Horizon 2020 Workshop

Bioenergy, Advanced Biofuels and Renewable Fuels

10-11 April 2018

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Thomas SCHLEKER

Approuved by : Piotr TULEJ

July 2018

Table of contents

Executive Summary

In April 2018 the Renewable Energy Sources Unit in DG RTD organised the *Horizon 2020 Workshop on Bioenergy, Advanced Biofuels and Renewable Fuels*. The workshop successfully brought together a portfolio of around 50 projects funded by the Horizon 2020 Secure, clean and efficient energy Societal Challenge. Projects are spanning the entire Technology Readiness Level (TRL) chain, from breakthrough technologies over applied research and demonstration to pre-commercial scale financing. The mix of low-TRL and market-close projects and different technological sub-chains formed a fruitful basis for the workshop.

Active participation of the project teams provided fundamental input to the way forward for research and innovation in the area of bioenergy, advanced biofuels and renewable fuels.The detailed objectives of the workshop were:

- To identifying the progress made in research and innovation in the sector through support under the European Union's Framework Programme Horizon 2020.

- To discuss gaps and needs for further funding, as well as measures of pushing innovation to the market.

- To obtain the project's views on future research, development and innovation needs.

Thematic topic sessions were organised: next generation biofuels, intermediates, advanced biofuels demonstration, aviation biofuel and international cooperation, bioenergy cogeneration, market up-take-measures for solid and gaseous and liquid biofuels, market up-take-measures with strategic Initiatives and coordination with Member States. Short project presentations were made in each of the sessions. They served as primers for the break-out sessions where the participants discussed the following questions:

1. How was the specific challenge of the topic addressed?
2. What is the expected impact?
3. Based on the progress achieved in the current project portfolio, what is the way forward?

The workshop closed with reports from the break-out sessions and a common synthesis discussion. Conclusions of the workshop discussions are the following recommendations:

- A vast portfolio of technologies and value chains combining feedstock types to conversion processes exists at different TRL. Currently novel breakthrough technologies have emerged, showing the importance of co-development of different TRL pathways in parallel, resulting in different time horizons for their realization and expected impact.
- Support is necessary at all TRL stages and value chains to address challenges in conversion technology, feedstock supply and logistics as well as commercial uptake to respond to both technological and commercial challenges and risks at different development stages.
- Flexibility of installations to feedstock type and conversion technology are needed for cost-effective marketable products and therefore feedstock sourcing and conversion need to be co-optimized.
- Collaboration across EU and internationally is key for the development of the sector.
- Understanding of innovation potential is already necessary at early stages of development, including the identification of bottlenecks, needs for integration and alignment of programmes, market barriers, removal of non-technological barriers for technology development, harmonisation of support schemes and markets.
- A Regional approach, market players clustering and SME support are crucial factors for market uptake of innovative solutions.
- Value added from social and environmental benefits should be linked to the bioenergy products and measures to support the internalization of the generated additional value are necessary to ensure that innovation can feed effectively into regulation (climate target setting and regulation relevant for the respective markets, e.g. CO2 pricing, circular economy, sustainability, standards.
- Communication and dedicated education measures are essential for successful implementation of technologies, e.g., dedicated courses in curriculums and programs
- New modes of support of the area should be considered (e.g. PPP) and new/improved financial instruments could contribute to cover commercial risks that remain even when implementing the INNOVFIN instrument (e.g. complementary post-demo projects, follow-up grants, mechanisms for better bankability, supporting business plan development, etc.)

The consolidated information collected from the workshop is a useful source of information and it is presented in Annexes (Annex I -Concept note and agenda, Annex II -sessions, project and poster presentations, Annex III- CORDIS projects abstracts, Annex IV –List of Participants).

Maria Georgiadou & Thomas Schleker
Policy Officers

Annex I – Concept note and Agenda

The Unit Renewable Energy Sources of the European Commission's General Directorate of Research and Innovation organises a workshop that will bring together current Horizon 2020 Research and Innovation on Bioenergy, Advanced Biofuels and Renewable Fuels.

The workshop will aim at identifying the progress made in research and innovation in the sector through support under the European Union's Framework Programme Horizon 2020. Based on the current project portfolio we will want to discuss gaps and needs for further funding, as well as measures of pushing innovation to the market. Active participation of the respective H2020 projects (spanning the entire TRL chain, from breakthrough technologies to applied research and demonstration to pre-commercial scale financing) is fundamental in this discussion. It is expected that the workshop will provide input to the way forward in the area of bioenergy, advanced biofuels and renewable fuels. We will seek projects' views on future research, development and innovation needs, market up-take, as well as non-technological ways of support through new tools, national actions and innovative financing mechanisms.

As a follow up, we envisage a collection of recommendations for policies based on project results and on the effectiveness of guiding innovative solutions to the market.

A draft agenda for the event is attached.

Day 1 *Development and Demonstration of Technologies*

14:00	–	**Welcome**
14.05		European Commission DG RTD
14:05	–	**Keynote address**
14.35		European Commission DG RTD
14.35	–	**Overview of the project portfolio and statistics**
14.50		Executive Agency INEA
14.50	–	**Next generation technologies for biofuels and sustainable alternative fuels**
16.00		Project coordinators
16:00	–	**Coffee break**
16:30		
16.30	–	**Demonstrating advanced biofuel technologies**
17.00		Project coordinators
17.00	–	**Next generation technologies for renewable electricity and heating & cooling**
17.35		Project coordinators
17.35	–	**From Topic to Project: What comes next?**
18.05		
		Breakout in working group sessions
		Q1: How is the specific challenge addressed? Q2: What is the expected impact? Q3 : Based on the progress what is the way forward?
18.05	–	**Roundtable:** How do we build on the assets in the H2020 project portfolio and what is the way forward for R&I on bioenergy, advanced biofuels and renewable fuels.
18.35	–	**Closing of the day**
18.40		DG RTD

Day 2 *Deploying technology and Developing Synergies*

8:30 – 8.45	**Market up take and Coordination with Member States** DG RTD
8.45 – 10.05	**Market up-take in bioenergy** Project coordinators
10:05 – 10:15	**Coffee break**
10.15 – 10.50	**Coordination with MS and stakeholders** Project coordinators
10.50 – 11.10	**Financing innovation: The InnovFin EDP and the case of CHO-TIPER**
11.10 – 11.40	**From Topic to Project: How do we create success?** **Breakout in four working group sessions** Q1: How is the specific challenge addressed? Q2: What is the expected impact? Q3 : Based on the progress what is the way forward?, 10 min each [1 min
11.40 – 12.10	**Roundtable:** Bridging the gap to the market with the H2020 toolset and the way forward for MUM and EU/national support on bioenergy, advanced biofuels and renewable fuels.
12.10 – 12.30	**Closing of the event** DG RTD

Annex II – Sessions, project and poster presentations

Nom	Poster
Bin2Grid	55
BioVill	56
Heat-To-Fuel	57
ISABEL	58
REWOFUEL	59

Nom	Page	
	Presentation	Cordis Abstract
2G BIOPIC	-	432
4REFINERY	61	434
ABC-SALT	67	436
ADVANCEFUEL	73	438
BABET-REAL5	79	440
BECOOL	87	442
BESTF	93	444
BESTF2		446
BESTF3		448
Bin2Grid	99	450
BIO4A	113	452
Bioenergy4Business	119	454
BioEnergyTrain	157	456
Biofficiency	163	458
BiogasAction	169	460
Bio-HyPP	175	462
Biomasud Plus	183	464
BioMates	189	466
BioRES	-	468
BIOSURF	195	470
BioVill	-	472
ButaNexT	201	474

CHO TIPER	207	476
COMSYN	213	478
ECRIA1 (Ambition)	219	480
ECRIA2 (BALANCE)	225	482
eForFuel	231	484
ETIP Bioenergy-SABS	237	486
FLEDGED	243	488
FLEXCHX	249	490
FlexiFuel-CHX	255	492
FlexiFuel-SOFC	261	494
FlexJET	267	496
FORBIO	273	498
greenGain	281	500
Heat-To-Fuel	287	502
HiEff-BioPower	295	504
HyFlexFuel	301	506
ISAAC	307	508
ISABEL	313	510
KeepWarm	321	512
KEROGREEN	327	514
Macrofuels	333	516
Photofuel	339	518
Record Biomap	345	520
Residue2Heat	351	522
REWOFUEL	357	524
SECURECHAIN	363	526
SEEMLA	369	528
STEELANOL	375	530
SUN-to-LIQUID	381	532
Torero	389	534
TO-SYN-FUEL	395	536
uP_running	419	538
WASTE2FUELS	425	540

Sessions presentations

EU Bioenergy research and innovation policies in the Energy Union

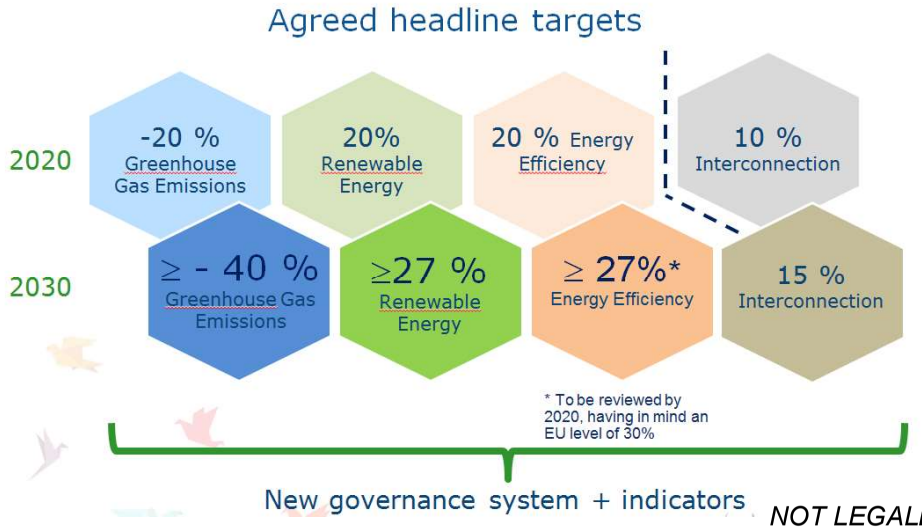
Dr Maria GEORGIADOU
Renewable Energy Sources
DG Research & Innovation
EUROPEAN COMMISSION

H2020 Workshop on Bioenergy, Advanced Biofuels, Renewable Fuels, EC DG RTD, Brussels, 10-11 April 2018

Policy Framework

"Clean Energy for all Europeans"

- *Putting energy efficiency first*
- *Demonstrating global leadership in renewables*
- *Delivering a fair deal for consumers*



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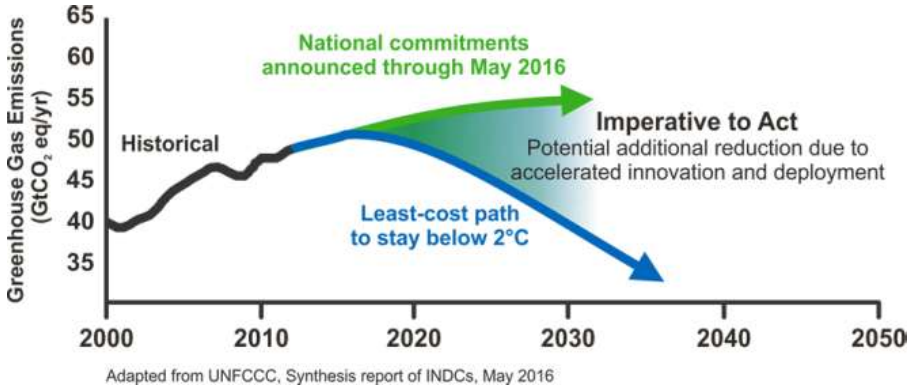
Paris Agreement

*Holding the increase in the global average temperature to **well below 2°C** above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels*

*Accelerating, encouraging and enabling **innovation** is crucial...*



Adapted from UNFCCC, Synthesis report of INDCs, May 2016

Other EU policy priorities

- Digital Single Market
- Jobs, Growth and Investments
- EU as a strong global actor
- ...

European Commission

We need to strengthen the share of renewable energies on our continent. This is not only a matter of a responsible climate change policy. It is, at the same time, an industrial policy imperative if we still want to have affordable energy at our disposal in the medium term. ***I therefore want Europe's Energy Union to become the world number one in renewable energies.*** *COM(2016) 110 Resilient Energy Union with a forward-looking climate change policy*

European Commission

EU Regulatory Framework & updates

1. Renewable Energy Directive *RED 2009/28/EC*
2. The Fuel Quality Directive *FQD 2009/30/EC*
3. *Directive to reduce indirect land use change for biofuels and bioliquids (EU)2015/1513*
4. New Renewable Energy Directive *RED II* and Bioenergy sustainability legislation *COM(2016) 767*
5. New Electricity Market Design Legislation *COM(2016)861 862 864*
6. Revised Emissions Trading Directive ETS *COM(2015)337*
7. Revised Effort Sharing Decision and LULUCF *COM(2016) 482*
8. Strategy for Low-emission Mobility *COM(2016) 501*
9. *Revised Directives on Energy Efficiency, Buildings, Energy Labeling, Security of electricity supply COM(2016) 761 765 773 EU(2017)2196*
10. Accelerating Clean Energy Innovation ACEI *COM(2016)763*

Mission Innovation

<u>Overall objective</u>:
To reinvigorate global efforts in clean energy innovation, Mission Innovation members share a common goal to **develop and scale** breakthrough technologies and substantial **cost reductions**. MI members aim to seek to **double public clean energy research & development investment** over 5 yrs

EC is proactively engaged :

- 150 Million € on MI-relevant calls by 2020 in Horizon 2020
- Engaged in all the 7 Innovation Challenge (IC)
  - ✓ smart grids, off-grid access to electricity, CCS, biofuels, solar fuels, clean energy materials, H&C buildings
- Co-leading IC5 and IC7
- Chair of MI Steering Committee
- Co-host ministerial meeting in Malmo, Sweden 23-24 May 2018

The Strategic Energy Technology Plan (SET Plan) - *coordinating research and innovation across Europe*

Overall objective: Accelerating the development and deployment of low-carbon technologies through cooperation among EU countries, companies, research institutions, and the EU itself, based on **common priorities, targets and actions**.

Priority Actions:

1&2. Improving performance and reducing cost of renewable energy
3. Smart solutions for consumers
4. Smart Resilience and Secure Energy System
5. Energy Efficiency in Buildings
6. Energy Efficiency in Industry
7. Batteries and e-Mobility
8. Renewable Fuels and Bioenergy
9. Carbon Capture Utilisation and Storage
10. Nuclear Safety

Defining priorities
- SET-Plan Communication 2015

Setting targets
- Declaration of Intents

Implementation Plans (IP)
- Temporary Working Groups

Execution of IPs

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Action 8 - Renewable Fuels and Bioenergy

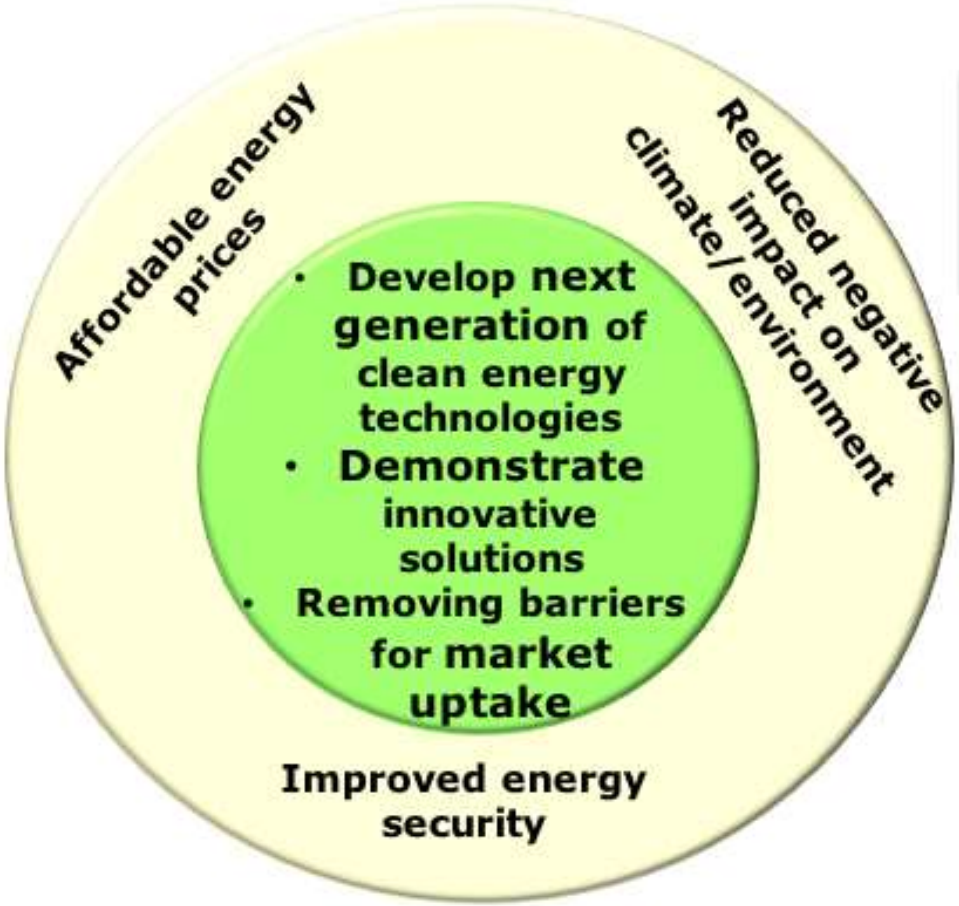
- ✓ Targets in Declaration of Intend – November 2016
- ✓ Implementation Plan will be endorsed in June 2018
- ✓ R&I activities:
  1. Advanced liquid and gaseous biofuels
  2. Other renewable liquid and gaseous fuels
  3. Renewable hydrogen
  4. High efficiency large scale biomass CHP
  5. Solid, liquid and gaseous intermediate bioenergy carriers

Energy Financing in the Energy Union

1. The Juncker Investment Plan and the European Structural and Investment Funds
2. **The EU Horizon 2020 research and innovation framework programme 2014-2020** with more than 30 billion euros climate related budget and the SMEs instrument
3. The **Innovfin EDP** facility for loans, guarantees or equity type investments to risky first-of-a-kind commercial scale energy demonstration projects
4. The **NER** Innovation Fund for first-of-a-kind investments in RES, CCS and low-carbon innovation in energy intensive industry with about 450 million allowances from 2021

Research Policy Framework (1)

H2020 ENERGY Challenge



FP7 Energy (2007-2013) EUR 3.25 bn

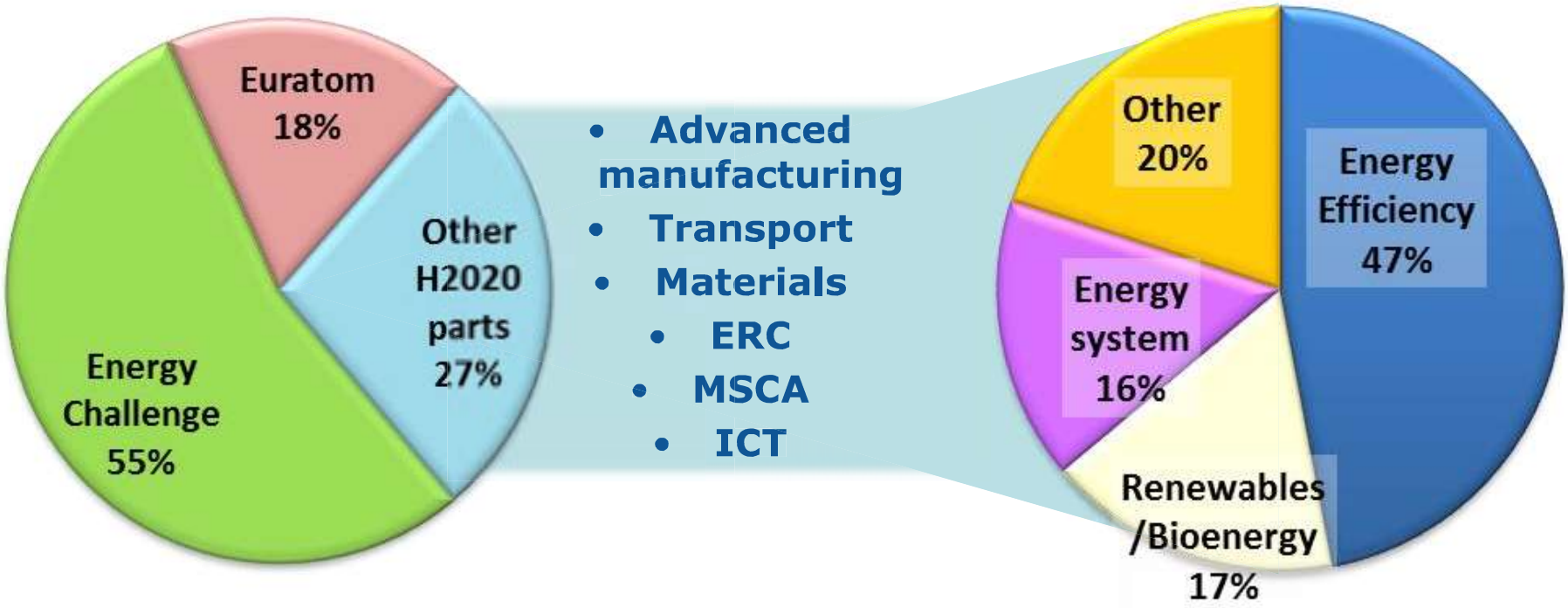
Intelligent Energy for Europe (IEE) (2007-2013) EUR 0.73 bn

H2020 – Energy Challenge

Budget (2014-2020): EUR 5.7 billion (as of 2015)

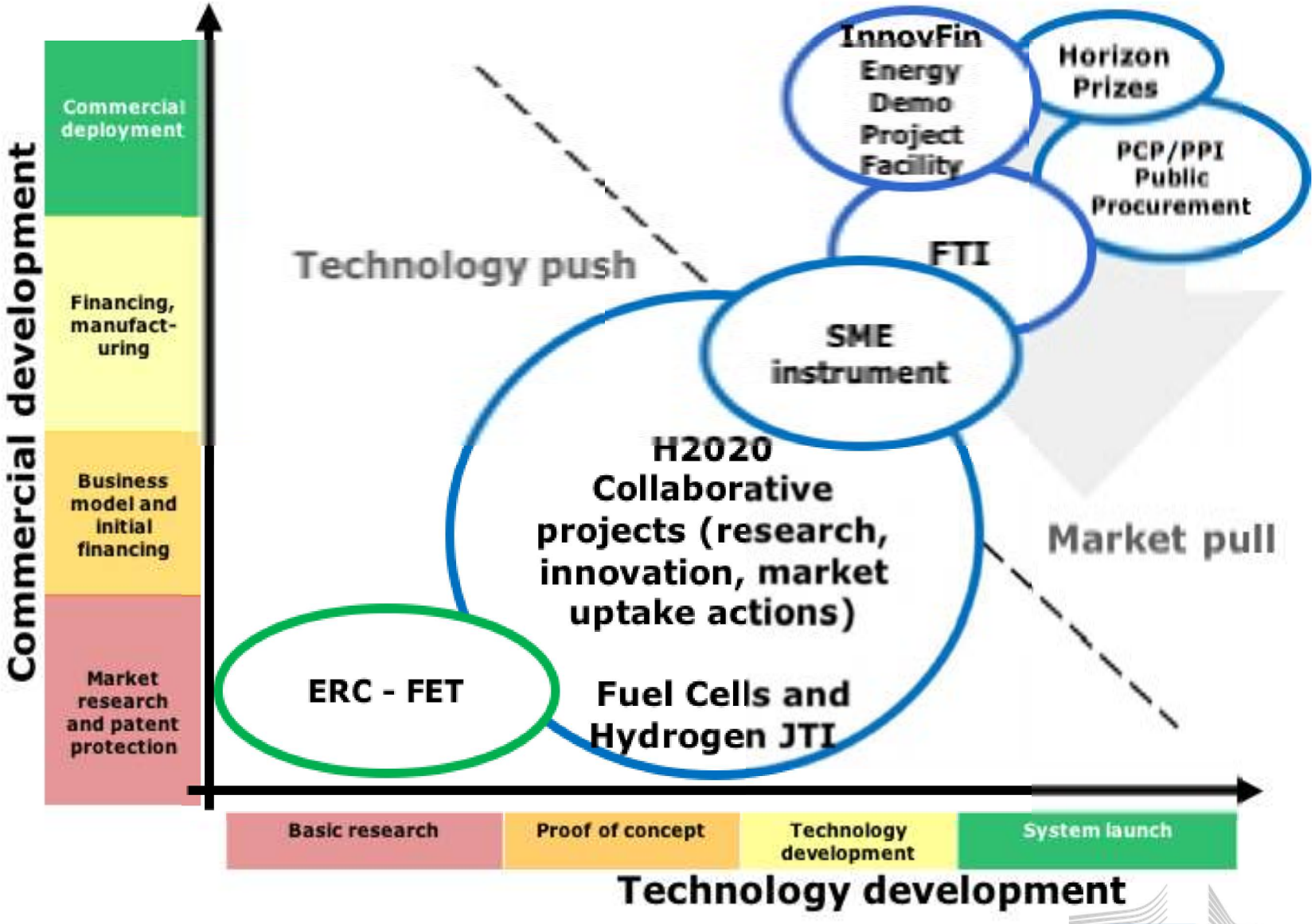
Research Policy Framework (2)

