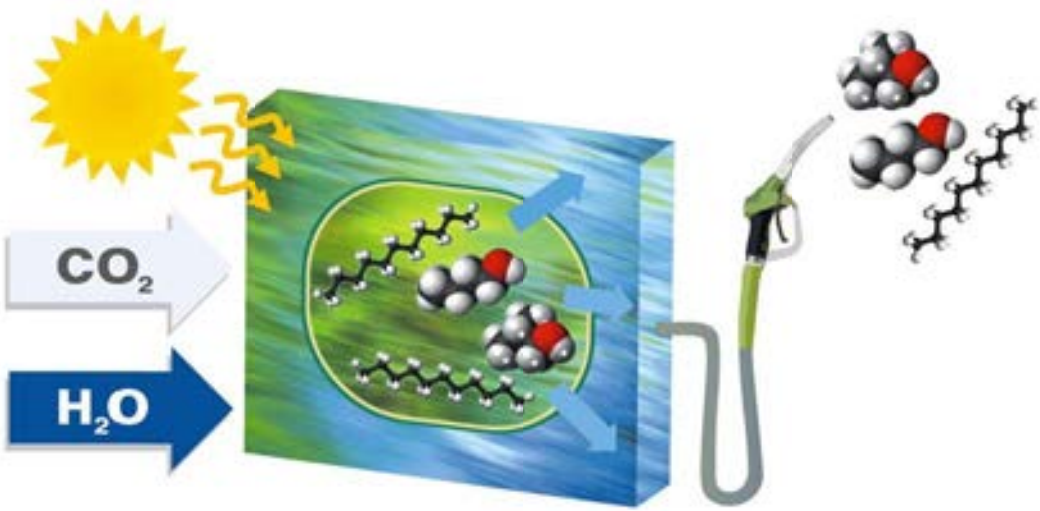
Biocatalytic solar fuels for sustainable mobility in Europe

Overall objective:

Development of high quality, low impact transportation fuels

Challenges:

Photobiocatalyst development - Synthesis of fuel compounds - Excretion to medium – Direct, continuous separation – Fuel blending – Engine tests – Consumer acceptance



Contact:

Coordinator: Volkswagen AG, Hilke.heinke@volkswagen.de

Presenter: Klaus Lenz, SYNCOM

www.photofuel.eu

Key results

WP2 – Biocatalyst development

- Several-fold increase of productivity for butanol, bisabolene and octanol compared to published values

WP3 – Upscaling and Production

- Biocatalytic production shifted to industrial environment and upscaled to ~150 L volume; Separation system for fuel products developed
- *Nannochloropsis* and *B. braunii* (reference systems) established

