



bioenergy2020+

IEA Task 39 Commercializing Liquid Biofuels

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Representative of Austria in the IEA Bioenergy ExCo

IEA Bioenergy, Task 33 Workshop
November 4th, 2014, Karlsruhe





What I will talk about

- Introducing IEA Implementing Agreements
 - IEA Bioenergy
 - IEA AMF
- IEA Bioenergy Task 39 „Liquid Biofuels“
 - Meetings
 - Newsletter
 - Publications
 - Demo plant data base
- Biofuels in Austria
- Outlook



The International Energy Agency is ...

... an autonomous organization to ensure ...

... reliable, affordable and clean energy for its 29 member countries and beyond

... focussed on

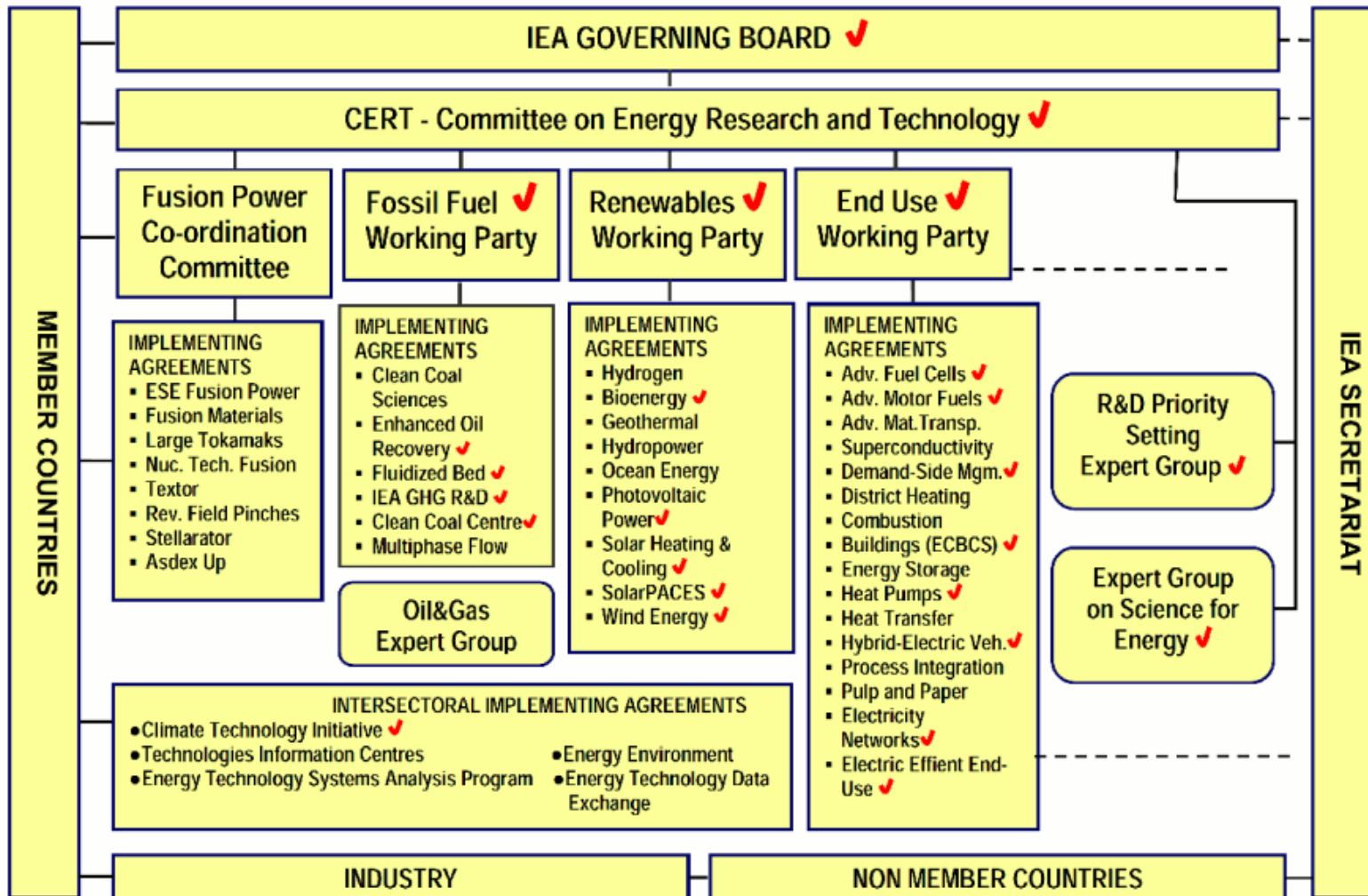
- energy security,
- economic development,
- environmental awareness and global engagement