Energy in other parts of H2020



- ✓ Additional energy-related spending in H2020 outside Energy Challenge: ~ **50% of the Energy Challenge budget**
- ✓ Total budget for energy in H2020: **~ EUR 8.5 billion** (11.4% of the total H2020 budget)

Research Financing Instruments



Opportunities and Challenges for Bioenergy, Advanced Biofuels Renewable Fuels

- Advanced biofuels and bioenergy intermediates essential for both **energy storage and use** (grid balancing, use in electricity, heat and transport)
- Growing market for advanced biofuels
- Biofuels are the medium term solution for road & maritime and the **long-term** solution for air transport
- Reaching **competitiveness** by lowering production costs of advanced biofuels and addressing feedstock constraints
- European leadership in advanced biofuels technologies but little deployment in Europe
- **R&I** needed to improve cost, performance and sustainability
- Coordinated R&I funding and risk-funding availability needed for **market-uptake**
- R&I needed for **renewable fuels** that **outperform** fossil fuels

Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 (1)

- Bottom-up approach to long-term research and technology development
- Advance and demonstrate the technology, reduce its costs, improve its performance and prove its reliability
- Technology-specific demonstration activities
- Support mechanisms for first-of-a-kind plants with a higher leverage than 'standard grants' (e.g. through the Innovfin EDP facility)
- Market up-take measures
- Breakthrough market-creating innovation
- EU contribution under ENERGY calls ~ **€350** Mio

Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 (2)

Overall strategy is to target the following sector challenges

- Technology and cost competitiveness through technology improvement and diversification
- Feedstock availability through feedstock diversification
- Market up-take by focusing on particular transport sectorial needs and aligning market up-take measures
- Breakthrough research and market-creating innovation for completely replacing fossil fuels
- International cooperation to reinforce knowledge and innovation link and tackle global societal challenges

in order to create

- Positive social and economic impact by targeting Europe's competitiveness, environmental benefits and energy security

Next generation technologies for biofuels and sustainable alternative fuels (3)

LCE-11-2014/15: Developing next generation technologies for biofuels & sustainable alternative fuels RIA TRL 3-4 to 4-5

LCE-08-2016-2017: Development of next generation biofuel technologies RIA TRL 3-4 to 4-5

LCE-06-2017: New knowledge and technologies - Sustainable Biofuels RIA TRL to 4

LCE-22-2016: International Cooperation with Brazil on advanced lignocellulosic biofuels RIA TRL 3-4 to 4-5

LC-SC3-RES-1-2019-2020: Developing the next generation of renewable energy technologies Sustainable Fuels RIA TRL 2 to 5

LC-SC3-RES-2-2018: Disruptive innovation in clean energy technologies –Bionic Leaf RIA TRL 3 to 5

LC-SC3-RES-21-2018: Development of next generation biofuels & alternative renewable fuel technologies for road transport RIA TRL 3-4 to 5

LC-SC3-RES-23-2019: Development of next generation biofuel and alternative renewable fuel technologies for aviation and shipping RIA TRL 3-4 to 5

Demonstrating advanced biofuel technologies (4)

LCE 12 – 2014/2015: Demonstrating advanced biofuel technologies IA TRL 5-6 to 6-7

LCE-19-2016-2017: Demonstration of the most promising advanced biofuel pathways IA TRL 5-6 to 6-7

LCE-20-2016-2017: Enabling pre-commercial production of advanced aviation biofuel IA TRL 5-6 to 6-7

LC-SC3-RES-22-2018: Demonstration of cost effective advanced biofuel pathways in retrofitted existing industrial installations IA TRL 5 to 7

LC-SC3-RES-24-2019: Boosting pre-commercial production of advanced aviation biofuels IA TRL 5 to 7

Next generation technologies for renewable electricity and heating/cooling (5)

LCE 2 – 2014/2015: Developing the next generation technologies of renewable electricity and heating/cooling – micro and small scale biomass CHP RIA TRL 3-4 to 4-5

LCE-07-2016-2017: Developing the next generation technologies of renewable electricity and heating/cooling - medium and large-scale biomass-based CHP RIA TRL to 4-5

Renewable energy solutions for energy system implementation (6)

LC-SC3-RES-11-2018: Developing solutions to reduce the cost and increase performance of renewable technologies – Bioenergy RIA TRL 3-4 to 4-5

LC-SC3-RES-12-2018: Demonstrate highly performant renewable technologies for combined heat and power (CHP) generation and their integration in the EU's energy system – Biomass CHP IA TRL 5 to 7-8

LC-SC3-RES-16-2019: Development of solutions based on renewable sources that provide flexibility to the energy system - Bioenergy carriers RIA TRL 3-4 to 4-5

LC-SC3-RES-17-2019: Demonstration of solutions based on renewable sources that provide flexibility to the energy system– Intermediate Bioenergy carriers IA TRL 5 to 7

Market Uptake Support (7)

LCE 14 – 2014/2015: Market uptake of existing and emerging sustainable bioenergy CSA

LCE-21-2017: Market uptake of renewable energy technologies – Sustainable Fuels CSA

LCE 20 – 2014: The human factor in the energy system RIA/CSA

LC-SC3-RES-28-2018-2019-2020: Market Uptake support Bioenergy specific CSA

LC-SC3-CC-4-2018: Support to sectorial fora- Renewable Fuels and Bioenergy CSA

Supporting the development of a European research area in the field of energy (8)

ENERGY.2012-2013.10.1.1: ERA-NET Plus – Bioenergy: Demonstrations of the European Industrial Bioenergy Initiative ERANET-Plus

LCE 18 – 2014/2015: Supporting Joint Actions on demonstration and validation of innovative energy solutions ERANET Cofund TRL 2 to 5

LCE 19 – 2014/2015: Supporting coordination of national R&D activities (Berlin model) CSA TRL 3 to 5

LCE-33-2016: European Common Research and Innovation Agendas (ECRIAs) in support of the implementation of the SET Action Plan RIA TRL 2 to 5

LC-SC3-JA-1-2018: Joint programming actions to foster innovative energy solutions ERANET Cofund

LC-SC3-JA-2-2018-2019: Support to the realisation of the Implementation Plans of the SET Plan CSA

Topics of WP2020 under preparation including international cooperation

InnovFin EDP Facility

InnovFin Energy Demo Projects

Basic features

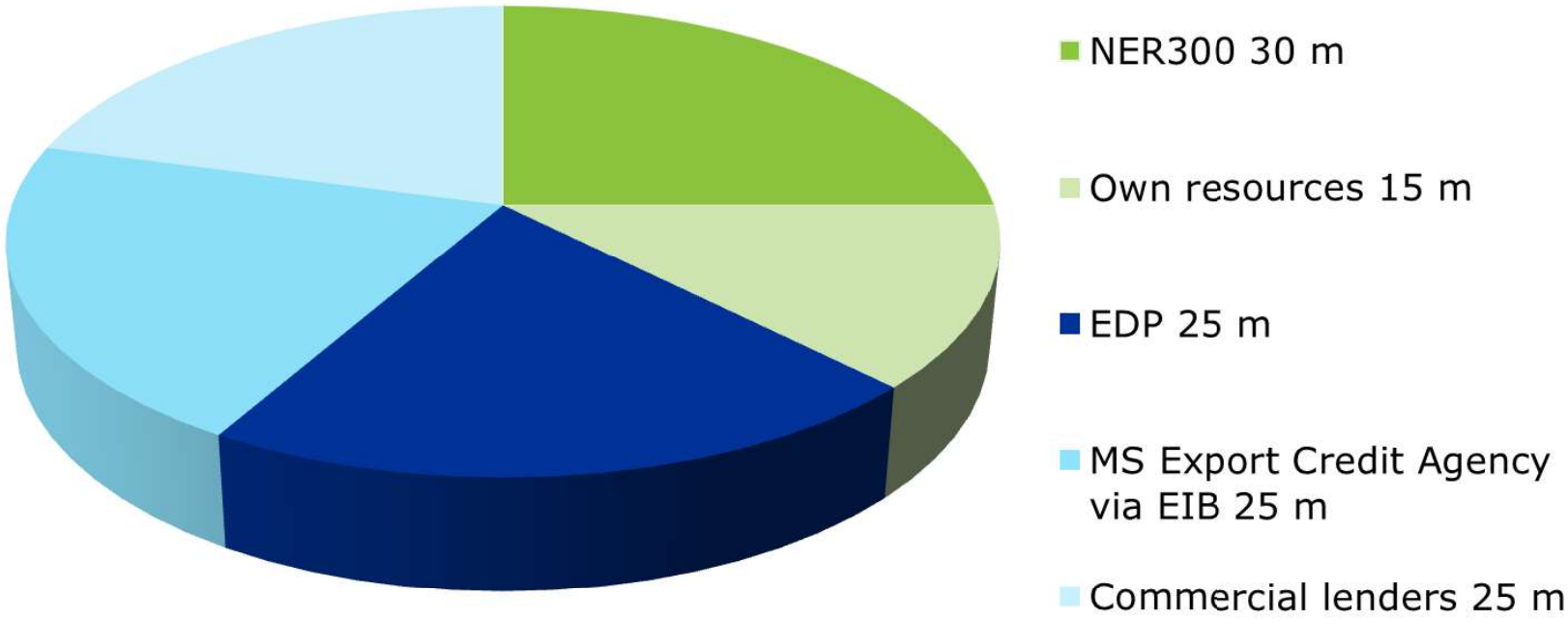
- Risk-finance instrument (loans/loan guarantees) - Pilot launched in June 2015 focused on renewable energy but scope is now enlarged
- Implemented by the EIB
- Budget up to € 800 million
- Single proponents are the norm
- Criteria are Innovativeness, Replicability, Bankability during operations (revenue stream), Commitment by promoters

How it works

- Projects apply to the EIB http://www.eib.org/products/blending/innovfin/products/energy-demo-projects.htm
- EIB process: Eligibility (EC confirmation) ➔ due diligence ➔ approval
- EIB provides loans with max 15 years & covering up to 50% of project costs
- EC (via Horizon 2020) provides guarantee on loan covering riskiest phase of the project

European Commission

Example of financial engineering of First of a Kind Plant



Financial needs = EUR 120 million

European Commission

Research and Innovation Perspective for Bioenergy, Advanced Biofuels and Renewable Fuels

Thomas SCHLEKER, PhD
Renewable Energy Sources
DG Research & Innovation
EUROPEAN COMMISSION

Advanced Biofuels/Renewable Fuels Bioenergy – Strategy in Horizon 2020

Overall strategy is to target the following sector challenges:

- Technology and cost competitiveness
  - Technology improvement, resource efficiency and diversification
- Feedstock availability
  - Feedstock diversification, energy intermediates
- Commercialization
  - Focus on particular transport sectorial needs
  - Aligned market up-take measures

MANDATE ON THE PROVISION OF DATA AND ANALYSIS ON BIOMASS SUPPLY AND DEMAND BY THE JRC ON A LONG-TERM BASIS

JRC is requested by Commission services to periodically provide data, processed information, models and analysis on EU and global biomass supply and demand and its sustainability

More information:

- *https://biobs.jrc.ec.europa.eu/analysis/jrc-biomass-mandate*

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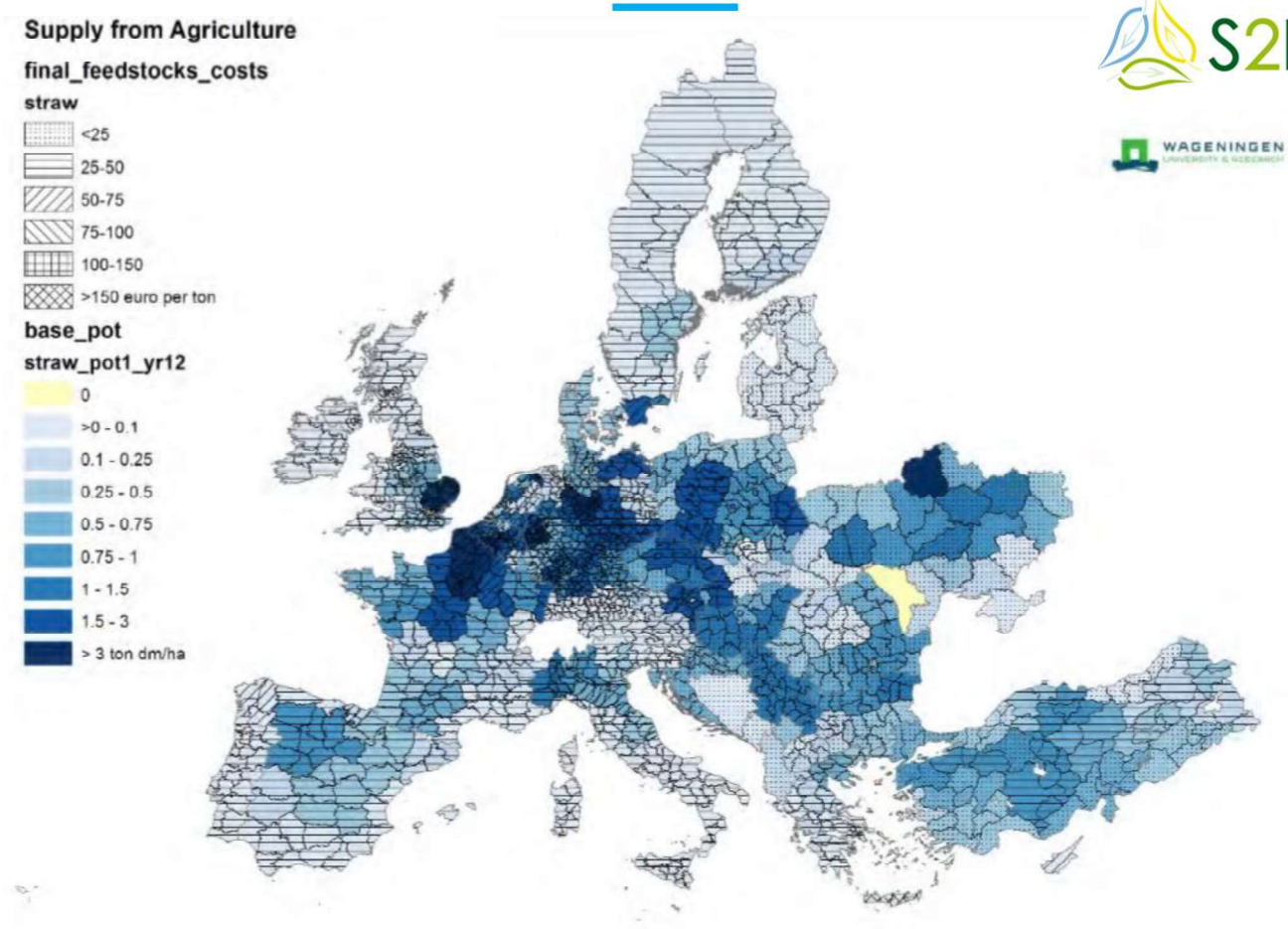

Figure 12 Cost and supply levels- for straw & stubbles

Drees et al. (2017): http://www.s2biom.eu/images/Publications/D1.8_S2Biom_Atlas_of_regional_cost_supply_biomass_potential_Final.pdf

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S2Biom has received funding from the European Union's 7th Framework Programme for research, technological development and demonstration under grant agreement No FP7-608622

European Commission

Task 1: Assesses the potential for R&I to enable secure, low-cost, and low ILUC biomass feedstock for energy for the 2030 and 2050 time horizons

Task 2: Assesses the potential contribution of advanced biofuels to achieving the EU's ambitious climate change objectives

Task 3: Compares advanced biofuels with alternative fuel options for the road, maritime, and aviation transport sectors

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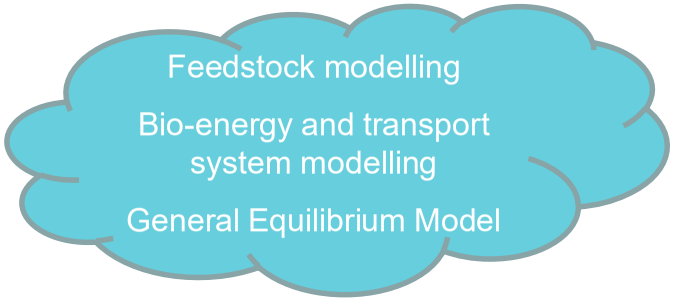
Approach:

1) Extensive qualitative research on R&I potential and competitiveness

2) Quantitative modelling with three scenarios



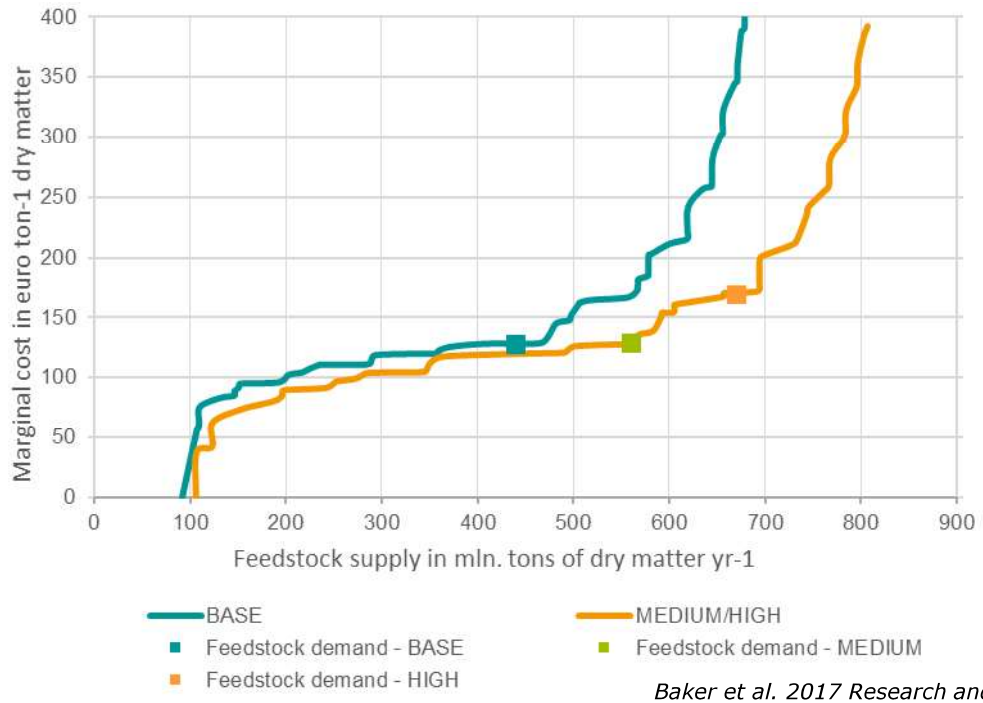
Scenario	Biomass feedstock	Conversion technologies	Demand for biofuels
BASE scenario	Option A0 – Baseline case	Option B0 – Low learning rates for conversion technologies at low TRL	Option C0 – Baseline: Low demand for biofuels
MEDIUM scenario	Option A2 – High R&I case	Option B1 – High learning learnings for all technologies	Options C1 – Moderate biofuels demand
HIGH scenario	Option A2 – High R&I case	Option B1 – High learning learnings for all technologies	Option C2 – High biofuels demand

European Commission

For every level of feedstock demand, R&I significantly decreases the cost of biomass

Aggregated cost-supply curve for feedstock that can be used in the production of advanced biofuels (excluding algae)

ECORYS



Baker et al. 2017 Research and Innovation perspective of the mid-and long-term Potential for Advanced Biofuels in Europe.