WP4 – Fuel characterisation and blending

- Test matrix determined, fuel blends prepared for engine tests

WP5 – Engine tests

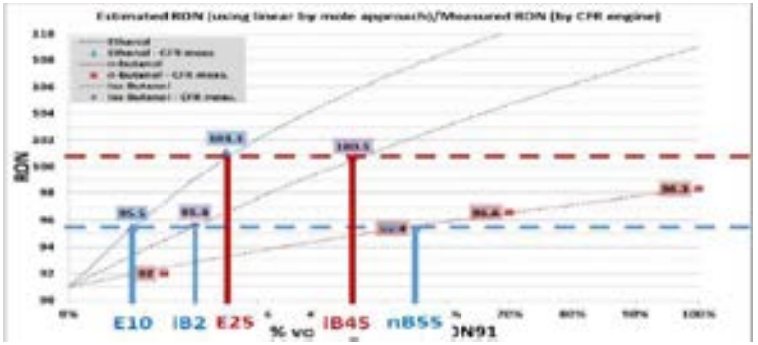
- Engine tests ongoing

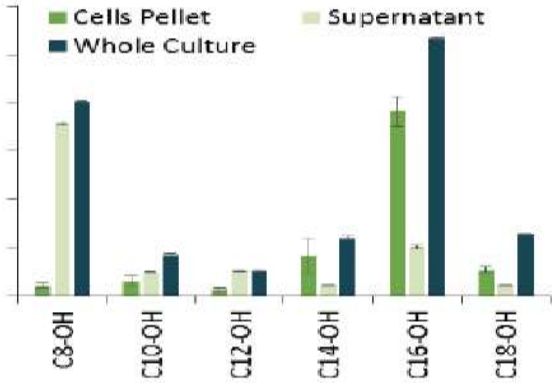
WP6 – Assessment

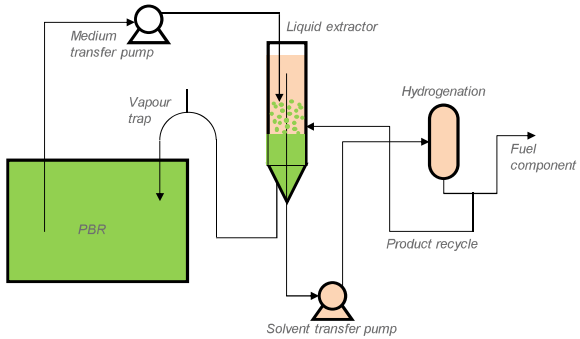
- LCA-modelling ongoing, first encouraging results in technology risk perception

WP7 – Business case development

- To start July 2018







Project Acronym: **Photofuel**; Project Number: **640720;**
Call: **H2020-LCE-2014-1** Topic: **LCE-11-2014**
Project title: **Biocatalytic solar fuels for sustainable mobility in Europe**

Specific Challenge:

- Alternative fuels through use of new, renewable and sustainable resources from non-biomass non-fossil sources

Technological approach of the Project:

- Biocatalytic production of alternative liquid transportation fuels, which require only sunlight, CO_2 and water
- Microbial cells directly excrete hydrocarbon and long chain alcohol fuel compounds to the medium
- Direct separation of drop-in fuel compounds without the need to harvest biomass

Expected Impact:

Fuel production without food competition; pos. energy balance; competitive costs; GHG-performance, decentralised energy production, and job creation in rural areas, as well as secure and affordable energy supply in Europe or worldwide

Contribution of the Project:

- Prototype for stand-alone, small-scale production of fuel compounds
- Base for further development of biocatalytic fuel production and upscaling to demo-size
- Business case development

Highlights (technological/non-technological):

- High biocatalytic production rates and continuous separation of fuel compounds from the medium shown
- Fuel blending completed, engine tests ongoing
- Assessment of technology risk perception among stakeholders and citizens with first favourable results

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640720

Record Biomap

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691911

Project Acronym: **RecordBiomap** Project Number: **691911** Call: H2020-LCE-2015-2 Topic: LCE-19-2015
Project title: **Research Coordination for a Low-Cost Biomethane Production at Small and Medium Scale Applications**

Specific Challenge: Without a technological shift in our current energy system, the EU will fail on its 2050 ambitions to largely decarbonise the energy and transport sectors. The EU needs to accelerate innovation in cutting edge low carbon technologies and innovative solutions, and bridge the gap between research and the market.

Technological approach of the Project: Small to medium scale biomethane production technologies

Expected Impact: Acceleration of the time to market of, affordable, cost-effective and resource-efficient technology solutions to decarbonise the energy system in a sustainable way

Contribution of the Project: The overall objective is to bridge the gap between research and industry and to accelerate innovation in small and medium scale biomethane production, thus shorten the time to market of the most promising technologies.

Highlights (technological/non-technological):

- 30 technology descriptions and stakeholders mapped on the "biomethane map"
- Technology assessments to serve as a 1st level due diligence evaluation for potential investors
- Policy advice for facilitation of small scale biomethane production
- Active networking, such as workshops and webinars – investors⇔tech developers⇔tech users/buyers

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *691911*

Objectives of Record Biomap

Knowledge Transfer Platform
www.biomethane-map.eu

Target Groups:

- Small and medium-sized enterprises
- Research Institutes, universities, etc.
- End user, biogas plant operators, etc.
- Politicians, decision makers

Workshops | **Knowledge Transfer** | **Project Concepts /Cooperations**

Focus: Innovative technologies with TRL 3-5 (7) for a small to medium scale biomethane production