Read more: [www.iea.org/aboutus/What we do](http://www.iea.org/aboutus/What%20we%20do)

www.iea.org/aboutus/executiveoffice/managementteam/

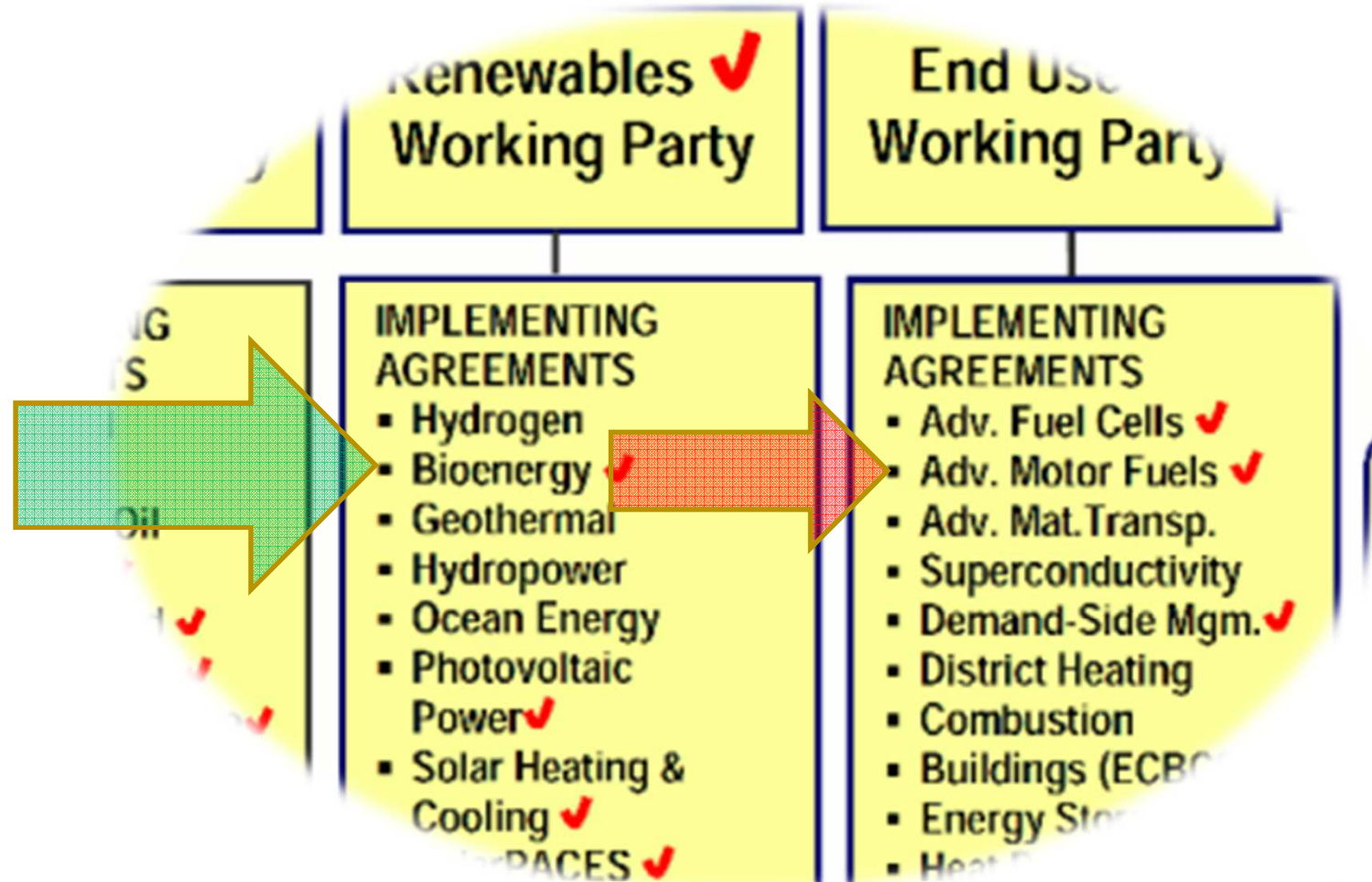


IEA Research Cooperation - Structure





Some Implementing Agreements



www.nachhaltigwirtschaften.at/iea/struktur/index.html

IEA Bioenergy

Strategic Plan 2015-2020

Facilitating commercialisation and market deployment of environmentally sound, socially acceptable and cost-competitive bioenergy systems and technologies.....