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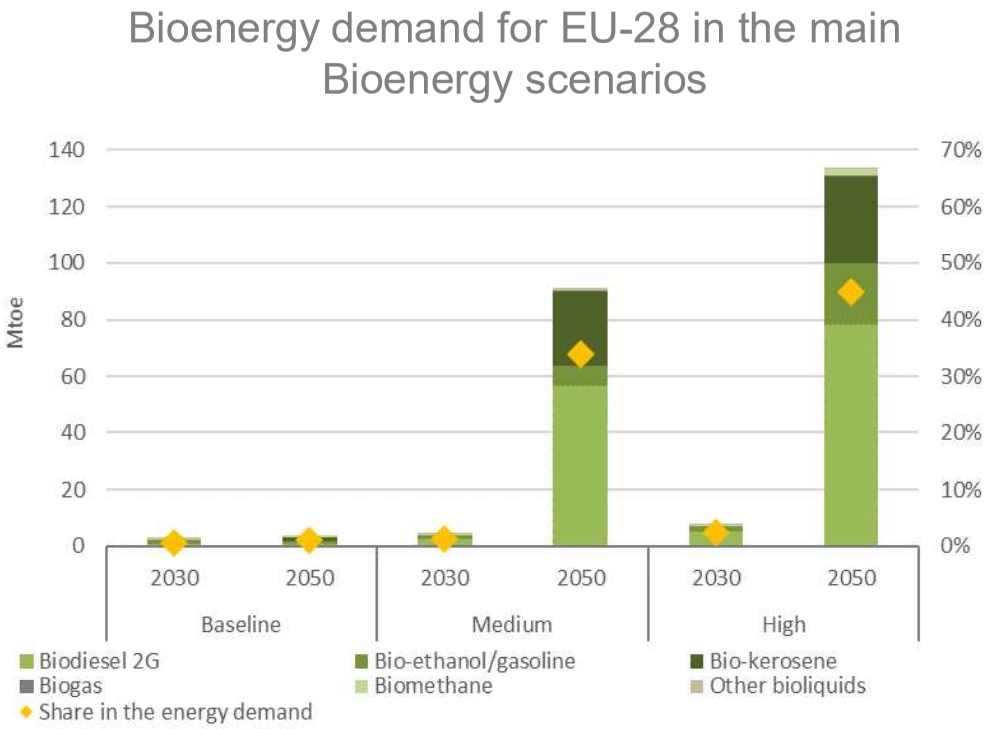
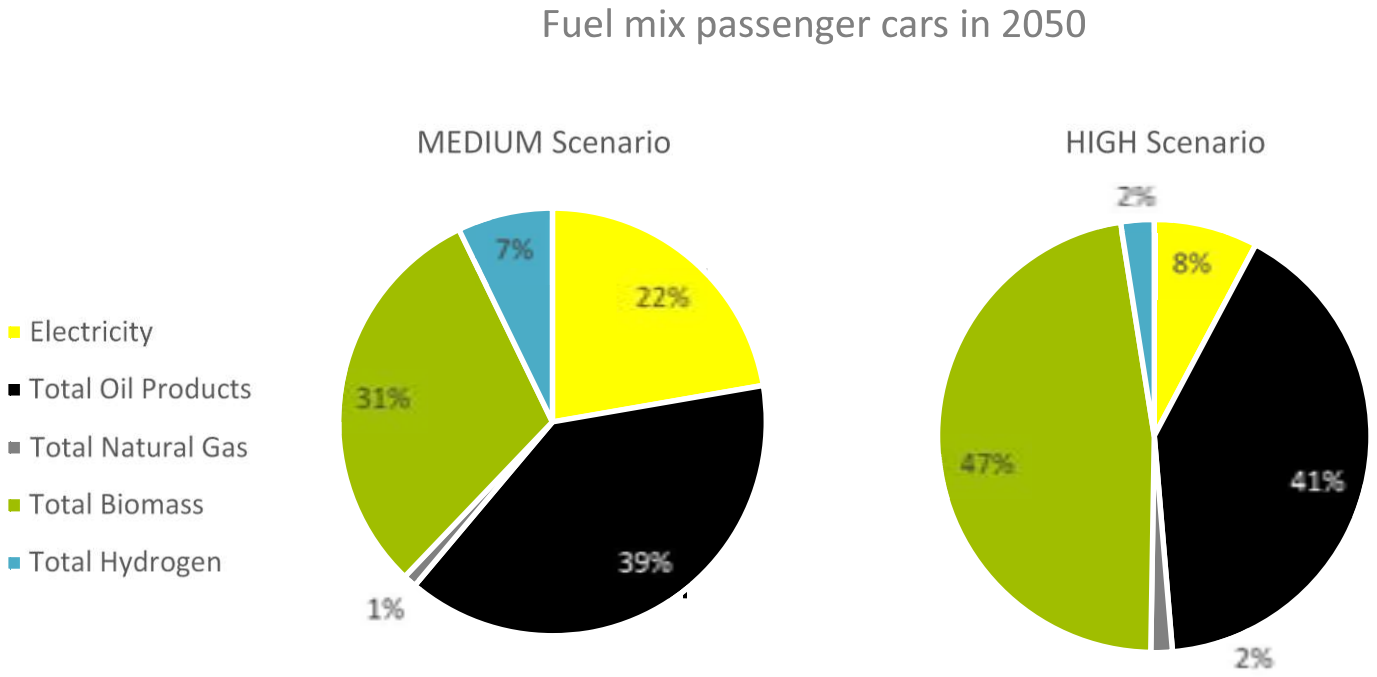
Advanced biofuels can help achieve the EU climate and energy goals

- Advanced biofuels have much lower Well-To-Wheel emissions than conventional fuels.
- Under targeted R&I policies for feedstock utilization and conversion technologies, advanced biofuels will be able to meet around **50% of the EU transport sector's energy demand**.
- Wide penetration of advanced biofuels in energy mix will enhance energy security.



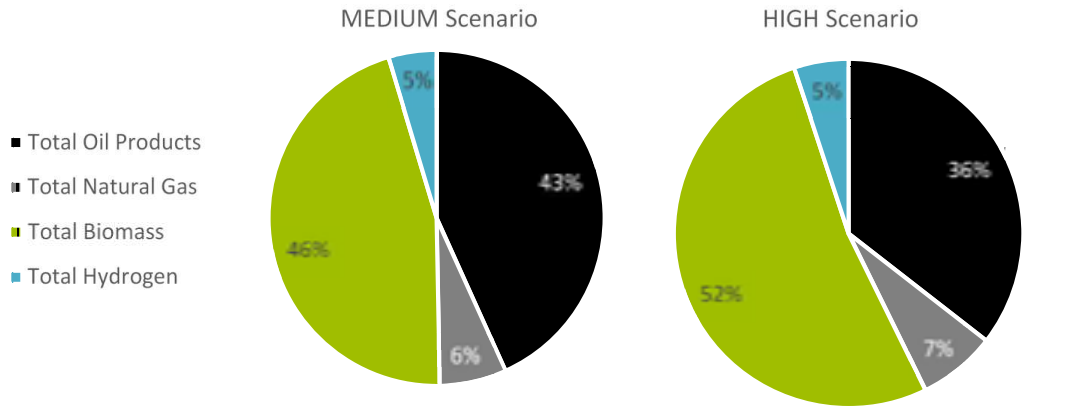
Competition between advanced biofuels and electrification in passenger transport



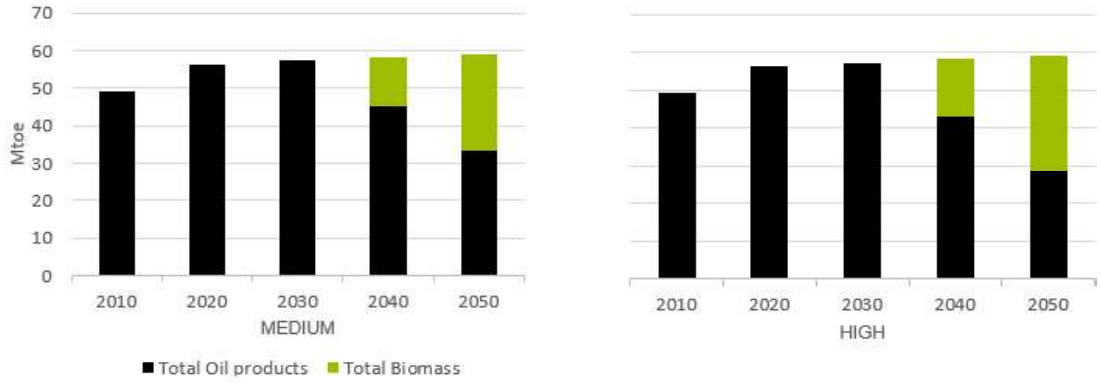
- Passenger cars are front-runners in the adoption of electric powered motors.
- Both advanced biofuels and electrification are necessary to cover overall demand.

Advanced biofuels are the main alternative for aviation, maritime, and heavy-duty road transport

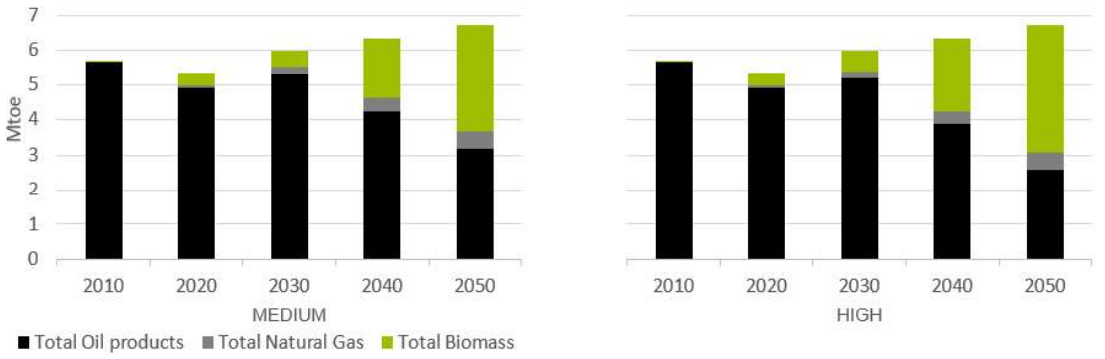
Fuel mix heavy duty road transport in 2050



Fuel mix aviation transport in 2050

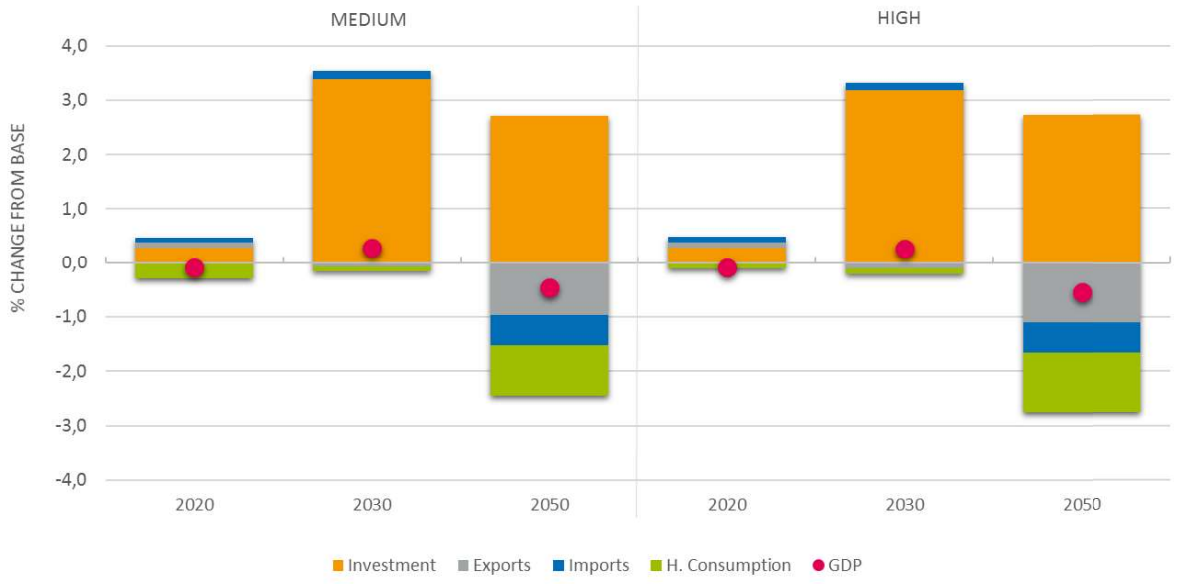


Fuel mix maritime transport in 2050



Decarbonizing the energy system using advanced biofuels is achievable without a negative impact on GDP

Decomposition of GDP impact- EU28



108,000 new jobs are created up to 2050 in the HIGH scenario

R&I outlook from the study results

- **R&I on several fronts can lead to successful development of advanced biofuels**
  Improved biomass feedstock supply, reduced conversion costs

- **Successful Advanced Biofuel value chains need to be created**
  Biomass logistics, flagships

- ***Substantial share of advanced biofuels in overall transport is possible by 2050***
  Substantial market volume, GDP-neutral decarbonisation, energy security, jobs

R&I outlook: Current Challenges – Primer for discussion

- *Exploit feedstock diversity/novel feedstocks*
- *Complex Cost/Supply Curves*
- *Biomass Flows*
- *Regional/Interregional Bioeconomy*
- *Conversion Technologies*
- *Deployment (Flagships)*
- *Market-uptake support*

Thank you for your attention!

Poster

Turning unexploited food waste into biomethane supplied through local filling stations network

BACKGROUND

*In EU around **90** mil tons of food waste is produced annually, or around 180 kg/person. While usage of food waste for biogas production is renewable resource of energy, still **40%** of biowaste in EU goes to landfills, and in some Member States almost completely. Estimation is that about **one-third** of Europe`s 2020 targets for renewable energy in transport could be met by using biogas produced from biowaste, and around **2**% of the EU`s overall renewable energy target could be met if all biowaste is turned into energy.*

OBJECTIVES

*Promotion of segregated **food waste** collection from specific and various waste producers (food and beverage industry, catering, residential) in order to produce **biofuel** (biomethane) and usage through local filling stations network. Concept implementation for the target cities is based on different events, including workshops, foodwaste working group meetings and study tours.*

TARGET CITIES

Within Bin2Grid 4 European target cities are supported for biofuel production from food waste.

*City of **Zagreb** (Croatia)*

*City of **Skopje** (FYR Macedonia)*

*City of **Malaga** (Spain)*

*City of **Paris** (France)*

BIN2GRID PARTNERS

Zagreb Holding, Croatia
UNIZAG FSB, Croatia
WIP-Renewable Energies, Germany
Gussing Energy Technologies, Austria
City of Skopje, FYR Macedonia
JSP Skopje, FYR Macedonia
IAT, Spain
ORDIF, France

BIN2GRID COORDINATION

Zagreb Holding - Čistoća, Croatia
Bojan Ribić
bojan.ribic@zgh.hr

Web site: **www.bin2grid.eu**
Duration: **01/2015 - 12/2017**

www.zgh.hr
www.cistoca.hr

This project has received funding from the European Union`s Horizon 2020 research and innovation programmme under grant agreement No 646560

BioVill

Increasing the Market Uptake of Sustainable Bioenergy

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

BIOENERGY VILLAGES

7 VILLAGES ONE TARGET - INCREASING THE MARKET UPTAKE OF SUSTAINABLE BIOENERGY

Jens Adler, Franziska Harter, Dominik Rutz, Konstanze Stein, Martin Höher, Martina Krizmanić, Natasa Markovska, Daniel-Alexandru Cosnita, Nike Krajnc, Miodrag Gluščević

CHALLENGE

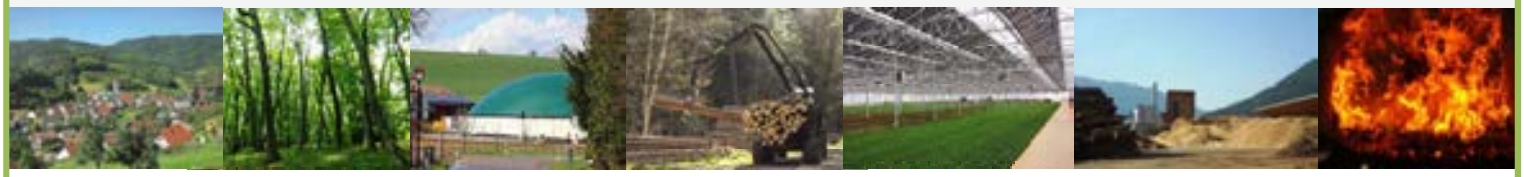
Many South-East European countries have high biomass potentials, but they are often not or inefficiently used. The challenge is to increase the market uptake of bioenergy by establishing sustainable local bioenergy supply chains and thereby supporting regional economic development.

OBJECTIVE

The overall objective of BioVill is to support the development of regional bioenergy concepts and the establishment of Bioenergy Villages in Macedonia, Serbia, Croatia, Romania and Slovenia by transferring existing experiences from Austria, Germany and other European countries to the partners in South-East Europe.

RESULTS

- Enlarged capacities & awareness of local stakeholders and citizens regarding bioenergy opportunities
- Improved planning and multi-stakeholder involvement
- Increased market uptake of bioenergy supply chains
- Strengthened local and regional economy
- Initiation of at least 5 bioenergy villages up to the investment stage



WHAT IS A BIOENERGY VILLAGE?

A bioenergy village is a village, municipality, settlement or community or a part of it which produces and uses most of its energy demand from local biomass sources, e.g. agriculture, forestry and waste as well as from other renewable energies. Bioenergy villages usually combine several technologies for energy and heat production with a local heating grid.

KEY CHARACTERISTICS OF BIOENERGY VILLAGES:

OVERALL SUSTAINABILITY: The whole bioenergy value chain from the local production of biomass up to its utilization supports economical, ecological and social sustainability.

ENERGY SELF SUFFICIENCY: A large share of the power supply and the heat demand is covered by locally produced biomass and/or other renewable energies.

LOCAL OWNERSHIP: The business model allows citizens, energy consumers, farmers and forest owners to become shareholders of the installations.

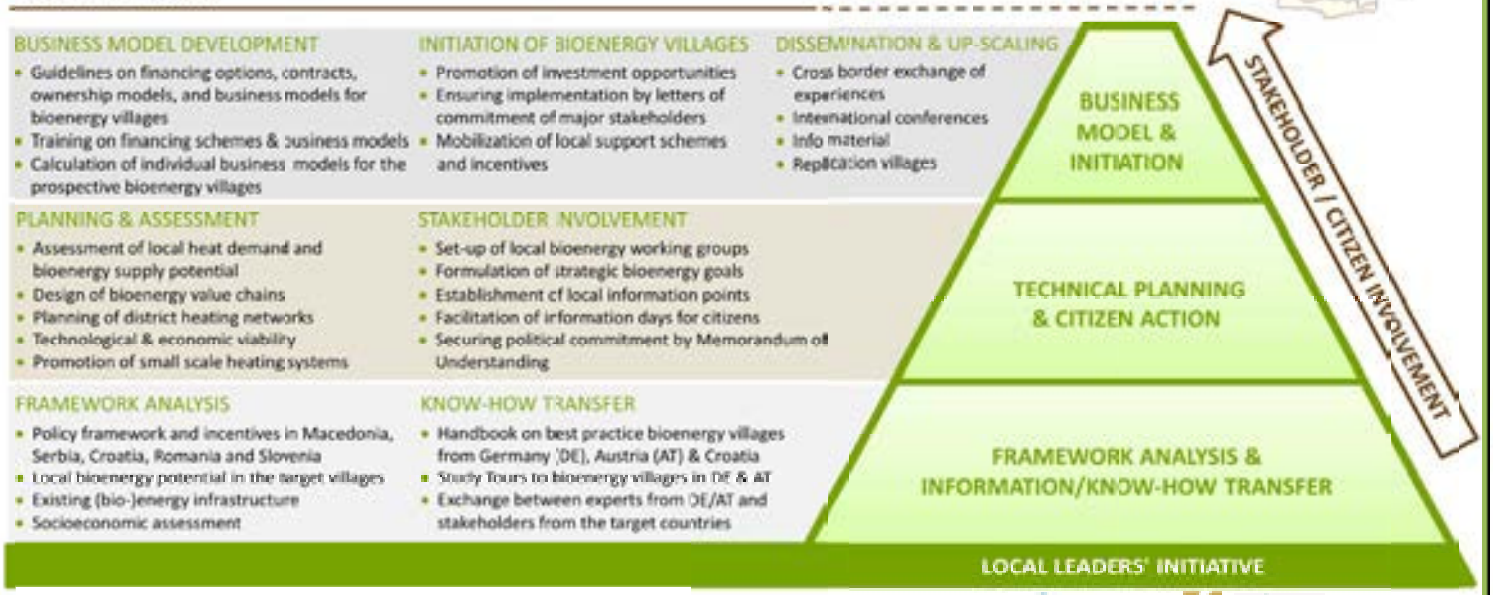
REGIONAL DEVELOPMENT: The added value remains in the village and supports the local and regional economic development.

PUBLIC PARTICIPATION: The creation and management of the bioenergy village is based on a high level of public participation.

RESOURCE EFFICIENCY: The energy concept of a bioenergy village includes also energy efficiency and energy saving measures.

THE BIOVILL TARGET VILLAGES

PROJECT APPROACH



BioVill is a three years project supported by the European Union's Horizon 2020 research and innovation programme and implemented by the following partners:

giz WIP KEA

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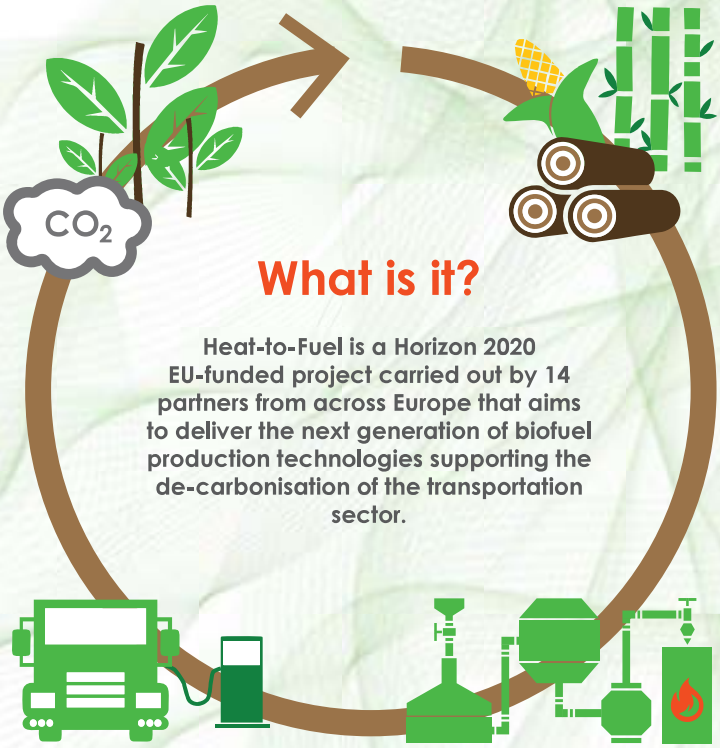
This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement N° 691661

For more information visit www.biovill.eu

Heat to Fuel



What is it?

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.

Why HtF?

Transportation fuels corresponded in 2013 to 31.6% in Europe of the final energy consumption. The source of this energy depends to a large extent on fossil fuels import, being diesel and kerosene the two major fuels for heavy trucks and air transportation. Thus, decarbonised production diesel and kerosene as alternative to fossil fuels becomes relevant for reducing carbon emissions in these two means of transport. Heat-to-Fuel will spearhead EU's research in grasping the opportunity to provide efficient technologies and processes for decarbonised fuels for the transportation sector

NOVEL TECHNOLOGIES + COMPLEMENTARY ACTIVITIES DESIGN MODELLING

TESTING | ANALYSIS INTEGRATED HEAT TO FUEL SYSTEM + DEVELOPMENT HARDWARE PROCESSES

REPRESENTATIVE OF NEXT GENERATIONS OF SUSTAINABLE BIOFUELS TECHNOLOGIES

At the end of the project, the technology will be market ready in around **7 years**
The **know-how** acquired will allow scalability at a demonstration level before commercialisation

Objectives

In numbers, Heat-to-fuel aims to:

- Deliver cost-competitive technologies achieving biofuel prices below €1 per litre. This is achieved by a 20% cost reduction in the biofuel production processes;
- Contribute to delivering goals of EU's energy security by increasing the share of local resources used for producing energy, and thus reducing EU's dependency of energy's imports;
- Increase the quality of the biofuel resulting in 5% life-cycle green-house gases emissions reduction;
- Support local economies by generating 80-100 direct and 250 indirect jobs each time a new Heat-to- Fuel biorefinery is built;
- Prove the technological feasibility and economic worthiness of the concept acting as a catalyst of future industrial units.

Project Facts

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

Acronym: Heat-to-Fuel **Budget: € 5.896.987,50** **Type of action: Research and Innovation Action** **Duration: 48 months**

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

Isabel

Triggering Sustainable Biogas Energy Communities through Social Innovation

Vision

ISABEL is about promoting, supporting and developing **community biogas** in Europe and pave the way for the transition from traditional supply chains to regional community-driven biogas initiatives.