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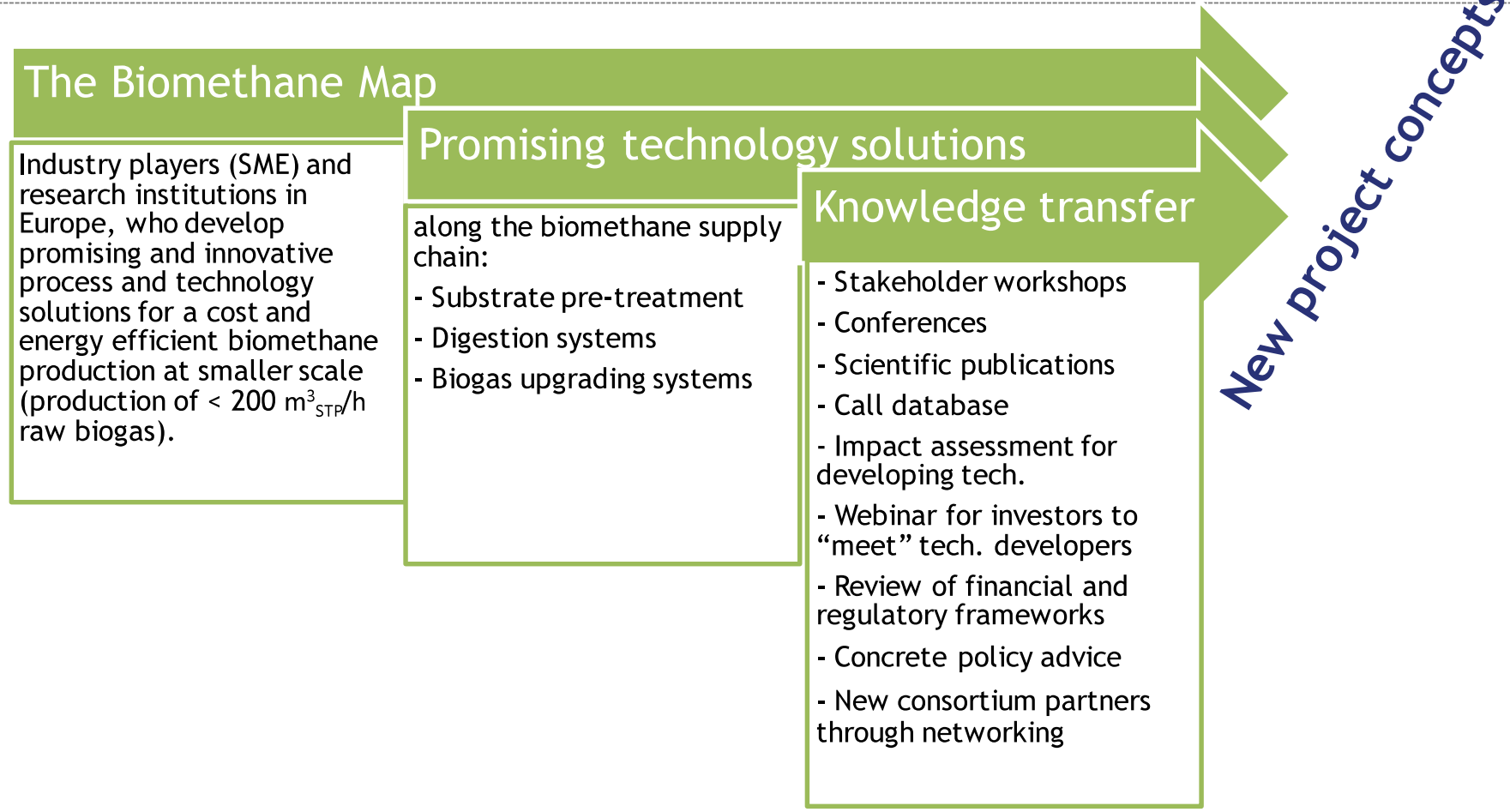
The Record Biomap network



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 691911.