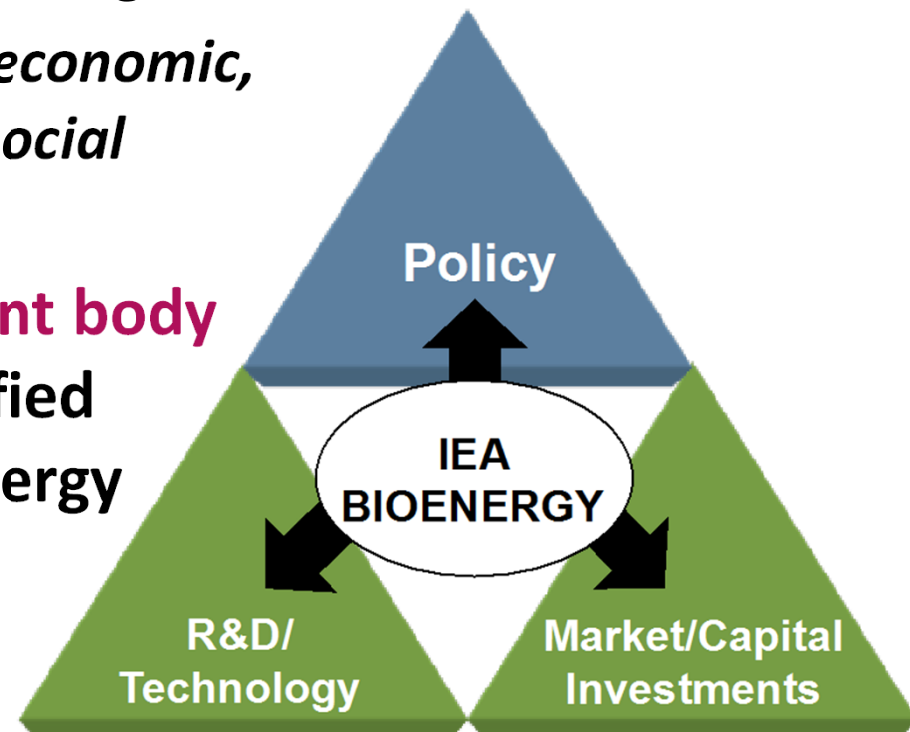


IEA Bioenergy, also known as the Implementing Agreement for a Programme of Research, Development and Demonstration on Bioenergy, functions within a Framework created by the International Energy Agency (IEA). Views, findings and publications of IEA Bioenergy do not necessarily represent the views or policies of the IEA Secretariat or of its individual Member countries.