Local community

Re-brand biogas as a **"public good"** addressing the local communities' needs and perception

Sustainable Biogas

Implement **Social Innovation** and **Public Participation** practices.

emPOWERment

Empower the creation of a favorable environment for Community Biogas initiatives

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

Find us.
isabel-project
isabel_project
isabe-project

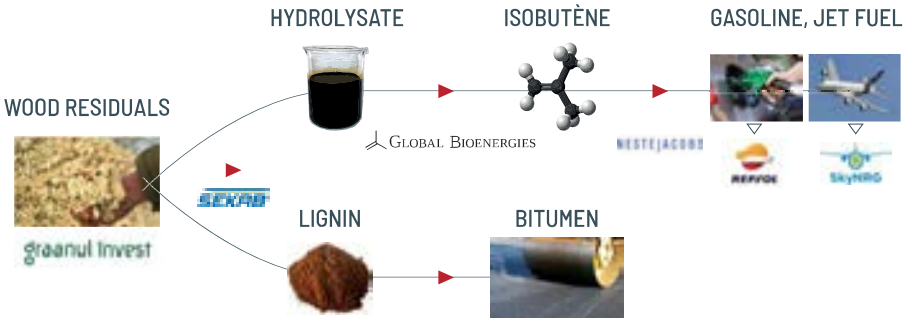
Q-PLAN INTERNATIONAL (Greece, Coordinator)
INSEAD The Business School for the World (France)
FNR (Germany)
UNIVERSITY OF SURREY (United Kingdom)
Global Biotechnology Transfer Foundation (United Kingdom)
EuroEnergy (Greece)
WhiteResearch (Belgium)
Bodensee Stiftung (Germany)

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

REWOFUEL

RESIDUAL WOOD CONVERSION TO HIGH PERFORMANCES DROP-IN BIOFUELS

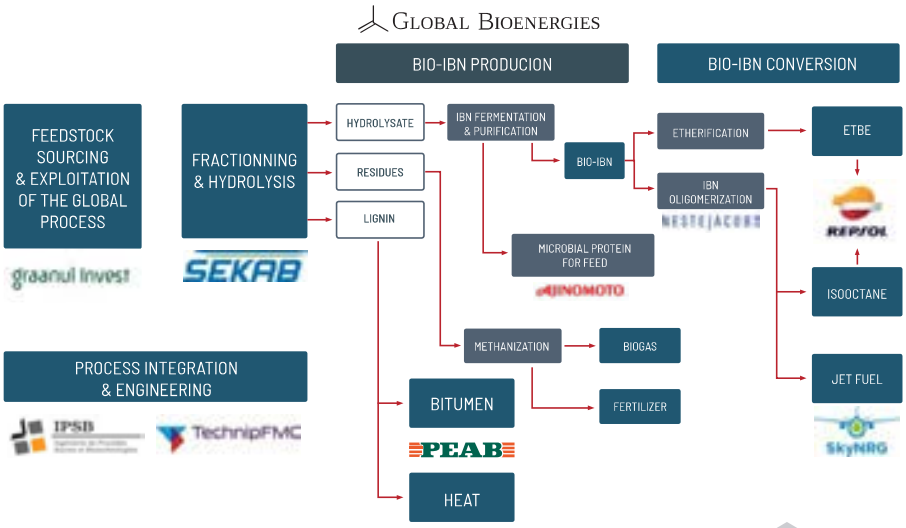


- EUROPEAN CONSORTIUM TO VALIDATE A NEW VALUE CHAIN (FROM WOOD RESIDUALS TO DROP-IN BIOFUELS) AT DEMO SCALE
- EUROPEAN UNION GRANT: €13.9M
- PARTNERS: GLOBAL BIOENERGIES, GRAANUL INVEST, SEKAB, NESTEJACOBS, REPSOL, SKYNRG, AJINOMOTO, PEAB, TECHNIPFMC, IPSB AND JKU

FORESTRY RESIDUES EUROPEAN UNION : 2015				
Harvest residues (kt/a)	Coniferous	Non-coniferous	Residues from sawnwood production (Kt/a)	
Branches and various cut-off	36.047	26.587	Saw-dust	10.488
Bark	13.045	5.400	Wood chips	28.602
Foliage	19.905	3.570		
Total	**68.998**	**35.558**		**39.089**

- AVAILABILITY OF WOOD HARVEST RESIDUES IN EUROPE (2015): 105 MT PER YEAR. AVAILABILITY OF RESIDUES FROM SAWN-WOOD PRODUCTION IS ESTIMATED TO BE ABOUT 39 MT PER YEAR IN EUROPE
- TOTAL FEEDSTOCK AVAILABILITY OF 144 MT PER YEAR IN EUROPE.
- OUT OF 160 MT OF GASOLINE + JET FUEL CONSUMED EVERY YEAR IN EUROPE, THE REWOFUEL PROJECT HOLDS THE POTENTIAL TO PRODUCE MILLIONS OF TONS OF DROP-IN FUELS (GASOLINE AND JET FUEL)

GLOBAL SUSTAINABILITY ANALYS OF ENTIRE VALUE CHAIN



4REFINERY

Project presentation

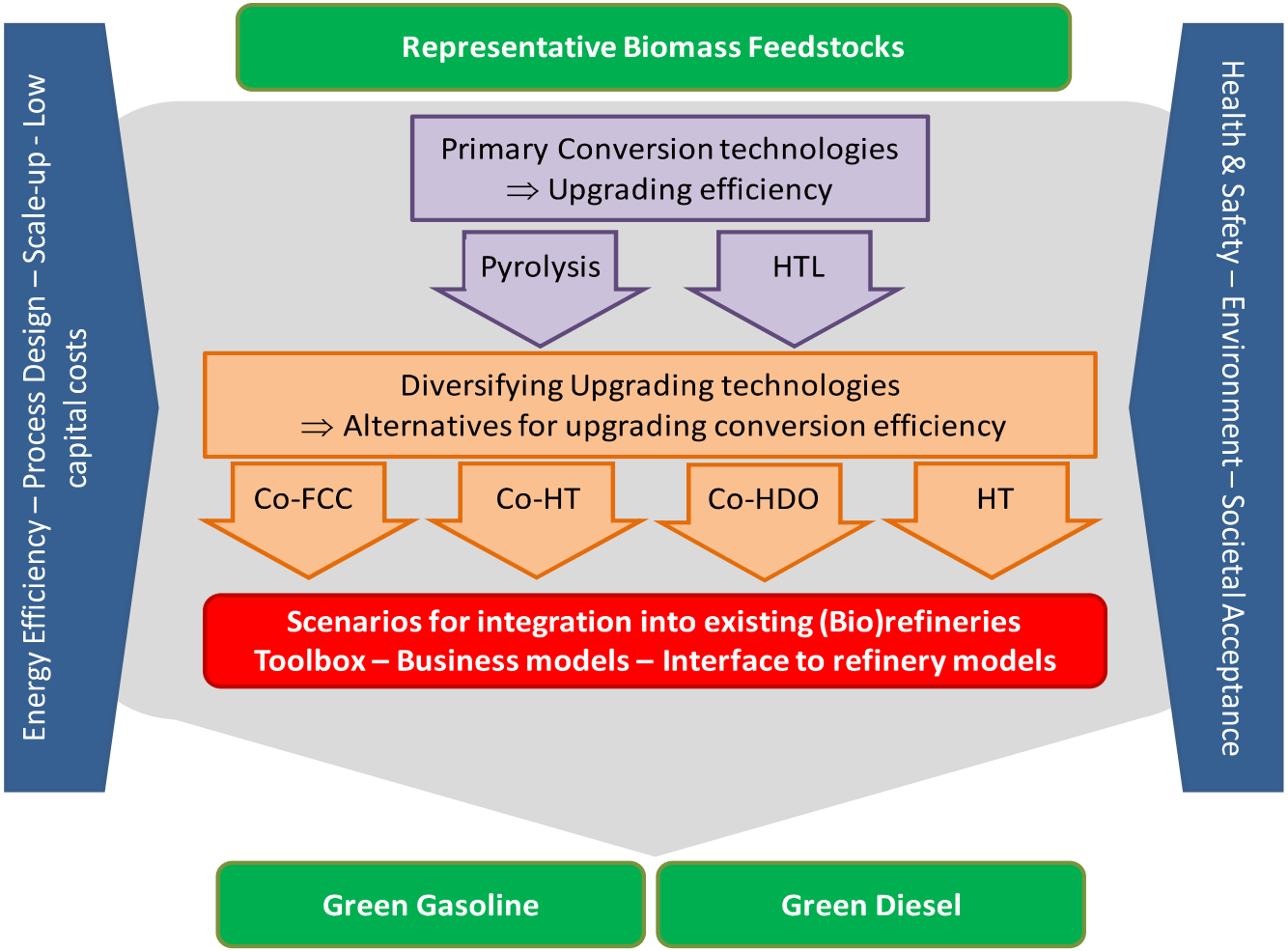
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727531

- Presenter: Duncan Akporiaye, SINTEF

Horizon 2020 Workshop on Bioenergy, Advanced Biofuels and Renewable fuels, Brussels April 10th – 11th 2018

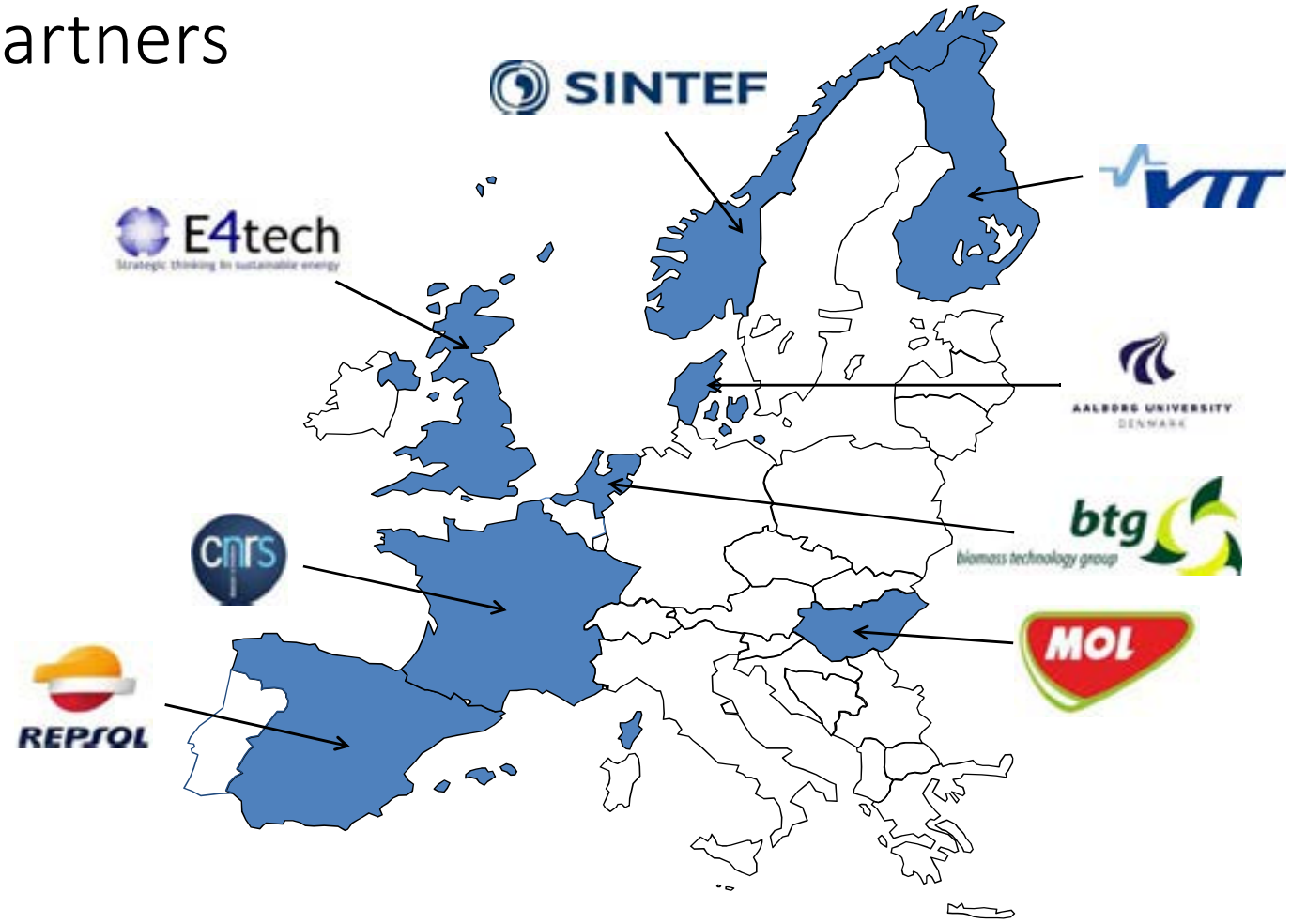
European Union's Horizon 2020 research and innovation programme, GA No. 727531

4Refinery Vision



European Union's Horizon 2020 research and innovation programme, GA No. 727531

4Refinery Partners



Project Acronym: **4REFINERY** Project Number: **727531** Call: H2020-LCE-08-2016-2017 Topic: Development of next generation biofuel technologies

Project title: **Upgraded scenarios FOR integration of biofuel value chains into REFINERY processes**

Specific Challenge: 4REFINERY will develop and demonstrate the production of next generation biofuels from more efficient primary liquefaction routes integrated with upgraded downstream (hydro)refining processes to achieve overall carbon yields of >45%. The consortium will aim for successful deployment into existing refineries, including delivering a comprehensive toolbox for interfacing with existing refinery models.

Technological approach of the Project: Transformation of bio-liquids from fast pyrolysis and hydrothermal liquefaction into advanced biofuels, through intermediate process steps combined with downstream co-processing technologies. The project will establish relations between product's properties, the quality of renewable feedstocks and all relevant process parameters along the value chain. This will allow a full understanding of the influence of feedstock and treatment processes on product characteristics.

Expected Impact: 4REFINERY will develop scenarios for efficient implementation of biofuel production in existing refineries. The project will allow a major progress in conversion of biomass into fuels with better conversion efficiency, less GHG emissions, improved cost-competitiveness, while bringing better knowledge of the underlying mechanisms.

Contribution of the Project: 4REFINERYwill demonstrate the use of biomass derived industrially avialble liquid products in existing refinery assets, and provide the know-how required to optimize the overall value chain. In addition, 4REFINERY will develop scenarios for efficient implementation of biofuel production in existing refineries.

Highlights (technological/non-technological): 4REFINERY has successfully produced 10 kg of stabilized pyrolysis liquids and 50 kg of HTL bio-liquids.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727531

ABC-SALT

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 764089

Advanced **B**iomass **C**atalytic Conversion to middle distillates in Molten **Salts**

Acronym: ABC - Salt

Duration: April 1, 2018 – March 31, 2022

Coordinator: prof.dr.ir. H.J. Heeres

university of groningen

Partners:

Aston University Birmingham

btg biomass technology group

DLR Deutsches Zentrum für Luft- und Raumfahrt

Norwegian University of Life Sciences

RI SE

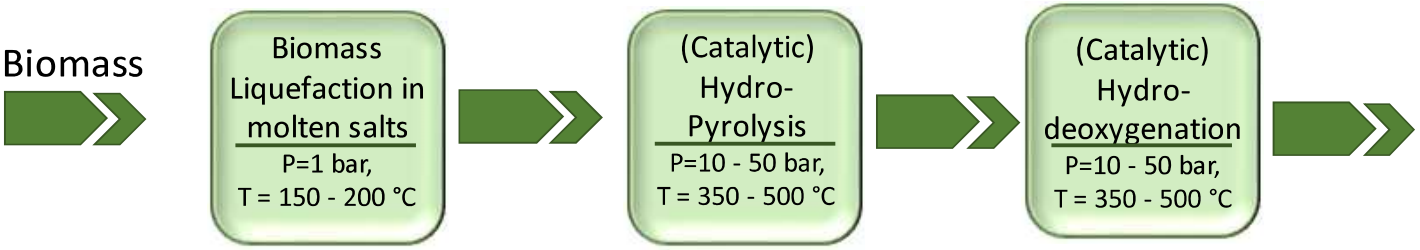
GHENT UNIVERSITY

ayming

Overall Objective

Development of a novel route to produce sustainable liquid biofuels (middle distillates) from various lignocellulosic waste streams for the transport industry targeting a yield over 35% to middle distillates and a carbon yield of 55%.

Concept - Approach



Step 1: Dissolving biomass in novel media at ambient pressure and low temperature

Step 2: Vaporizing the biomass at elevated pressure and temperature

Step 3: Vapour-phase hydro-deoxygenation to produce middle distillates

Project Acronym: **ABC-salt** Project Number: **764089** Call: H2020-LCE-06-2017 Topic: Sustainable Fuels

Project title: **Advanced Biomass Catalytic Conversion to Middel Distillates in Molten Salts**

Specific Challenge: Sustainable Fuels: Diversification of renewable fuel production through novel conversion routes and novel fuels: Development of middle distillate range biofuels (i.e. diesel and jet fuel) from liquid organic or lignocellulosic waste streams through advanced thermochemical conversion processes.
Technological approach of the Project: Experimental research supported by relevant system modeling activities on technology, environmental and social impact. The technology concept will de demonstrated experimentally in an integrated bench scale unit.

Expected Impact: Move the technology involved to TRL 4; Provide better scientific understanding and guidance; New, out-of-the-box or advanced innovative ideas, to improve the conversion efficiency for sustainable fuels;
Contribution of the Project: The project aims to develop novel integrated technology for the efficient conversion of lignocellulosic waste streams to middle distillates from TRL level 2 to 4 using a unique, out of the box concept. The concept will be investigated using a holistic approach, involving research activities aiming for a sound scientific understanding of the individual conversion steps as well as smart integration activities.

Highlights (technological/non-technological): The project starting date is April 1, 2018. The kick off meeting is scheduled for April 23, 2018. As such, no highlights can be reported yet.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *764089*

ADVANCEFUEL

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 764799

ADVANCEFUEL

Horizon 2020 Workshop on Bioenergy

Advanced Biofuels and Renewable fuels

Kristin Sternberg

FNR

Brussels, 10-11/04/2018

OBJECTIVES

ADVANCEFUEL will generate **new knowledge, tools, standards and recommendations** aiming to overcome barriers to the commercialisation of renewable transport fuels. Investigations will include the **entire value chain**, including

- (lignocellulosic-based) Biomass availability;
- Biofuels conversion processes and technologies;
- Advanced biofuels sustainability;
- End-use and social acceptance.

To build and validate their results, ADVANCEFUEL partners will **engage stakeholders** from the biofuels value-chain and support actors to participate in the project through consultations, dedicated workshops and the ADVANCEFUEL **Stakeholder Platform (www.advancefuel.eu)**

Duration: 09/2017– 08/2020

Funding: Horizon 2020

Partner countries: DE, NL, BE, GB, SE, FI

Coordinator: FNR

Coordination of scientific content: ECN

ATB

Greenovate!

Imperial College London

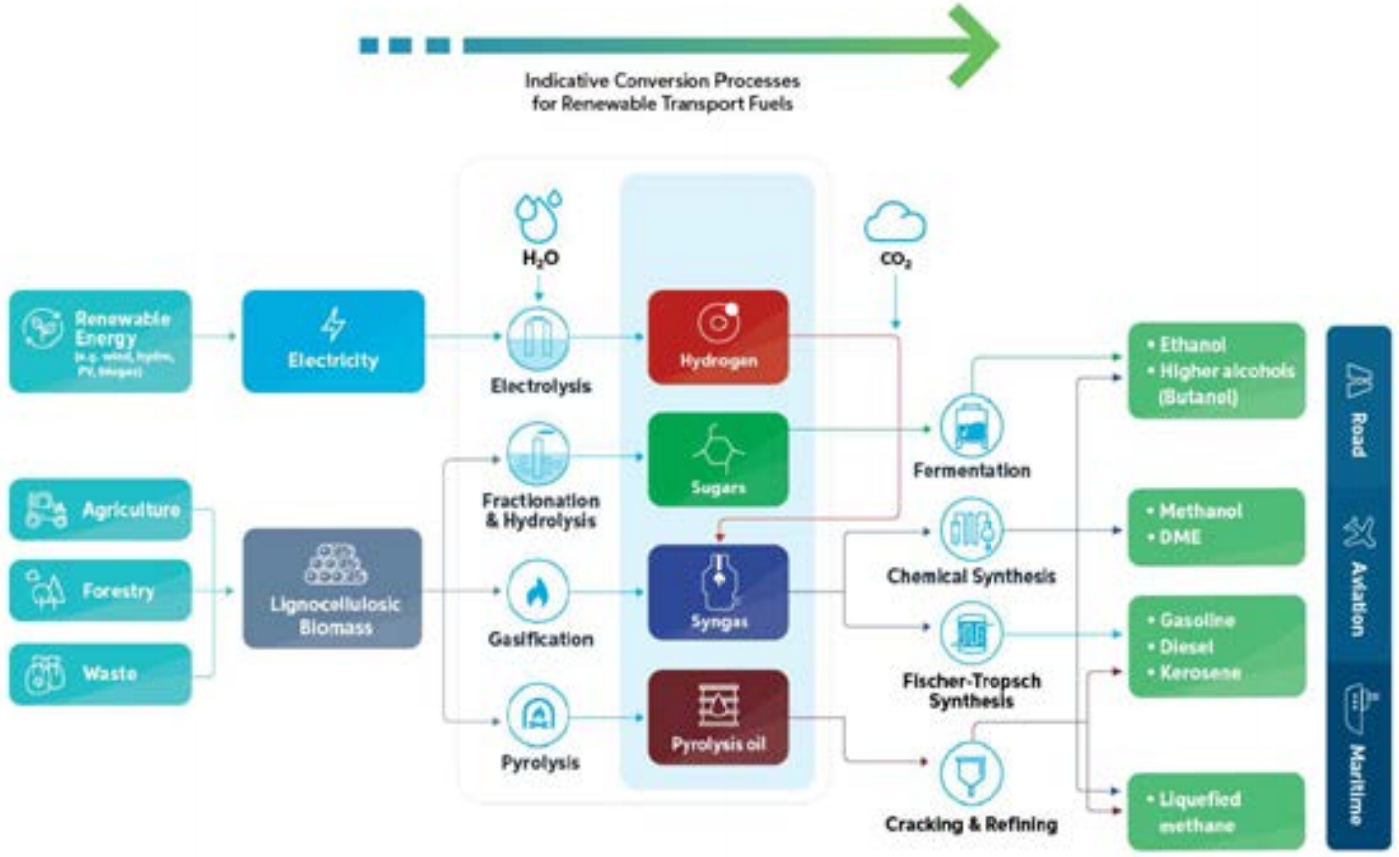
Aalto University

Universiteit Utrecht

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 764799.

ADVANCEFUEL Project Scope

ADVANCEFUEL aims at increasing the market uptake of **liquid advanced biofuels and other liquid renewable fuels,** jointly referred to as **'RESfuels'**



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.° 764799.

Project Acronym: **ADVANCEFUEL** Project Number: 764799 Call: H2020-LCE-2017-RES-CSA
Topic: LCE-21-2017-Market uptake of renewable energy technology
Project title: Facilitating market roll-out of RESfuels in the transport sector to 2030 and beyond

Specific Challenge: Commercialisation of advanced biofuels to help meeting the 10% target for Renewable Energy Sources (RES) in the EU transport energy consumption by 2020; Contribution to the EU targets of 27% share of RES in the EU energy consumption and of 40% GHG reduction by 2030. Fossil fuels and biofuels produced from food/feed crops are excluded.

Technological approach of the Project: Coordination & Support Action- thus new knowledge and tools for stakeholders

Expected Impact: Increase share of renewable energy in the future energy mix and to increase the share of sustainable advanced biofuels and renewable alternative fuels in the final EU transport energy consumption. Contribution to market understanding for possible policy and regulatory development

Contribution of the Project: ADVANCEFUEL addresses the whole value chain aiming at accelerating the market roll-out of RESfuels via four main guiding ideas: Engagement of key stakeholders, Support to decision makers by providing tools and recommendations based on validated R&I results, Modelling and assessment of useful scenarios and sensitivity analyses on the future of RESfuels, Communication displaying positive message on sustainability of RESfuels aiming to increase demand

Highlights: Advanced biofuels Key Performance Indicators monitoring tool to follow the progress in biofuels' market uptake; Supply chain analysis tool, to assess the social, economic and environmental performances of biofuels supply chains; Technology assessment tool with a roadmap for development and innovation; Numerical tool for prediction of fuel performance and fuel blend properties.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *764799*

BABET-REAL5

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654365

The BABET-REAL5 Project

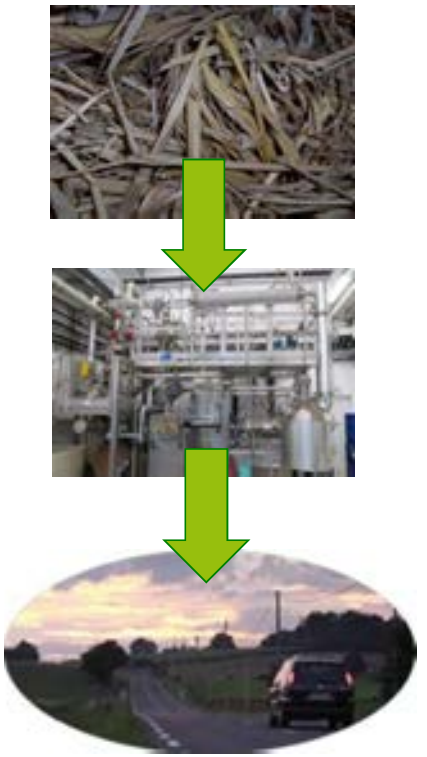
10 - 11 April 2018
Brussels, Belgium

Gérard Vilarem, INP Toulouse
gerard.vilarem@ensiacet.fr
http://www.inp-toulouse.fr
Julio Valles
jvalles@valles-impulsion.fr

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654365.