Residue2Heat

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654650

Renewable Residential Heating with Fast Pyrolysis Bio-Oil

Project partners:

RWTH AACHEN UNIVERSITY

DWI affiliated to RWTH Aachen

universität innsbruck

MEKU

btg

btg-btl biomass-to-liquid

VTT

POLITECNICO MILANO 1863

Project start 01/01/2016
Project end 31/12/2019

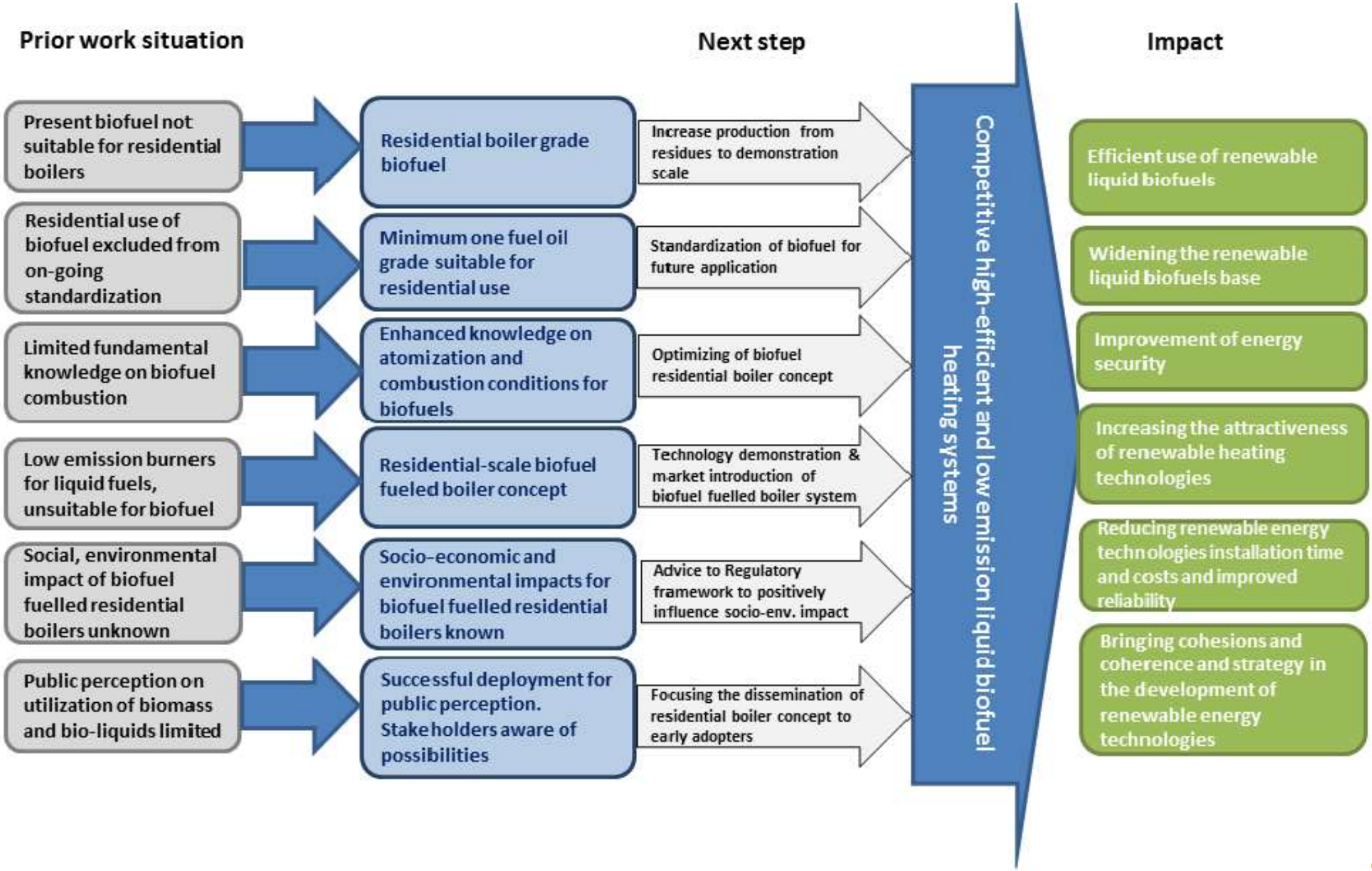
LCE-2-2015 – Developing the next generation technologies
of renewable electricity and heating/cooling

Overview Residue2Heat

The objective of *Residue2Heat* is to use agricultural or forest residue streams that are unsuitable for food or feed production (low ILUC values) for residential heating. Within *Residue2Heat* a burner is modified to build up a reliable combustion system in which Fast Pyrolysis Bio-Oil (FPBO) can be used as a fuel.

http://www.residue2heat.eu

Main steps targetted in Residue2Heat



Contact / Acknowledgement

Thank you for Attention!

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