Drivers

- *Energy security*
- *Low carbon society, GHG emissions reduction*
- *Need for robust policy analysis*
- *Integration with natural gas*
- *Optimisation of the economic, environmental and social value of bioenergy*

IEA B – **an independent body** to give clear and verified information on bioenergy

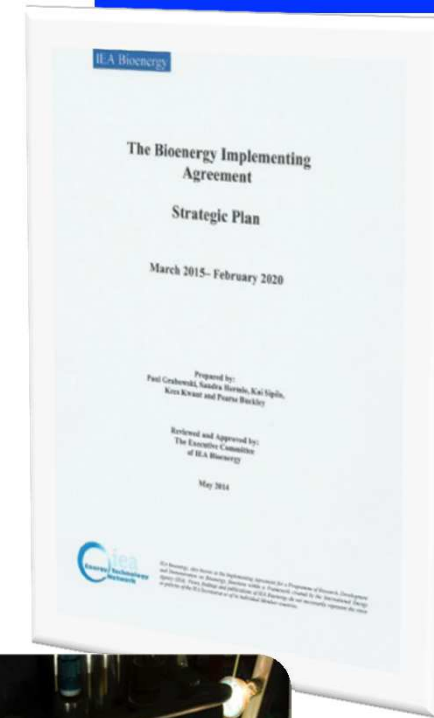


Strategic plan - OBJECTIVES

- ***Promote the market deployment***
- ***Raising public awareness for biomass by dissemination of information***
- ***Outreach to new member countries, industries and organisations***

New Tasks, special projects

- ***Micro- and macro-algae as novel biomass resources***
- ***Solar fuels (artificial photosynthesis)***
- ***Biomass with carbon capture and sequestration***



ACTIONS SUPPORTING IMPLEMENTATION STRATEGY

*Collaboration with
international bodies: FAO,
GBEP, IRENA, etc.*

*Membership expansion,
particularly in IEA non-
member countries*



Input from the end-use side with focus on internal combustion engine processes

Clean, energy-efficient and sustainable fuels and related vehicle technology

Collaboration with other IEA IA's

Combustion

IEA AMF

Lower pollutant emissions
Reduced fuel consumption
Analytical and experimental methods
Use of synthetic and renewable fuels in engines

Low toxic emissions
Improved life cycle efficiency
Reduced GHG emissions
Fuels contributing to sustainability transportation
Fuels for new propulsion systems

Clean energy production by fluidized bed conversion

IEA FBC

Operational issues
Mathematical modelling

IEA Bioenergy

Specific developments of process or energy technologies

Industry based biorefineries

IEA IETS

Reduction of GHG emissions by CCS
Mitigation options

IEA GHG R&D

Overall system aspects

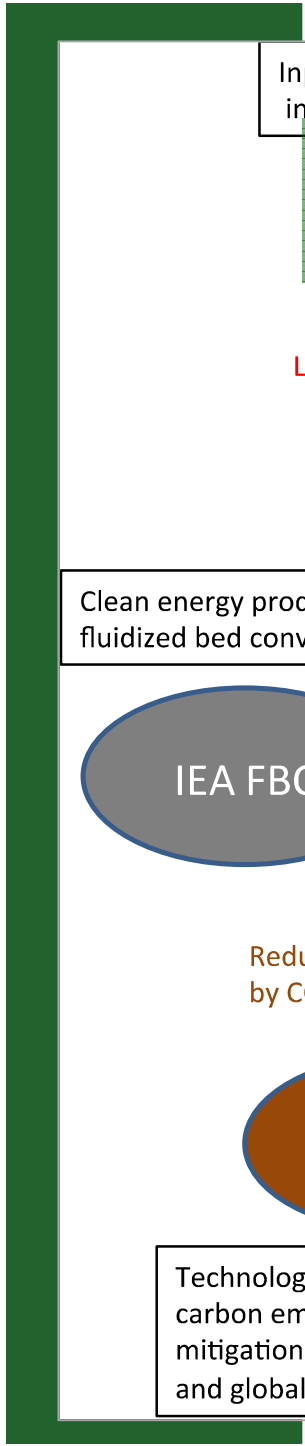
Different clean coal technologies

Energy use in industry sectors

Technologies for reduction of carbon emissions, and for mitigation of climate change and global warming