BABET-REAL5 objectives

- Achieve favourable techno-economic and environmental performances for the production of 2G ethanol in small-scale industrial plants processing 30,000 t dry biomass per year.
- Identify feedstock with sustainable and reliable supply conditions for the evaluation and selection of business cases in Latin America and Europe.
- Provide all the necessary data for the selected business cases so that the new technology can be realistically evaluated and scaled-up after the project to TRL 6-7.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654365.

BABET-REAL5 case studies on sustainable availability of crop residues (wp4)

CASE 1

France
Region:
South-West France

Feedstock (50-km radius):
Corn stover

300,000 t_{dm}/y

Feedstock slection

CASE 2

France
Region:
Southern France

Feedstock (50-km radius):
Sunflower stover

96,300 t_{dm}/y

Technical potential

CASE 3

Germany
Region:
Bavaria

Feedstock (50-km radius).
Wheat straw

120,000 t_{dm}/y

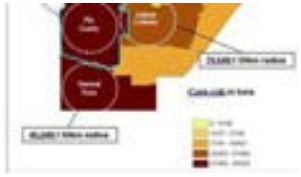
Agronomic potential

CASE 4

Argentina
Region:
Córdoba

Feedstock (50-km radius):
Sugarcane crop residues

45,000 to 70.650 t_{dm}/y



Net mapping

CASE 5

Uruguay
Region:
North-East Uruguay

Feedstock (50-km radius):
Eucalyptos grandis

49,000 to 57,000 t_{dm}/y

Logistics

Techno-economic, agronomic 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 No 654365.

Project Acronym: **BABET-REAL5** Project Number: **654365** Call: **LCE-11-2015** Topic: **RIA**

Project title: **New technology and strategy for a wide and sustainable deployment of second generation biofuel plants in rural areas**

Specific Challenge:

- Developing next generation technologies for biofuels and sustainable alternative fuels
- Improving conversion efficiency and/or enlargement of the biomass feedstock basis.
- Improving the economic, environmental and social benefits relative to fossil fuels and currently available biofuels, notably regarding cost reduction, minimisation of demand on natural resources (land and water in particular), enhanced energy balance, reduced GHG emissions (including carbon stock changes) and development of rural areas.

Technological approach of the Project:

The main concept underpinning the project relies on a new pretreatment process, able to run all the operations from the processing of the lignocellulosic biomass to the enzymatic pre-hydrolysis in a one-stage-reactor.

The slurry resulting from the new pretreatment process is delivered under favourable conditions ready for further hydrolysis and fermentation in external tanks. This new concept offers the most integrated and compact solution for the pretreatment of lignocellulosic biomass which has been designed and studied so far. All the operations necessary to increase the access for the enzymes to the carbohydrates (deconstruction, defibrillation and depolymerisation) and start the solubilisation of sugars are carried out in a single twin-screw extruder with high throughput.

The techno-economic and environmental viabilities must be reached at the lowest or unit processing scale of 30,000 tons equivalent dry biomass per year.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654365.

Expected Impact:

- New developed technology pathways permit the use of new feedstock sources that do not compete directly or indirectly with food or feed production for resources, or a more efficient conversion of the current ones.
- A favourable energy balance, as well as a significant potential for cost reduction is expected.
- The development of new technologies will permit robust and reliable assessment of the environmental and social benefits with respect to current technologies, notably in terms of GHG performance, energy balance, efficient use of natural resources, 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:

If the project reaches its techno-economic and environmental objectives, the new concept can be successfully applied not only to the biofuel market, but also to other non-biofuel production chains (e.g. agro-food industry and material/chemical industries based on 2G hexose and pentose sugars). If small-production units are profitable, the new knowledge will have a leverage effect to strengthen the competitiveness and growth of many companies active and/or interested in the energy and non-energy markets.

Highlights (technological/non-technological):

Advance beyond the state-of-the-art is provided by the new pretreatment process and can be summarised in one sentence: one step-one reactor process, few minutes residence time from the raw biomass feeding to the saccharification reactor and three pumps to inject the reagents. The new technology concentrates in one reactor all the reactions (thermal-mechanical-chemical-enzymatic) necessary to reach favourable conditions for saccharification. Moreover, it is the only process of the state-of-the-art where enzymatic hydrolysis is initiated in the pretreatment reactor itself.

Such level of integration and compactness has never been reached before.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654365.

BABET-REAL5 consortium

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654365.

BECOOL

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 744821

Activities and cooperation

BECOOL
Brazil-EU Cooperation for Development of Advanced Lignocellulosic Biofuels

The activities of BECOOL are aligned with those of BioVALUE, the twin project in Brazil.

Three pillars

- Biomass production and feedstock diversification
- Biomass logistics
- Conversion processes

- Integrated food and fuel cropping systems
- Efficient biomass harvesting and logistics
- Thermochemical conversion co-products into aviation fuels
- Enhanced biochemical processing and lignin separation
- Integrated Sustainability Assessment
- Exploitation and communication


Annual crops trials


Perennial crops trials


Harvesting


Rotation trials


Lignin-rich residue


Pyrolysis trials


Gasification trials


Value chain workshop

Innovation potential and impacts

BECOOL
Brazil-EU Cooperation for Development of Advanced Lignocellulosic Biofuels

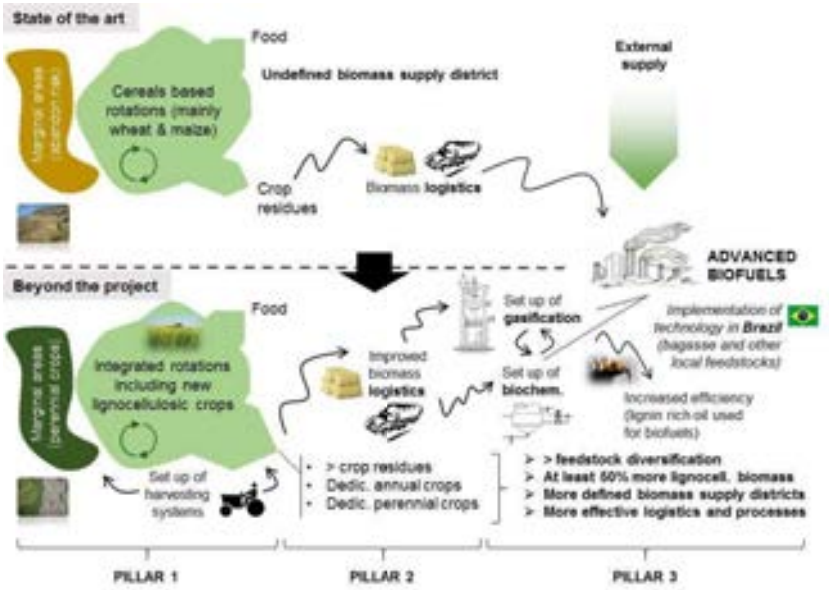
Key innovations

- Innovative food/feed/biofuel integrated cropping systems;
- Logistic concepts tailored to the selected BECOOL value chains;
- Innovative thermochemical and biochemical pathways;
- Valorization of residues (e.g. sugar cane bagasse and lignin-rich residues) to increase the efficiency of advanced biofuels
- Integrated assessment of the selected BECOOL value chains

Key impacts

- over 50% higher amount of lignocellulosic biomass per unit land (> LER) without negative impacts on food security;
- environmental and economical benefits from integrated value chains;
- more effective logistics by use of intermediate energy carriers
- improved conversion technologies to increase the competitiveness of European advanced bioethanol
- enhanced cooperation and synergies with Brazil in the advanced biofuel industry

www.becoolproject.eu



Project Acronym: **BECOOL** Project Number: 744821 Call: H2020 LCE 2016 Topic: LCE 22-2016

Project title: **Brazil-EU Cooperation for Development of Advanced Lignocellulosic Biofuels**

Specific Challenge: The coordinated call aims at exploiting synergies between Brazil and Europe in terms of scientific expertise and resources in topics related to advanced biofuels by implementing coordinated projects

Technological approach of the Project: The BECOOL project, in close cooperation with the BioVALUE Brazilian project, will provide solutions for highly efficient and sustainable value chains, encompassing the whole range of activities from biomass production and crop diversification to logistics and conversion pathways.

Expected Impact: A significant progress in: i) **gasification of bagasse** to syngas and advanced liquid fuel production, including biofuels for aviation; ii) applied research to **biomass production logistics** and applied research for **feedstock diversification** for advanced biofuels; iii) **development of new fermentation and separation technologies** for advanced liquid biofuels and applied research to increase the **energy efficiency of advanced biofuel processes**, should be obtained.

Contribution of the Project: i) providing innovative solutions for increasing lignocellulosic biomass through integrated food/feed/biofuels cropping systems and perennial lignocellulosic crops in marginal land; **ii)** identifying optimized and sustainable logistical concepts tailored to the selected BECOOL value chains; **iii)** setting up new pathways for increasing the efficiency of thermochemical and biochemical conversion technologies towards advanced biofuels; **iv)** providing feasible solutions for environmentally and economically sustainable value chains (from cultivation to advanced biofuels).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 744821]

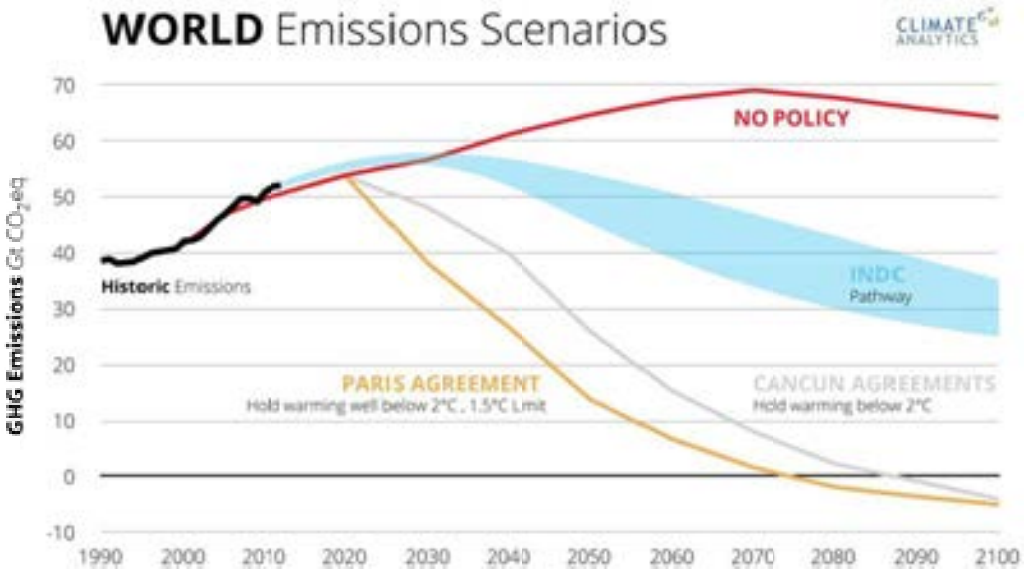
BESTF-BESTF2-BESTF3

Project presentation

These projects have received funding from the European Union's FP7 and Horizon 2020 research and innovation programme under grant agreement No 321477, No 618046, No 691637

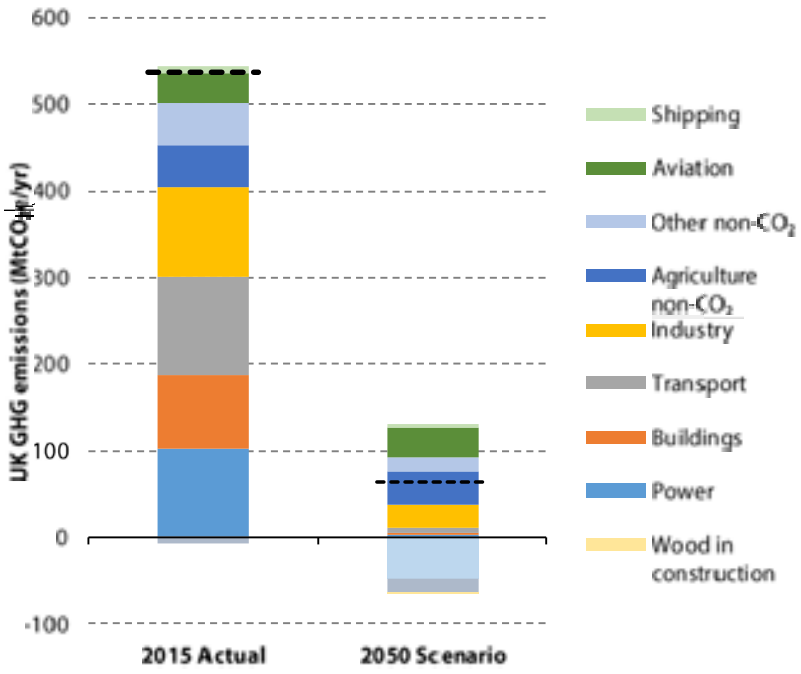
BioEnergy Sustaining the Future

BESTF ERANET Projects – Why?



IPCC AR5 for a 66% chance of staying below 2°C goal in 2100 the remaining carbon budget from 2011 is between 750 to 1400 Gt CO_2. A more recent study has given a carbon budget of between 590-1240 Gt CO_2 from 2015.

UK Current and Projected Emissions



BioEnergy Sustaining the Future

BESTF ERANET Projects (1)

BESTF1:

- **BioSNG** – UK/Germany - project complete – Development of an innovative process to convert gas and biomass into bio substitute natural gas to be used in existing gas network – has led to £25m commercial scale plant
- **BioProgress** – Sweden/Germany – project complete – Demonstrated a novel technology to simply gas clean-up following biomass gasification and online tar measurement

BESTF2:

- **CoryFee** – Denmark/Sweden – on going – Aiming to reduce production costs of cellulosic ethanol
- **MSWBH** – UK/Netherlands – on going – Demonstrate the economically viable production of butanol, hydrogen fuels and other chemicals from autoclave-pre-treated municipal solid waste by hydrolysis and fermentation
- **BioWaterMethanisation** – Spain/UK/Netherlands – on going – Demonstrate feasibility of anaerobic membrane bioreactor to achieve sustainable wastewater treatment.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nos 321477, 618046 and 691637
http://eranetbestf.net/

BioEnergy Sustaining the Future

BESTF ERANET Projects (2)

BESTF3:

- **Phoenix** – UK/Netherlands – on going – develop port injection gas engines to provide novel approach to power generation from syngas derived from biomass gasification.
- **Waste2Bio** – Spain/UK – on going – Demonstrate a process for treatment of MSW via recovery of bioethanol and biogas to enhance valorisation of residues.
- **Segrabio** – Denmark/Sweden – on going – Demonstrate the production of bioethanol and biogas from second-grade and low-cost biomass

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nos 321477, 618046 and 691637
http://eranetbestf.net/

BioEnergy Sustaining the Future

Review of Added Value

- The leverage of funding from the Member States and EC provides a great benefit and enabler for ambitious projects to pursue the development of innovations, which may otherwise not have taken place.
- Open discussions about priority innovation areas for bioenergy help shape the programme and creates a possibility to help influence the wider EU research and policy agenda.
- The programme offers access to and links with a wide prestigious European network in the field of bioenergy technologies and benefits from collaboration and learning from experiences of other countries.
- However, it should be noted that as demonstration projects can really only be built in one country, it can be difficult to show attractive added value for **all** involved countries in transnational consortia. As all national criteria shall be met, as well as the call criteria, the opportunity space for projects is limited.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nos 321477, 618046 and 691637
http://eranetbestf.net/

Bin2Grid

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646560

ZAGREBAČKI HOLDING

PODRUŽNICA ČISTOĆA

Project **BIN2GRID**

ZCH / Bojan Ribić

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 646560

Project Bin2Grid

Turning unexploited food waste into biomethane supplied through local filling stations network

OBJECTIVE

- to promote **segregated collection of food waste** from specific and various waste producers (food and beverage industry, catering, residential) in order to **produce biofuel** (biomethane) and its usage through local filling stations network

Background

- on the EU average **40**% of biowaste is still landfilled[1]

Figure 1. Biowaste recycling in EU (source: EEA Report, 2/2013)

[1] *Future steps in bio-waste management in EU, 2010*

Background

- in the EU alone, **90** millions tones of food waste is produced every year or around **180** kg per person

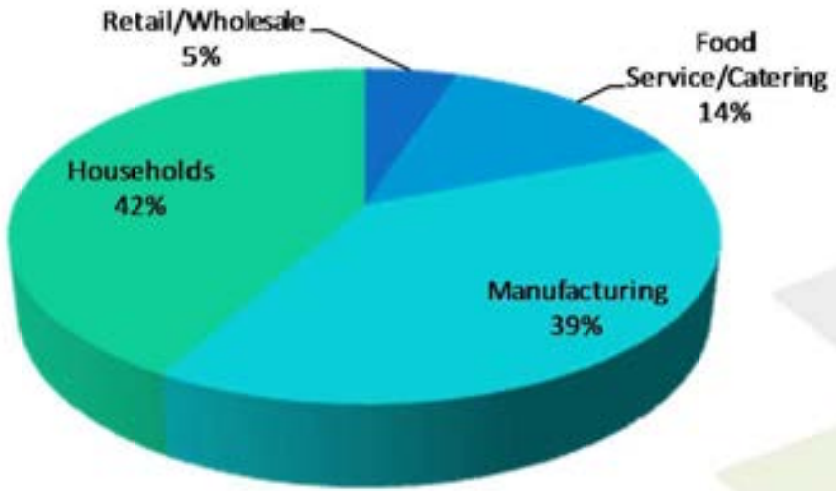
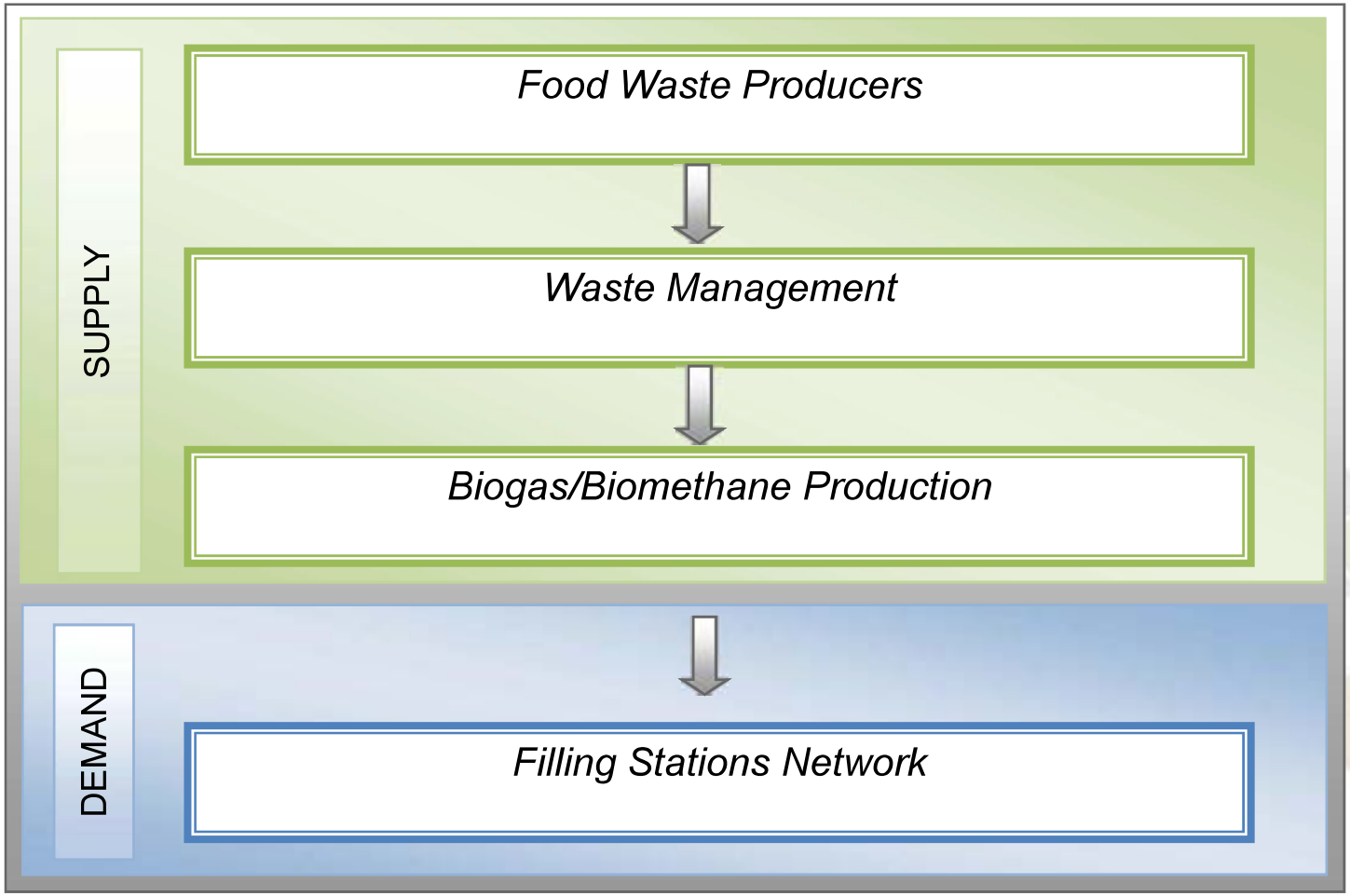


Figure 2. Percentage breakdown of EU27 food waste (2006 EUROSTAT data)

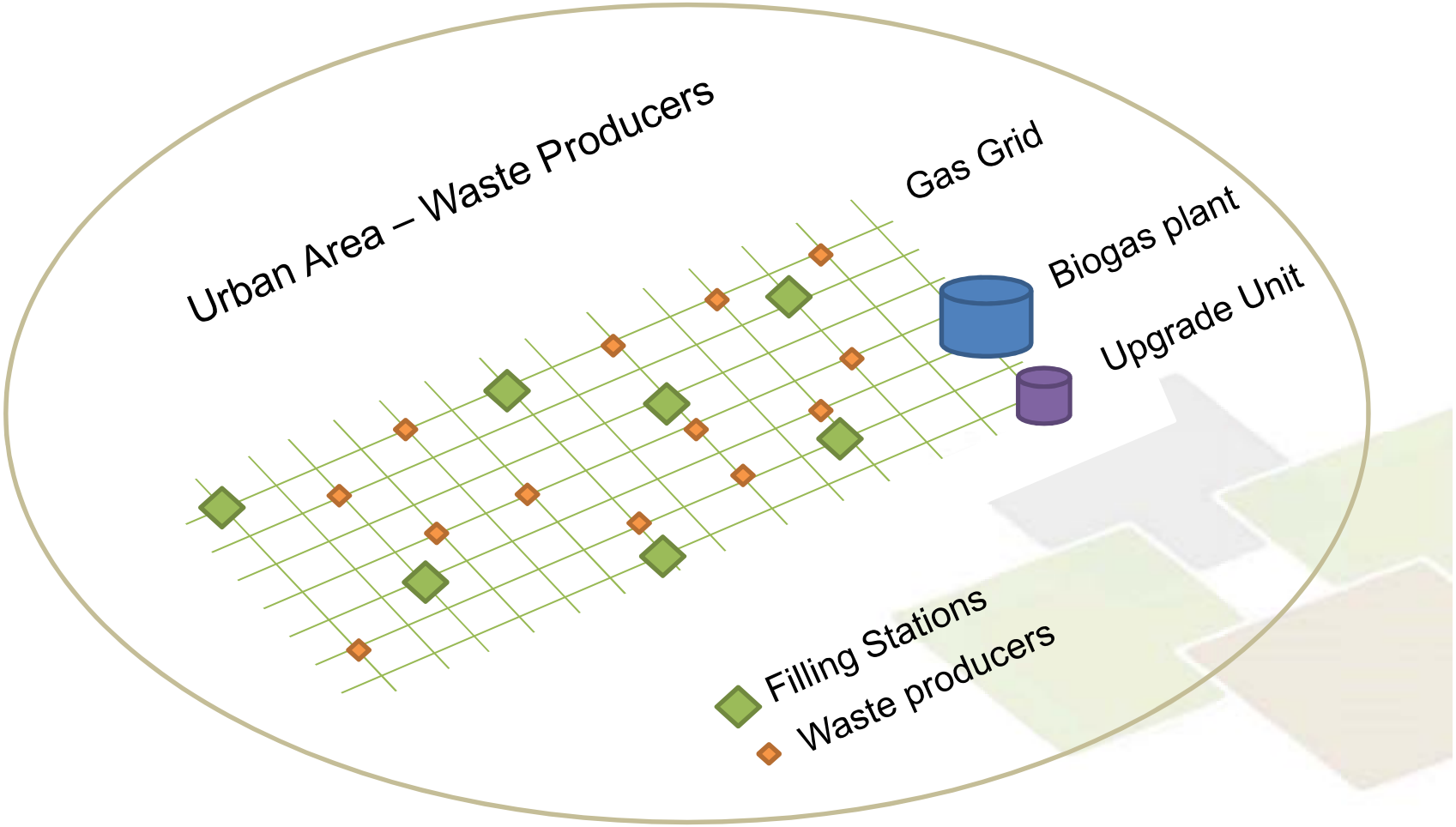
Background

- one-third of the **2020** EU target for renewable energy in transport could be met by using biogas produced from biowaste
- around **2**% of the EU`s overall renewable energy target could be met if all biowaste is turned into energy
- **10**% of renewables in transport fuels (*Directive 2009/28/EC*)
- average distance between refuelling points for CNG or compressed biomethane is approx. **150** km (*Directive 2014/94/EC* on the deployment of alternative fuel infrastructure)

Waste-to-Biofuel value chain



Waste-to-Biofuel value chain



Target Cities

Zagreb (Croatia)

Skopje (FYR Macedonia)

Malaga (Spain)

Paris (France)

Consortium

Coordinator

Zagreb Holding, Croatia

Partners

Faculty of Mechanical Eng. and Naval Architecture, Croatia

Wirtschaft und Infrastruktur, Germany

Gussing Energy Technologies, Austria

JSP SKOPJE, FYR Macedonia

City of Skopje, FYR Macedonia

IAT, Spain

ORDIF, France

Impact

EXPECTED IMPACT

- increase of the renewable energy production through sustainable management of food waste
- determination of energy potential from food and beverage waste
- promote technologies for environmental friendly food waste management and biofuel production

TARGET GROUPS

- governments and citizens of target cities
- food waste producers (industry, catering, households)
- biomethane end-users

Activities and Outcomes

MAIN OBJECTIVE

- **feasibility studies** on sustainable food waste management
- **prefeasibility studies** for biomethane production
- **case studies** on filling stations network

MAIN ACTIVITIES

- implementation of 4 promotional campaigns
- **24 FoodWaste Working group** meetings
- **4 training courses** on food and beverage waste management
- organization of **8 awareness campaigns**

Contact

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PODRUŽNICA ČISTOĆA

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BIO4A

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 789562

Project Acronym: **BIO4A** Project Number: **789562** Call: LCE-20-2016-2017 Topic: Aviation Biofuels

Project title: **Advanced sustainable BIOfuels for Aviation**

Specific Challenge: **Accelerate the deployment of Aviation Biofuels**, enabling **commercial production**. Supporting the accomplishment of **pre-commercial plant(s)** for advanced biofuels for aviation based on **sustainable biomass feedstock**.
Technological approach of the Project: Main goals: **1)** To bring **HEFA to full commercial scale in new plant using residual lipids (UCO)**; **2)** To investigate alternative supply of **sustainable feedstocks recovering EU MED marginal land for drought resistant crop production**; **3)** To **test the entire chain and logistic at industrial scale**, and **assess environmental performances**.

Expected Impact: **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. **Favourable energy and GHG balances expected**. demonstrated industrial concepts should ensure the techno-economic feasibility of the entire value chain. Significant **social and economic** impact.
Contribution of the Project: BIO4A will target through **the production and use of Aviation Biofuels at large-scale industrial scale from UCO**. The **new plant** will be operated for the very first time under this mode. Potential for **sourcing sustainable lipids from EU-MED marginal land** will be investigated.

Highlights (technological/non-technological):
New Aviation Biofuel plant producing HEFA (5 kt)
Production and test of HEFA in commercial flights in non-segregated mode
Test of marginal land in Spain recovered by biochar/compost addition, scenario analysis
Dedicated Dissemination, Communication and Exploitation action

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *[789562]*

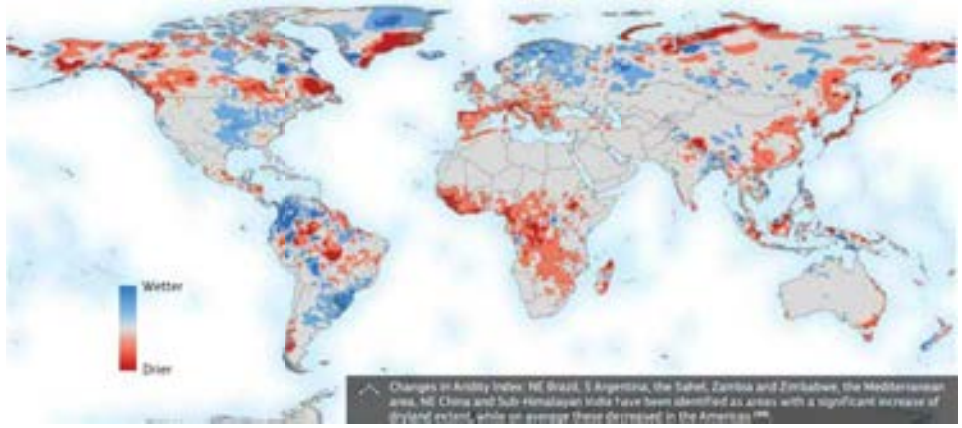
Industrial scale production of Biojet in new plant (WP1-3-4-5)

WP1 – Feedstock supply and large-scale industrial production of biojet [TOTAL]
WP2 – R&D Long-Term Strategy for HEFA production [RE-CORD]
WP3 – Downstream logistics & Use [SkyNRG]
WP4 – Evaluation [CENER]
WP5 – Market scaling strategy [SkyNRG]
WP6 – Management, dissemination and exploitation [RE-CORD]

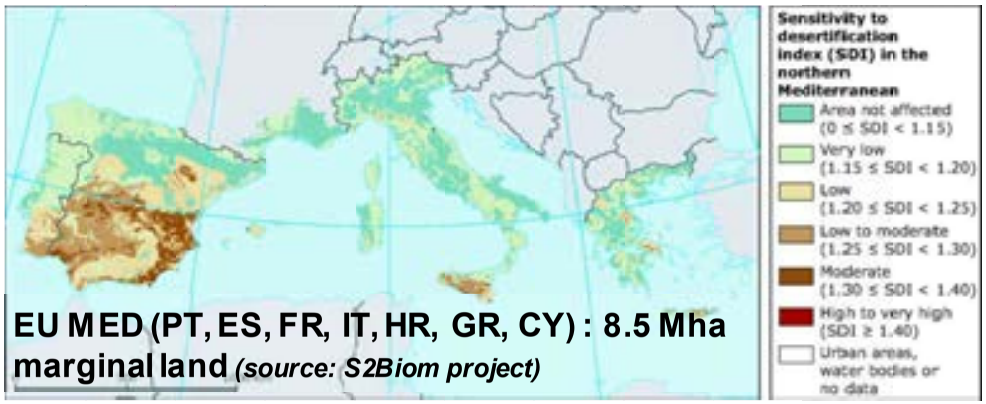
- Almost 8-10 kt UCO will be converted into ~5 kt HEFA (ASTM compliant)
- Axens' technology tested for the very first time at full industrial scale in TOTAL La Mède Biorefinery (FR)
- SkyNRG distributing the Biojet (non-segregated logistics) to commercial flights
- Market study
- Environmental and sustainability assessment
- Wide Dissemination, Communication and Exploitation action

RE·CORD TOTAL SkyNRG CENER etaflorence renewableenergies Camelina Company | España European Commission

Biochar/Combi + Camelina to help to exploit EU MED drylands for VO production. Exp.work & scenario modelling (vs REDII) - WP2



Source: EC-JRC. World Atlas of Desertification, 3rd Edition. Mapping Land Degradation and Sustainable Land Management Opportunities. 2015. http://wad.jrc.ec.europa.eu



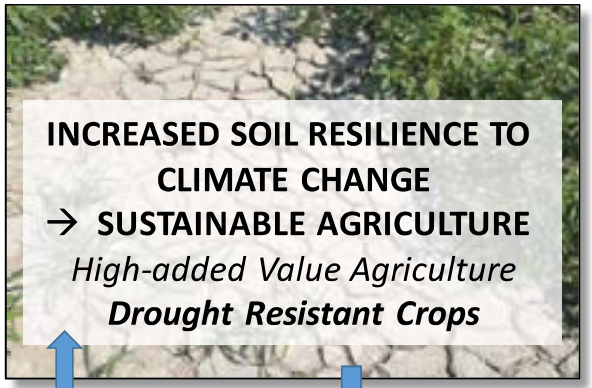
EU MED (PT, ES, FR, IT, HR, GR, CY) : 8.5 Mha marginal land ***(source: S2Biom project)***

Residual biomass (agri-woody)

CARBONIZATION (Innovative Oxidative Slow Pyrolysis System)

Biochar & Compost (COMBI)

ENERGY



CAMELINA oil

Biojet

Bioenergy4Business

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646495

Bioenergy4Business

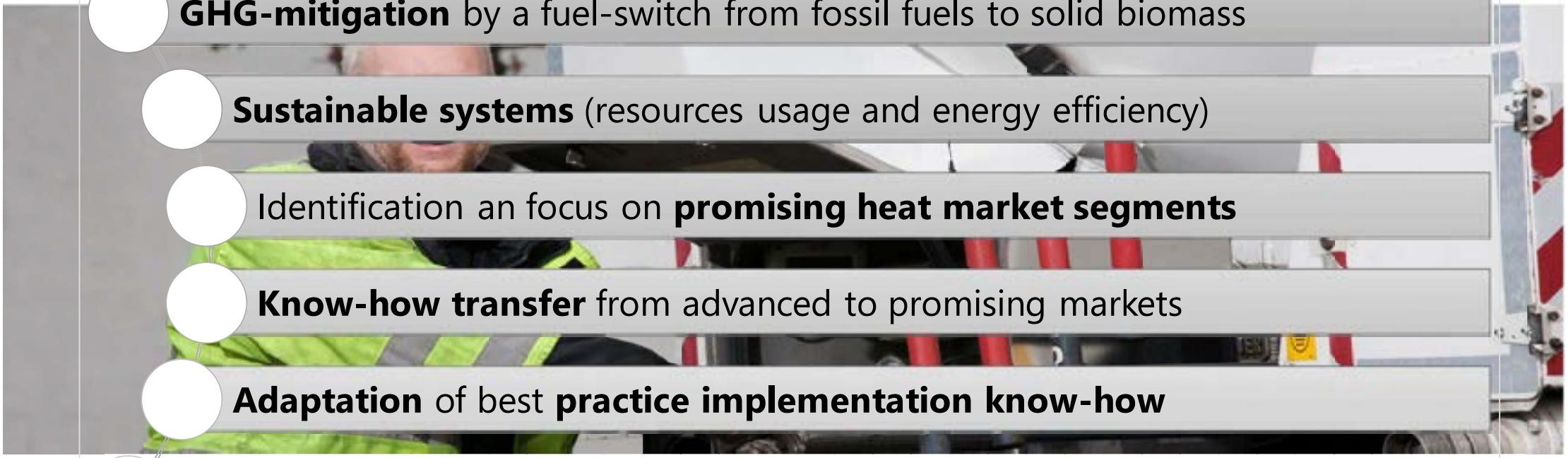
A project for the **uptake of solid biofuels** in **promising European heat market segments**

Coordinated by Herbert Tretter
Austrian Energy Agency

13 project partners

- Finland (MOTIVA)
- Denmark (DTI)
- Belgium (AEBIOM)
- Netherlands (RVO)
- Germany (DBFZ)
- Poland (KAPE)
- Slovakia (SIEA)
- Ukraine (SECB)
- Austria (**AEA**)
- Croatia (EIHP)
- Romania (ARBIO)
- Bulgaria (BGBIOM)
- Greece (CRES)

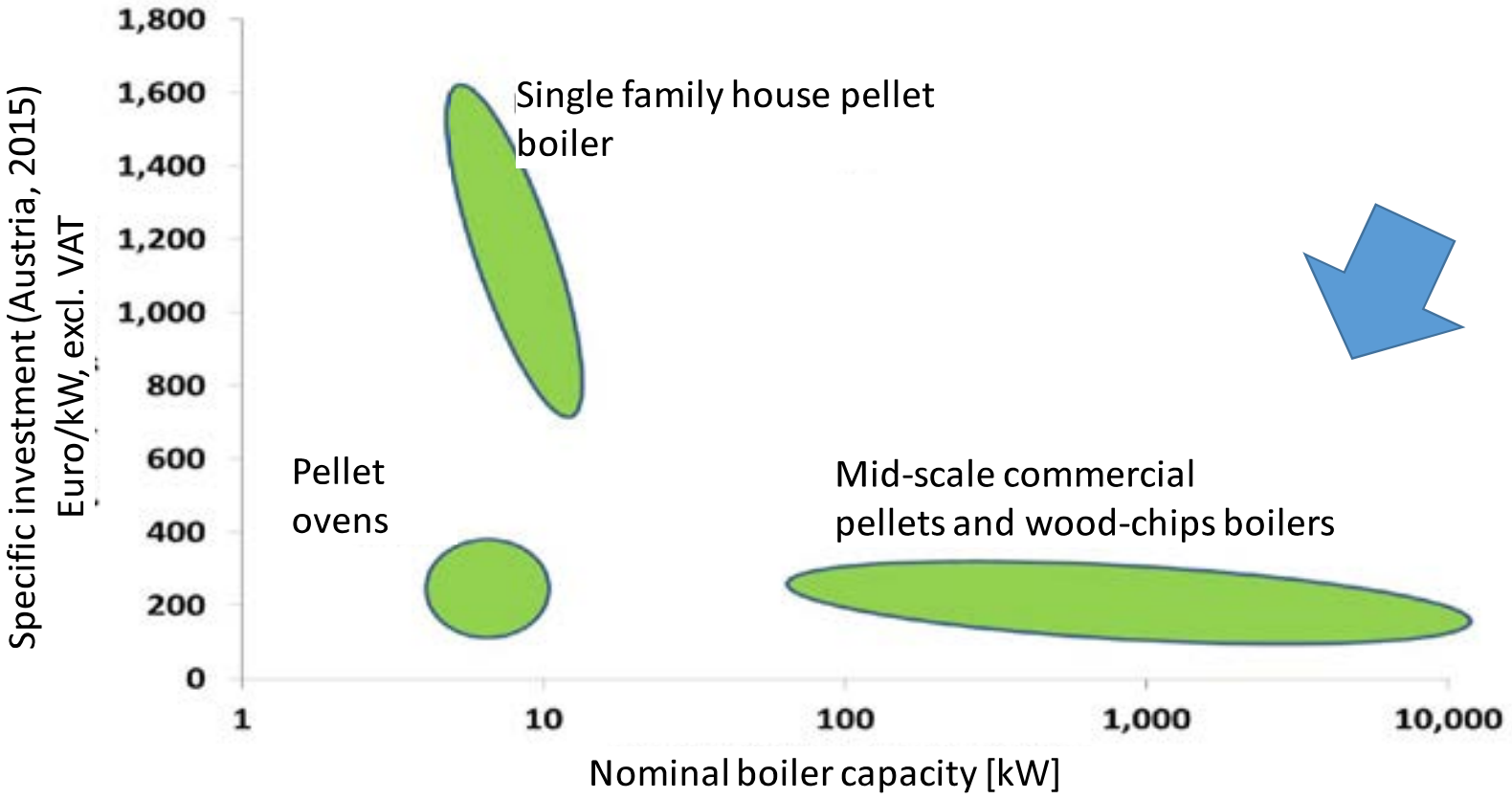
Objectives



- **GHG-mitigation** by a fuel-switch from fossil fuels to solid biomass
- **Sustainable systems** (resources usage and energy efficiency)
- Identification an focus on **promising heat market segments**
- **Know-how transfer** from advanced to promising markets
- **Adaptation** of best **practice implementation know-how**
- **Fostering** supportive **local framework conditions**

Focus on **in-house and district** biomass **heating plants**

Focus on **mid-scale biomass plants**



Scope of the project

- Fuel-switch or greenfield
- **mid-scale** (0.1 to 20 MW nominal power)
- in-house or district heating plants
- **heat-only plants** (no CHP)
- hot water pipe systems (< 130°C flow temp.)

Identified target heat markets

Public buildings

- BG
- HR
- NL
- PL
- SK
- UA

Hotel industry

- AT
- BG
- DE
- EL
- RO
- SK

District heat

- HR
- PL
- RO
- SK
- UA

Agriculture and Forestry

- AT
- EL
- NL
- RO
- UA

Industry

- BG (Wood)
- EL (Wood)
- FI
- HR
- PL

Identified target heat markets

Retirement homes

- DE
- HR
- NL

Large volume residential buildings

- AT
- NL

Swimming Pools

- DE
- NL

Hospitals

- DE

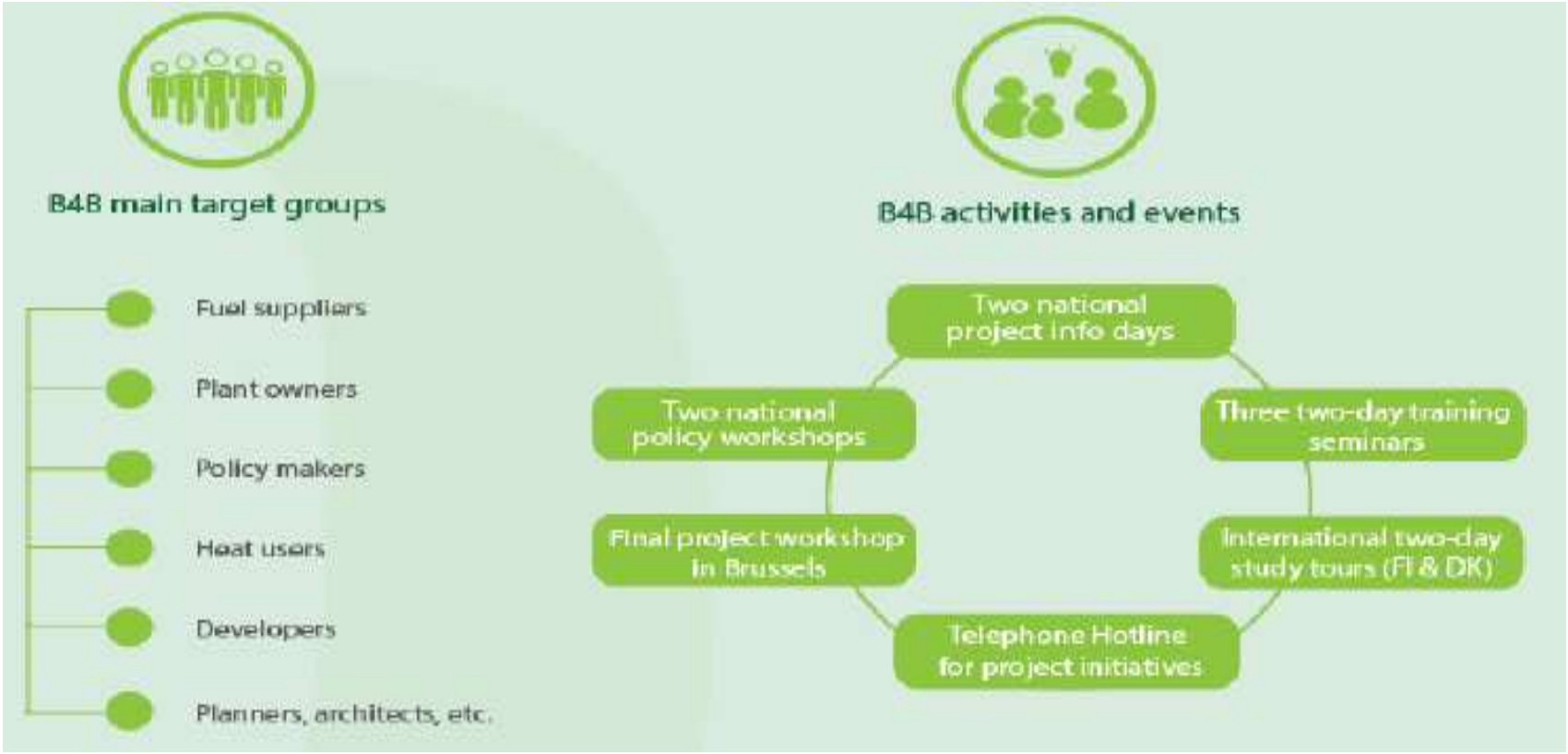
Leisure sector (holiday parks)

- NL

Churches buildings

- AT

Target groups, activities & events



Investors' & market actors' general needs

- **Basic knowledge** about the complex biomass heat system
- **Stable and predictable framework** conditions
- Sufficient, **well-trained professionals** for
  - Planning & designing (technology selection & dimensioning)
  - Implementation
  - Operational phase
- **Incentives** to overcome high up-front costs
- **Affordable and reliable supply** of **sustainable biomass**
- Service and maintenance **infrastructure** in the region
- **One-stop-shop** for quick plant **authorization**

General barriers for biomass heat

- **High up-front investment** vs. amortization (prices)
- **Reluctance** towards a new, complex subject matter
- **Many partners** to coordinate (fuel, authority, M&R)
- **Unawareness** of technical maturity, fuel availability
- **Unfamiliarity** with branch-own BP examples, with own benefits, with service providers & incentives
- **Planning errors** (neg. profitability, training of prof.)
- **Ko-criteria**: no transport access, no permission

Barriers & Solutions related to "Built Environment"

- **"Up-front" vs. "Life-cycle" cost** decision-making?
  - Owner / tenant dilemma (adequate legislation needed)
- "**Lock-in** effect": proven, simple solutions preferred
- **Cost pressure** for architects/developers (planning)
- **Heat supply safety** (no malfunctions, planning issue)
  - Training of professionals
- Centralized structures vs. **M&R** in the region?
- **Sensitive issues** (noise, smoke, dust, transport)
  - For cities rather district than in-house biomass systems

Barriers & Solutions related to "Hotel Industry"

- Energy costs "only" ~**5% of the annual turnover**
- Primary **investments into** "visible" **guests' benefits**
  - Marketing of the regions' attractions, regional food & energy etc.
- Difficult **financing situation** for energy equipment
  - Energy savings and plant contracting, guarantee bank
- **Lack of trust** (unfamiliar topic, service life?; BP examples)
- **Entry barrier** (installer of trust is long-term partner)
  - PPP model (Authority + Hotelier + Installer + Contractor)
- **Heat supply safety** (guests ratings in social media)
- **Sensitive issues** (noise, transport, dust, smoke)

Possible Solution to sensitive issues

- „Turnkey-ready“ biomass heating container systems

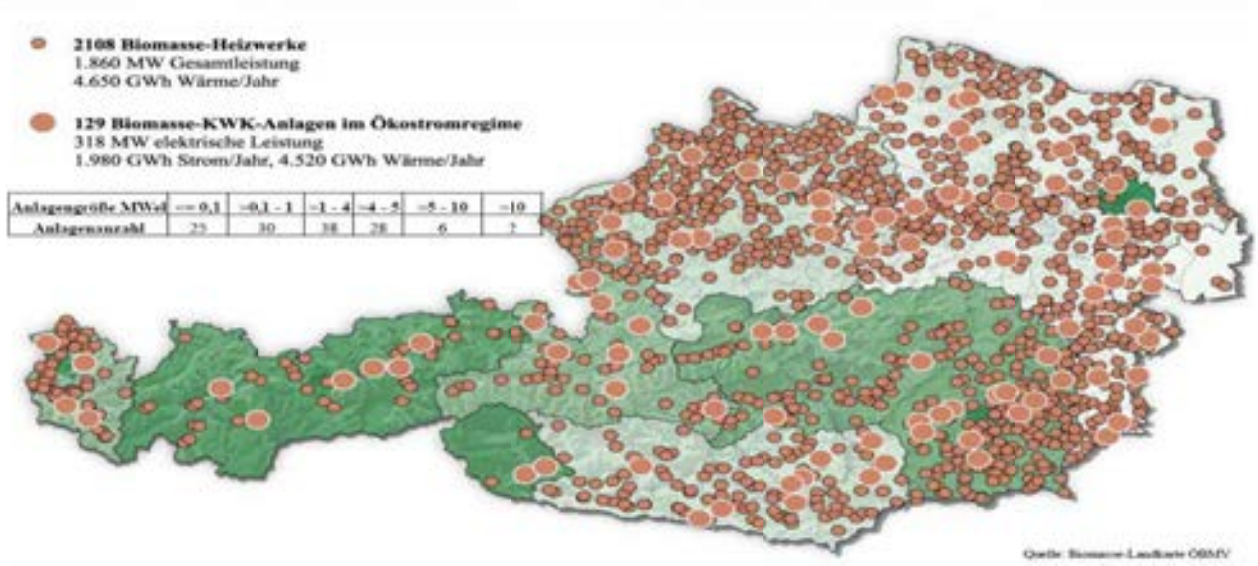
Source: EVN Wärme GmbH

AUSTRIAN SUPPORT PROCESS FOR DISTRICT HEATING

- Professionalisation of planning and operation
- Lifetime of the plant is the focus
- Already standard in middle size towns in rural areas
- Strong quality management makes them profitable

Learning from previous mistakes

- The heat demand of the consumers was over estimated
- Overestimated reserve capacity stored in the heating plant
- The pipeline grid system was over dimensioned
- Size of the fuel silo was bigger than required
- Low utilisation ratio of the wood boiler
- Fuel quality does not meet the quality requirements for the installed firing
- Faults in the hydraulic and in the control system lead to high operational costs



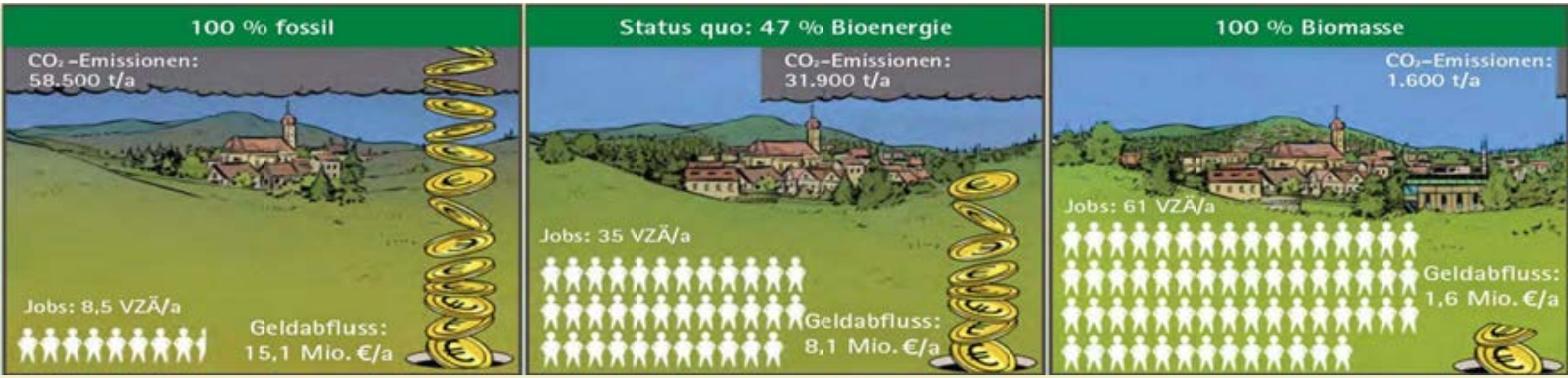
QUALITY MANAGEMENT AS SUCCESS FACTOR FOR EFFICIENT DISTRICT HEATING

EUROPÄISCHER RECHNUNGSHOF

„Ein Beispiel für empfehlenswerte Verfahren wurde jedoch in Österreich vorgefunden. Dank eines Qualitätsmanagement- instruments für Biomasse-Heizkraftwerke konnten in diesem Mitgliedstaat geeignete Vorkehrungen für die Überwachung getroffen werden .“
http://www.europarl.europa.eu/meetdocs/2014_2019/documents/cont/dv/sr14_06_/sr14_06_de.pdf

REGIONAL EFFECTS OF RENEWABLE ENERGY
STUDY HARTBERG (STYRIA)

- **Region with 12.600 inhabitants**



Wood fuel parameters conversion tool

Purpose of the tool

- **Knowledge of** the **energy content** is **important** in wood fuel trade
- Austrian Energy Agency has compiled an **easy-to-use** wood fuel parameters tool
- With only a **few required variables** one can converse **prices per volume or weight** unit **to energy prices**
  - Calculations in line with ISO 17225-1 to 5

Download for free

- Tool (10 languages) & Manual (English only)
- http://www.bioenergy4business.eu/services/fuel_parameters_tool/

TOOL FOR THE CALCULATION OF WOOD FUEL PARAMETERS

Due to a rising demand in wood fuel, the knowledge of the energy content of customary wood fuel assortments has been gaining in importance in wood fuel trade. In order **to facilitate the conversion** from prices per volume or weight unit commonly used in forestry and the timber industry to energy prices relevant in the context of energy production, the Austrian Energy Agency has compiled **an easy-to-use calculation tool**. With only a few required variables the program can quickly calculate the most important parameters for a variety of wood fuel assortments.

DOWNLOAD THE TOOL (V. 1.9)

- System requirements: Excel 2010/2013; enable macros

Bioheat Profitability Assessment Tool

Purpose of the tool

- **Comparison** of the **economic efficiency**
- of **mid-scale** (0.1 to 20 MW nominal power)
- **solid biomass and fossil fuel** fired
- **heat-only plants** (no CHP)
- For pre-feasibility level assessment

Scope of the tool

- Fuel-switch or greenfield
- in-house or district heating plants
- **hot water systems** (< 130°C flow temp.)
- fired with **gas, oil** or **coal**
- Compared to operation with
- **Wood-chips, pellets** or **straw**

Features of the Excel-based tool

- Comprehensive **integrated manual** (10 languages)
- **System dimensioning aid**
- 2015-based **reference investment values**
- - for all components of fossil/biomass systems
- - for sizes/fuels applicable in 12 selected countries

Methodology

- A selected fossil fuelled reference
- and a qualitatively equal biomass heating system
- are assessed Excel-based
- by a **discounted Cash-flow analysis**
- with a calculatory **service-life of 25 years**
- (tool applies VDI Guideline 2067 payment categories)

Results of the tool

- For both, the **biomass & fossil fuelled system**
  - **Dynamic Payback Time** (based on discounted values)
  - **Net Present Value** (NPV, t=25 yrs.)
  - **Internal Rate of Return** (IRR, t=25 yrs.)
  - **Calculatory Heat Generation Costs** [EUR/MWh]

Attention

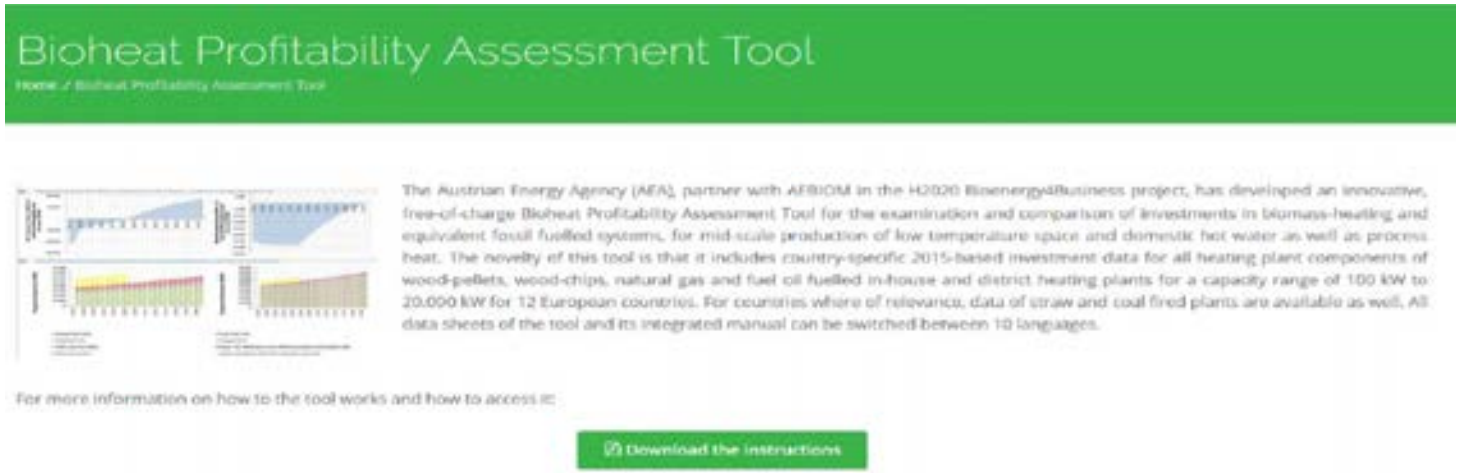
- **No investment decision based on application of reference investment values only**
- **In-depth heat demand survey**
  - essential for plant sizing at optimal cost
  - has a strong impact on the economic feasibility
- **Tool does not replace**
  - site specific **planning by professionals**
  - **collecting several offers from companies**
- Comparison of professional offers is best tool usage

7 Calculations' + 1 Manual + 2 Data Sheets

1. General
2. Technical
3. Investment
4. Receipts
5. Runningcost
6. Economic
7. Results

Download for free (after registration)

- Tool_v67 + User Instructions + Two pre-feasibility studies
- http://www.bioenergy4business.eu/bioheat-profitability-assessment-tool/



- System requirements: Excel 2010/2013
- Enable macros, activate Add-in “Solver”

Cross-country bioheat cost comparison

Assumptions 1/2

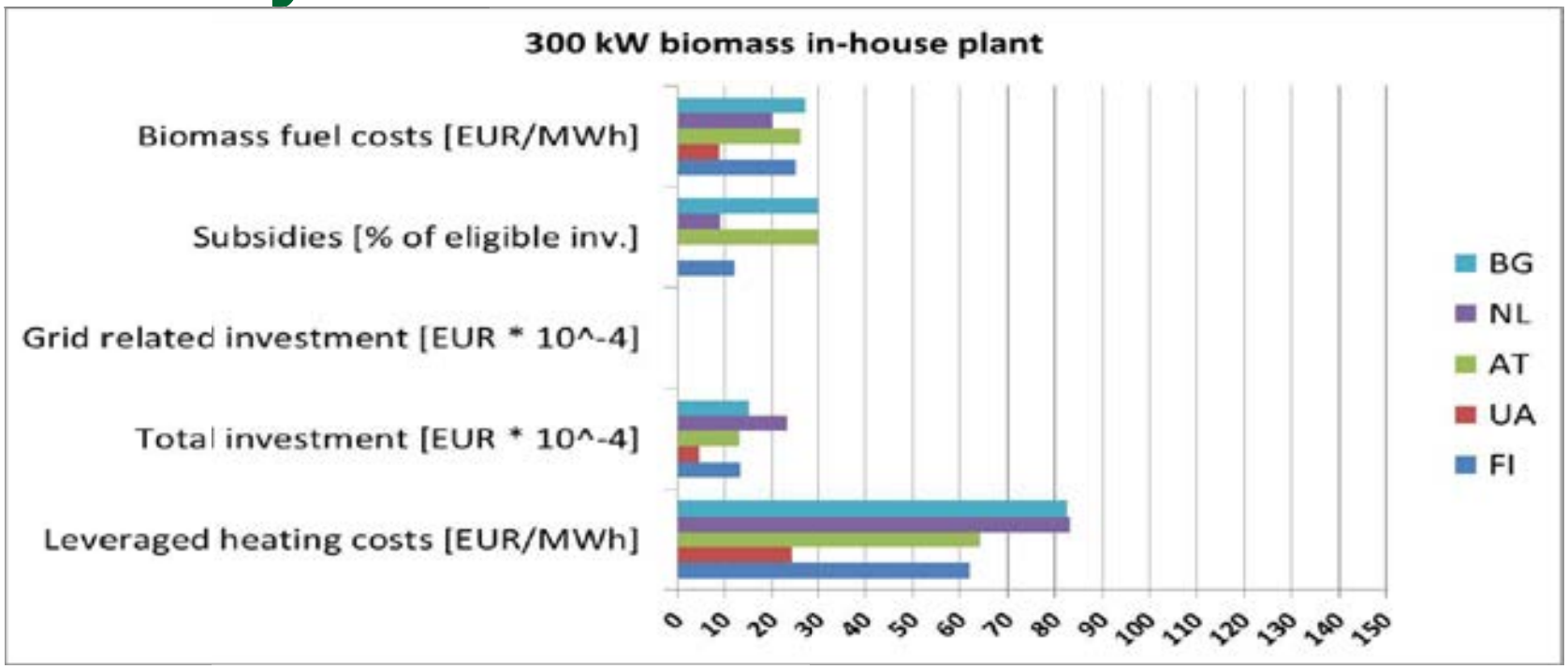
Bioheat costs of 3 model wood-chip fired systems

- **in-house system** (300 kW nominal heat load at boiler(s) outlet)
  - 1500 full load hours in AT, climate-corrected in other states
- **micro grid plant** (300 kW peak heat load at boiler(s) outlet with 250 m grid trass)
  - 1700 full load hours in AT, climate-corrected in other states
- **district heating plant** (1000 kW peak heat load at boiler(s) outlet with 1000 m grid trass)
  - 2000 full load hours in AT, climate-corrected in other states

Assumptions 2/2

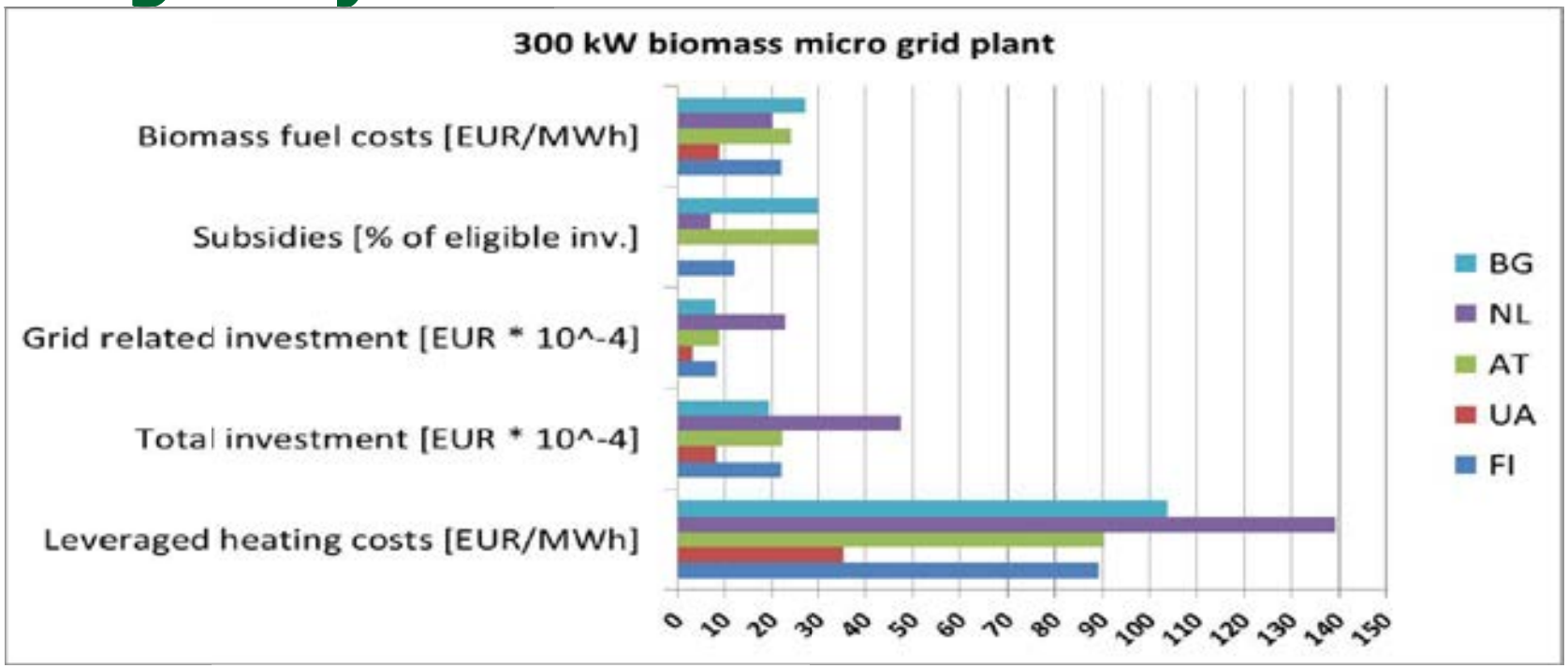
- **Basically same technical features** for all 3 model cases **but climate-corrected full-load hours** for amount of heat delivery in selected countries
- **Assessment** with B4B Profitability Tool
- **Data** of sample of partner countries
  - **Investments** (heating house + equipment, grid, etc.)
  - **Running costs** (fuel, labour, M&R, etc.)
  - **Financing costs**
  - **Subsidies** were considered, where applicable

Results model wood-chips in-house system



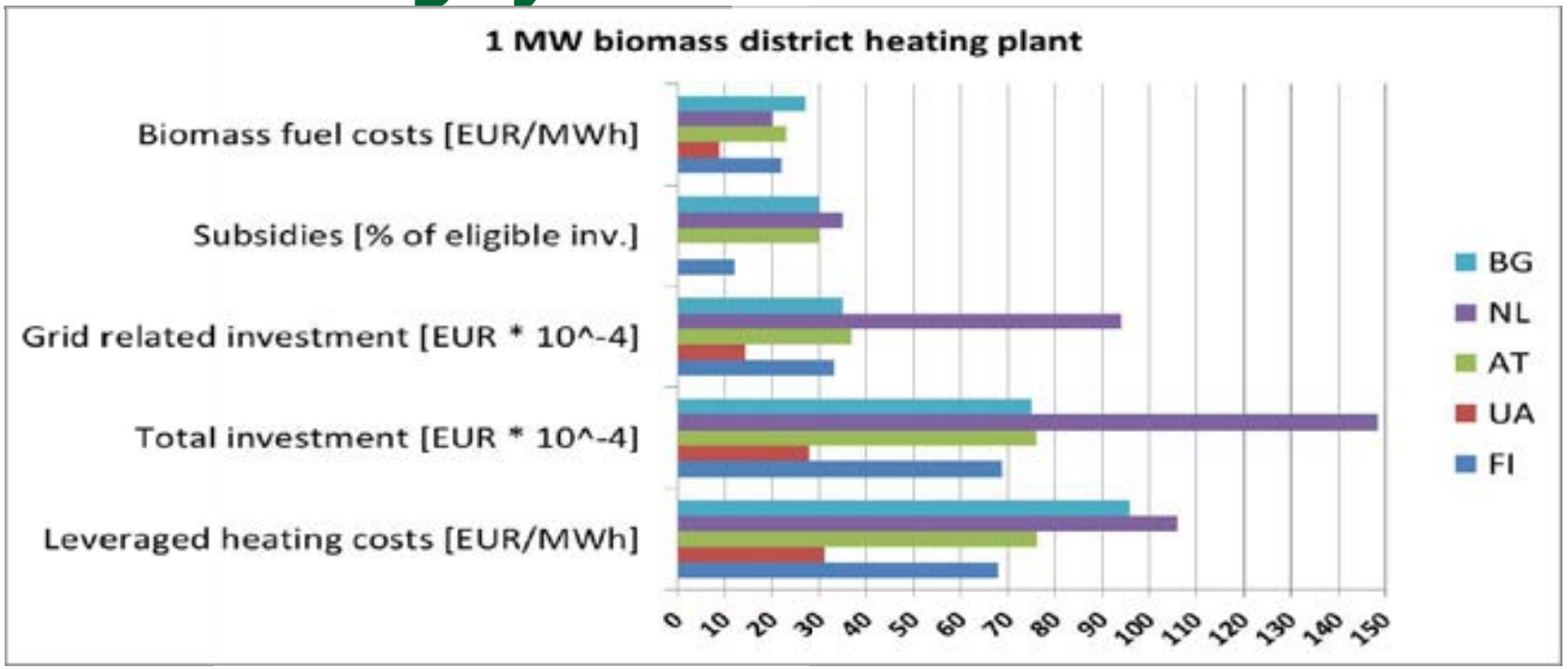
- NL : investment subsidies are equivalent to cash value of heat tariff revenues

Results model wood-chips micro grid system



- NL : investment subsidies are equivalent to cash value of heat tariff revenues

Results model wood-chips district heating system



- NL : investment subsidies are equivalent to cash value of heat tariff revenues

Project Acronym: **Bioenergy4Business** Project Number: **646495** Call: LCE-2014-3 Topic: CSA

Project title: **Uptake of Solid Bioenergy in European Commercial Sectors (Industry, Trade, Agricultural and Service Sectors) – Bioenergy for Business**

Specific Challenge: Market uptake of existing and emerging sustainable bioenergy

Technological approach of the Project: In the EU-28 heating (and cooling) accounts for 45% of final energy consumption. Switching from fossil fuels to renewable energy is essential for decarbonisation of energy sector. The project focused on well-established and proven technology and hence did not bring specific innovation or new products to the market. The objective of the project was to increase the use of bioenergy in the heating sector and therefore it addressed the issues related to promotion of sustainable energy use, climate change and environment protection.

Expected Impact: "Increasing the share of sustainable bioenergy in final energy consumption. … Development of better policy, market support and financial frameworks, notably at national, regional and local level."

Contribution of the Project: Out of 17 performed pre-feasibility studies, one project is already being implemented, whereas another 8 are scheduled to commence in the next 2 years. If implemented, the projects would lead to savings of 961 t CO2e and substitute the use of 3.2 GWh derived from fossil fuels.

Highlights (technological/non-technological): The objective of the project was to increase the use of solid biomass sources in the commercial heating sector. The technology manufacturers (e.g. boiler producers) ~~are mostly SMEs that are currently facing a strong competition with other technologies (e.g. heat pumps)~~ on the market. The project directly targeted the heat sector and identified new markets for boiler producers. A lot of interest by SMEs was raised by the project activities and results.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *646495*

BioEnergyTrain

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 656760

BioEnergyTrain

European cooperation for higher education

Period: 48 months, 2015 – 2019
Funding: 3.7 Mio EUR (H2020-LCE-2014-2)
Coordinator: Brigitte Hasewend, ***eseia***
Partners: 15 Partners from 6 EU Countries
(Austria, Germany, Netherlands, Portugal, Romania and Slovenia).

Objective

Set and scale up **two European Masters Programmes for Biorefinery Engineers** integrating **professional education formats** in **cooperation with industrial and regional players.**

- **Biorefinery Engineer (BRE)** at Graz University of Technology, Austria.
  The Programme started in October 2017.
- **Bioresource Value Chain Manager (BVM)** at the University of Twente, Netherlands.
  The Programme will start in Autumn 2018.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°656760

BET Results

BioEnergyTrain has developed and implemented multiple cooperative educational formats to become role-models for practice-oriented education. These include:

1. **2 Master Curricula (BRE and BVM)**
   - **Biorefinery Engineer (BRE): Modular Structure**
   - **Bioresource Value Chain Manager (BVM): Modular Structure**
2. **20 BET Courses**

   For more information, please contact: office@eseia.eu
3. **Professional Educational Formats** (Interdisciplinary Student Camp, International Summer School, Pilot Plant Course, Design Case Work, Internship, Master thesis) implemented under the eseia Education and Training Programme:
   1. International Summer School, venue LNEG Amadora, Portugal (9 – 21 July 2018)
   2. Pilot Plant Course, venue BAV Engelskirchen, Germany (17 – 19 October 2018)

BET Buying-In Opportunity

As layed out in the BET-Buying In Strategy, the Consortium will target 5 types of stakeholders that could adopt the cooperative educational formats and training materials:

1. Industry
2. Higher Education Institutions & Research Organisations
3. Vocational Training Providers
4. Regional Authorities
5. Regional and Business Networks on Bioenergy

Project Acronym: **BET** Project Number: **656760** Call: H2020-LCE-2014-2 Topic: LCE-20-2014

Project title: **BioEnergyTrain**

Specific Challenge: Consumer's and other actor's awareness, attitudes, risk perception, consumption behaviour and investment decisions have a strong influence on the development of our energy system and are a crucial factor in the dissemination of energy relevant technologies, but are on the other hand shaped by the social environment.
Technological approach of the Project: BET will develop the capacities to deliver all teaching materials and media contents via MOOC, which will allow for reusability and maintenance of materials on the open platform. In doing so, HEIs outside the consortium will be able to use them to improve their curricula, and businesses to improve the qualification of their workforce. The quality of the online teaching environments will be reviewed internally (PMC and EAB) and will undergo a joint certification process.

Expected Impact: Explore the factors triggering the behaviour of the different stakeholders, including consumers, policy makers, industrial strategists, regulators, technology developers, investors, etc.. Develop appropriate means to facilitate and actively stimulate the public engagement in transforming our energy system and to foster the dialogue with the public on this matter.
Contribution of the Project: BET addresses the lack of a qualified personnel, a lack of cohesion and integration among stakeholders, and poor linkage between professional training and industry needs by creating new post-graduate level curricula in key bioenergy disciplines, and a network of stakeholders encompassing the whole value chain of bioenergy.

Highlights (technological/non-technological):BET focuses on four core activities: education and curriculum development at post-graduate level and vocational training; engagement with industry through industry placements/ exchanges, and internships; engagement with regional stakeholders and EU decision bodies; engagement with standards and curricula organisations.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *[656760]*

Biofficiency

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727616

The BIOFFICIENCY project

Objectives

Develop next generation, biomass-fired CHP plant with **elevated steam temperatures up to 600°C** at medium to large scale (10 to 200 MW_{th}).

Increase efficiency of CHP plants by elevated steam temperatures through solving and understanding of ash-related problems – slagging, fouling and corrosion.

Reduce emissions – i.e. CO2, particulates, CO, NOx, and SO2 – by efficiency gain, reduction of impurities and by intelligent plant design.

Widen the feedstocks for pulverised fuel (PF) and fluidised bed (FB) power plants using pre-treatment methods with focus on the reduction of harmful, inorganic elements

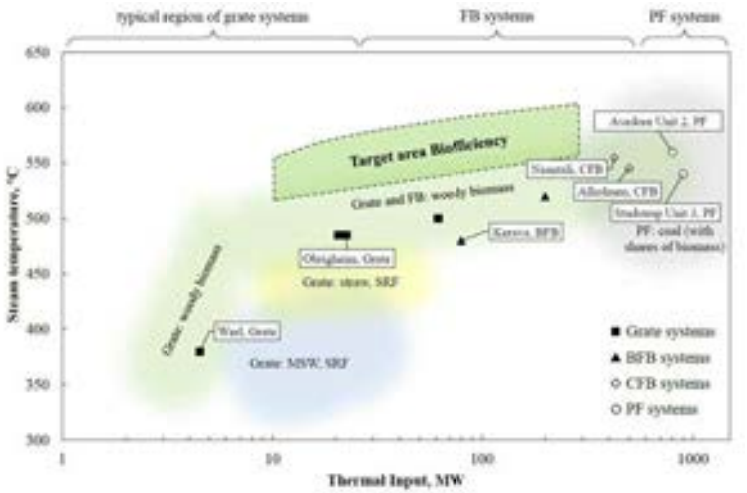
Prevent power plant damage due to high-temperature chlorine-induced corrosion by improved understanding from experimental and modelling work of ash formation and deposition and the intelligent selection of additives.

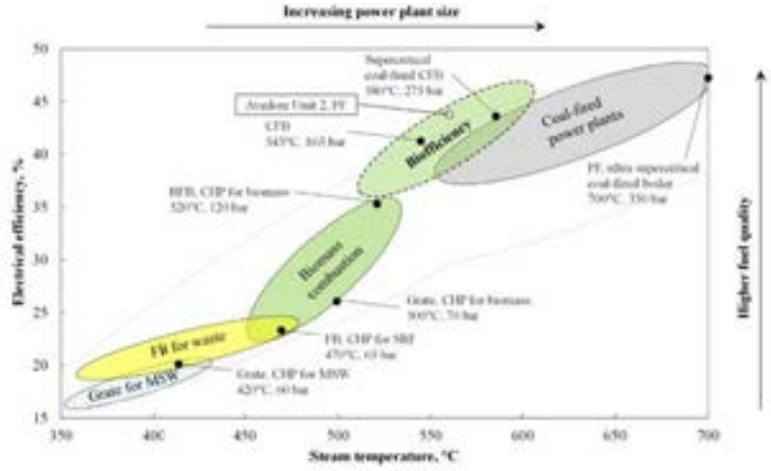
Reduce costs due to increased efficiency, lowered emissions and fuel consumption, decreased number of outages and maintenance due to ash-related problems.

Optimise biomass blending (e.g. wood & sewage sludge) in order to reduce slagging, fouling and corrosion propensities

Develop better furnace materials by studying superheater alloys in long-term tests in full-scale plants with focus on corrosion attack by chlorine compounds in the ash.

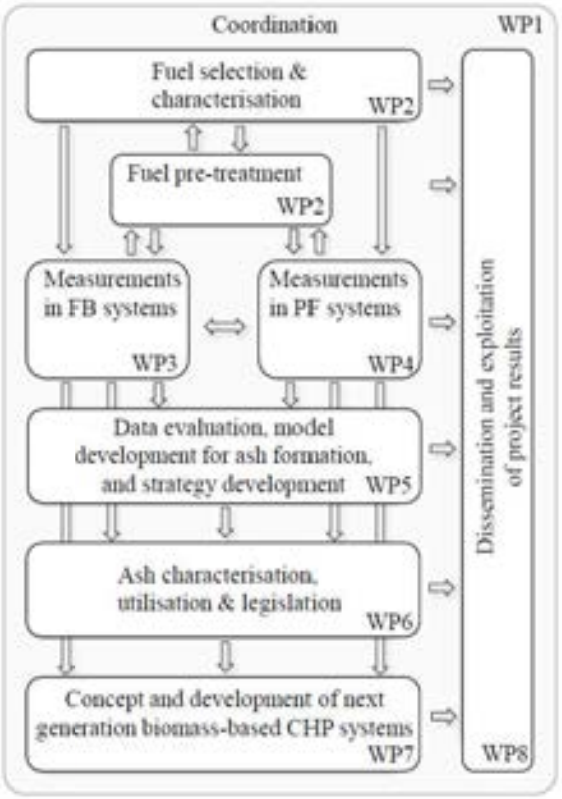
Widen ash utilisation and nutrient recirculation, by detailed ash analysis in terms of chemistry and physical properties.

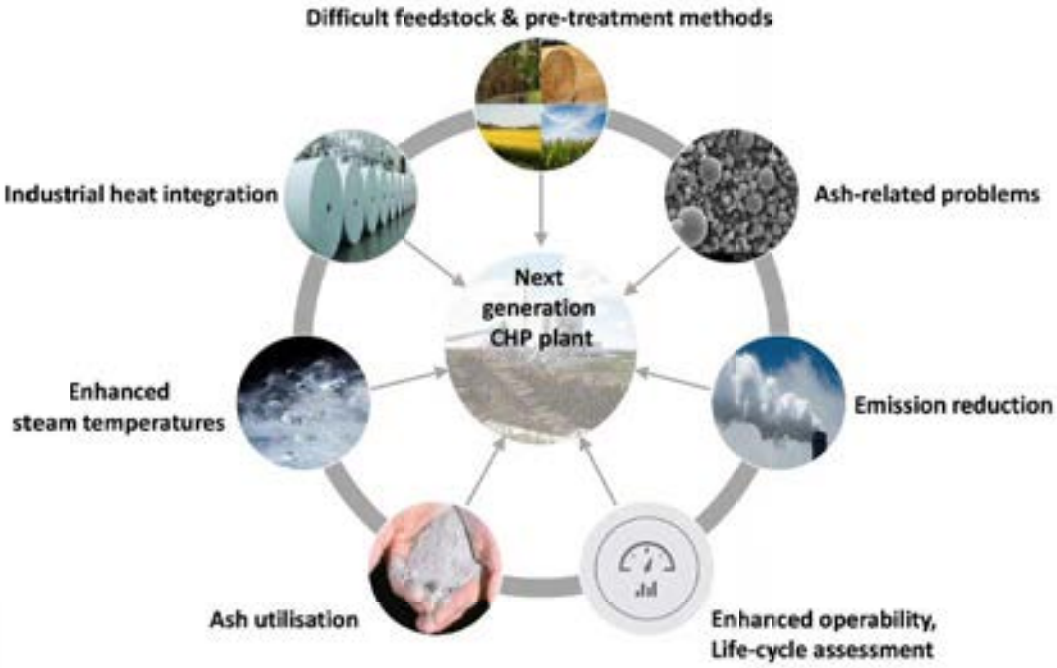




The BIOFFICIENCY project

Objectives





Project Acronym: Biofficiency Project Number: 727616 Call: H2020-LCE-2016-2017
Topic: LCE-07-2016-2017 Project title: Highly-efficient biomass CHP plants by handling ash-related problems

Specific Challenge: Development of highly-efficient, low-emission medium- and large-scale biomass-based CHP systems. CHP has a high potential for heat and electricity production in particular for decentralised applications. However, the challenge is to increase both technology performance and resource efficiency, while reducing environmental impacts. Cost effective, robust and low emission (both CO_2 NOx and particles) medium and large-scale industrial CHP (>1MW) with high thermal and electrical efficiency and increased high-temperature heat potential up to 600°C need to be developed allowing the use of a wider base of solid, liquid or gaseous sustainable biomass and recovered feedstock. Ash use or removal, as well as ash challenges during combustion, requires particular attention. A significant step forward in the technology efficiency together with a reduction in resource consumption and reduced emissions is needed, to deliver reduced costs, both operation and maintenance, and increased attractiveness of renewable heating.

Technological approach of the Project:

- Experimental investigation (emissions, deposit formation, fly ash formation etc.) of combustion of pre-treated biomass materials in FB and PF systems at different scales
- Investigation of pre-treatment technologies of different biomass materials with subsequent ash utilization options
- Life-cycle assessment and evaluation of design of next generation CHP power plant by state-of-the-art modelling tools

Expected Impact: Reduce the technological risks for the next development stages; Significantly increased technology performance; Reducing life-cycle environmental impact; Nurturing the development of the industrial capacity to produce components and systems and opening of new opportunities; Contributing to the strengthening the European industrial technology base, thereby creating growth and jobs in Europe; Reducing renewable energy technologies installation time and cost and/or operational costs, hence easing the deployment of renewable energy sources within the energy mix; Increasing the reliability and lifetime while decreasing operation and maintenance costs, hence creating new business opportunities; Contributing to solving the global climate and energy challenges.

Contribution of the Project:

- Increased power plant efficiency & availability leading to increased technology performance and reduced operation and maintenance costs
- Mobilization of un-used biomass and commercialization of pre-treatment technologies leading significant growth of the bio-energy sector

Highlights (technological/non-technological):

- Holistic understanding of ash-related problems during biomass combustion
- Bring biomass pre-treatment technologies (torrefaction, steam explosion, hydrothermal carbonization) to commercial stage
- Improve ash utilization from biomass combustion and development of new utilization pathways
- Design of the next generation biomass fired CHP plant with increased efficiency & availability, reduced emissions and optimized resource utilization
- Lifecycle assessment along the whole value chain of bioenergy generation by combustion in order to assure sustainability

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727616

BiogasAction

Project presentation

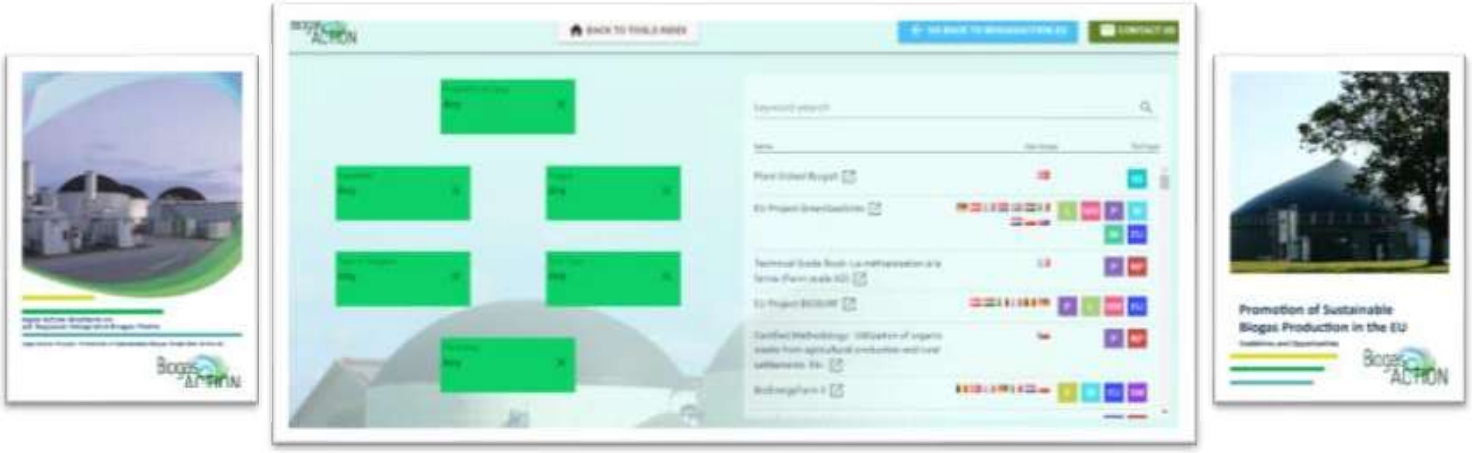
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691755

Biogas ACTION

- Removing non-technical barriers - Creating better frameworks
- Promoting biogas and biomethane production in line with EU 2020 targets

Tools and guidelines for developing the biogas sector

Identify and disseminate proven support strategies and guidelines in order to fulfil the biogas and biomethane development potentials in Europe



Intervention in target regions

Replication and dissemination

Deliverables:

- **Tools compilation** for regional biogas deployment
- **Data bank**: incentives and subsequent development of biogas plants compared to national targets
- **Brochure**: best regionally integrated biogas plants
- **Brochure**: biogas promotion
- **Toolboxes**: best-fitting tools available & optimal biogas project set-up

www.BiogasAction.eu

#BiogasAction

Tools and guidelines for biogas sector development

Intervention in target regions

Auvergne Rhône-Alpes and Bretagne of France, Wales/UK, Croatia, Czech Republic, Netherlands, Denmark, Latvia and South East Sweden

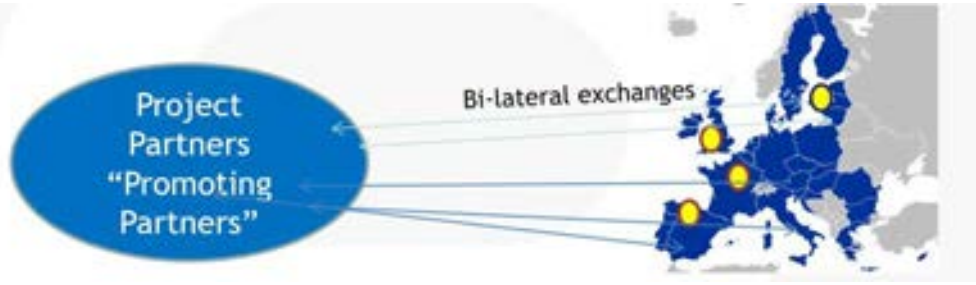
Define and implement a specific biogas/biomethane **intervention strategy in each target country/region** aiming to boost the biogas development in the intervention regions/countries

- Institutional-building of the key stakeholders
- Strengthening the biogas sector framework
- Optimising business models and financing of biogas projects
- Optimising biogas production
- Assistance on specific high quality biogas project development

Replication and dissemination

Replicate project partners' experience to other project developers **outside the Biogas Action consortium**

"Developing partners" outside the consortium chosen through open call and pairs agreed with PPs



Project Acronym: **Biogas Action** Project Number: 691755 Call: **LCE-14-2015**
Topic: **Market uptake of existing and emerging sustainable bioenergy**
Project title: **Promotion of sustainable biogas production in EU**

Specific Challenge: To foster the development of the European bioenergy sector and to ensure its sustainability. Removing non-technical barriers to widespread production and use of biogas/biomethane from manure and other wastes.

Technological approach of the Project: Biogas Action offers a consistent approach on how EU regions can become drivers in paving way for sustainable use of biogas. This includes efforts to find the appropriate technology solutions to make optimal use of the local resources.

Expected Impact: Increasing the share of sustainable bioenergy in the final energy consumption. Development of better policy, market support and financial frameworks, notably at national, regional and local level.

Contribution of the Project: Compilation of guidelines and tools for biogas sector development alongside proactive intervention in the project's nine target regions. This is accompanied by replication efforts in further regions and promotion of sustainable biogas solutions at European scale.

Highlights (technological/non-technological): Compilation of reports and tools for regional biogas deployment processed into an interactive database of tools (Toolbox) **http://tool.biogasaction.eu** Brochure of Europe's 10 most interesting projects. Case studies and other materials of the project's intervention in nine target regions.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691755.

Bio-HyPP

Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641073

Bio-HyPP

Biogas-fired Combined Hybrid Heat and Power Plant

Project Acronym: Bio-HyPP Project Number: 641073 Call: Horizon 2020 Topic: LCE-02-2014

Project title: Biogas-fired Combined Hybrid Heat and Power Plant

Specific Challenge:
Renewable electricity and heating/cooling:
2. Improving efficiency of biomass CHP systems while widening the feedstock base – Micro and small-scale CHP (0.5-250 kW and 0.25-1 MW input power respectively) have a high potential for heat and electricity production for decentralized applications. 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 biogas/biomethane.

Expected Impact:
- Significantly increased technology performance
- Nurturing the development of the industrial capacity to produce components and systems and opening of new opportunities
- Strengthening the European industrial technology base, thereby creating growth and jobs in Europe

Contribution of the Project:
The goal of the project is to realize the Hybrid Power Plant concept, a combination of a micro gas turbine (MGT) and a solid oxide fuel cell (SOFC) as a reliable, cost-effective and fuel-flexible micro combined heat and power (CHP) system fed by biogas blended with natural gas. Realizing this concept will validate the outstanding potential of the hybrid plant concept as an efficient and energy-sustainable source of heat and electrical power. Technology shall be moved beyond the state of the art to TRL 4.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *641073*

Project Acronym: Bio-HyPP Project Number: 641073 Call: Horizon 2020 Topic: LCE-02-2014

Project title: Biogas-fired Combined Hybrid Heat and Power Plant

Highlights (technological/non-technological):

The aim is to develop a technology demonstration plant to prove the functional capability of the Hybrid Power Plant with respect to fuel flexibility using biogas as well as to optimise the subcomponents to achieve high system efficiency. Emulation plants are used for characterization of the subcomponents and also to develop a suitable control system - taking into account both, the necessary SOFC and the MGT system specifications.

Achievements until Month 30 (Nov 2017):

- A market analysis has been carried out and business models have been evaluated
- Thermodynamic simulation models have been set-up and used to define specifications for the main components
- Components have been designed. A combined off-gas/biogas/natural gas combustor has been developed and tested on an atmospheric test rig. Turbine, compressor and electrical drive of the MGT engine have been optimized and tested in the real MGT
- Several test rigs have been developed, set up and used for selection of a top-efficiency layout and a top-economic layout and the suitable components (a turbocharger test rig, recuperator test rig, hybrid power plant emulation test rigs, MGT engine test rig)
- Existing emulation facilities have been upgraded and used for experiments to define control and to investigate surge avoidance
- Two emulation test rigs (SOFC test rig and MGT test rig) – each emulating the counterpart – have been set-up in the lab including all the components, piping, control system, instrumentation and safety concept.

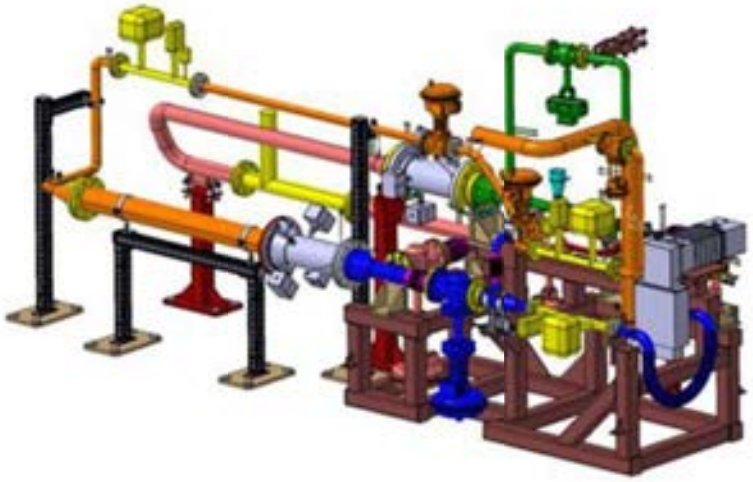
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *641073*

Project Acronym: Bio-HyPP Project Number: 641073 Call: Horizon 2020 Topic: LCE-02-2014

Project title: Biogas-fired Combined Hybrid Heat and Power Plant

Combined combustion system for hybrid system integration – component

Totally assembled stator of the high-speed generator, including the cooling sleeve



CAD model of the MGT hybrid test rig

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *641073*

Project Acronym: Bio-HyPP Project Number: 641073 Call: Horizon 2020 Topic: LCE-02-2014

Project title: Biogas-fired Combined Hybrid Heat and Power Plant

Set-up of the MGT hybrid test rig (left) and detail of the power module and combustion chamber in the test rig (right) before insulation

MGT hybrid test rig with pressure vessel and heat insulation

SOFC hybrid test rig after the assembly

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No *641073*

Biomasud Plus

Project presentation

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

BIOmasud Quality & Sustainability Certification of Mediterranean biomass fuels

In the Me runings, nut shells, ome barriers:

- Need fo ategories not bei
- Lack of
- Variatic
- Greater ance

research and innovation program under grant agreement No. 691763