IEA Clean Coal Centre

Clean and efficient uses of coal



Implementing Agreement for Advanced Motor Fuels New periode

Nils-Olof Nylund

8.9.2014

VTT Technical Research Centre of Finland

Vice Chair, AMF



Need for advanced motor fuels

- Because the internal combustion engines will be number one for the transports in the next decade(s), there is a clear need for fuels delivering:
 - Lower greenhouse gas emissions,
 - Lower local pollution,
 - Enhanced efficiency, and
 - A wider supply base for transportation fuels.
- It is also necessary to understand the full impact of alternative energy solutions from a life cycle perspective, and to use solid data for decisions

IEA AMF's approach

- AMF has established an international RD&D network and provides unbiased information on clean, energy-efficient, and sustainable fuels and related vehicle technology.
- AMF provides decision makers with a solid foundation for sustainable mobility
- AMF takes regional and local conditions into consideration and can facilitate new fuel and vehicle technologies.
- *AMF strives for increased impact through enhanced cooperation with industry as well as with other organizations like government agencies.*



Megatrends

- **Increasing number of vehicles**
- **Air quality problems due to urbanization**
- *More unconventional fossil energy sources*
- *Turning away from nuclear energy*
- *Growing demand for middle distillates
(road, aviation, and shipping)*
- **Increasing interest in advanced biofuels**
- **Advancement in engine and after-treatment technologies**
- **Energy-efficient vehicles**
- **Mobility as a service**



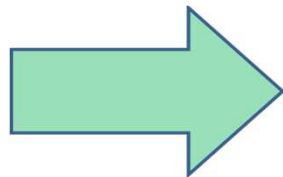
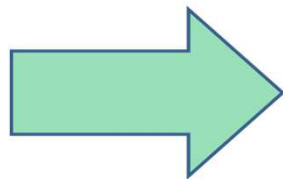
IEA Bioenergy Transport Biofuels related work

Home About Our work: Tasks Events Publications

finding out more about IEA Bioenergy, please [contact](#) the Executive Director

ONGOING TASKS

- 32 Biomass Combustion and Co-firing
- 33 Thermal Gasification of Biomass
- 34 Pyrolysis of Biomass
- 36 Integrating Energy Recovery into Solid Waste Management
- 37 Energy from Biogas
- 38 Climate Change Effects of Biomass and Bioenergy Systems
- 39 Commercialising Conventional and Advanced Liquid Biofuels
- 40 Sustainable International Bioenergy Trade: Securing Supply
- 42 Biorefining – Sustainable Processing of Biomass into Bioenergy
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<http://task39.org/>

Commercializing Conventional & Advanced Liquid Biofuels from Biomass

Task 39
IEA Bioenergy

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ABOUT

PUBLICATIONS

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NEWS



IEA Bioenergy Task 39

- **Helps to commercialize sustainable transportation biofuels**
- While there are numerous RE options for heat and power, **biofuels are currently the only means of displacing gasoline, diesel an, and aviation fuels**

About Task 39

Publications



Newsletters



We are a group dedicated to sustainable development and deployment of transportation biofuels. We are:

- a global network of biofuel experts
- part of IEA Bioenergy
- participants from 15 countries

[Find out more about us](http://task39.org/)

<http://task39.org/>



Valuable informations from Task meetings eg. technology development in Finland

- UMP's HVO 100 000 t/y plant for crude tall oil under construction
- 3 consortia develop BtL processes; two approved to get NER 300 investment aid from the EU, but decision is pending
- Fortum's 50 000 t/y pyrolysis oil plant under commissioning; product will be used as heavy oil replacement in boilers
- Neste oil pilot plant for the production of microbial oil

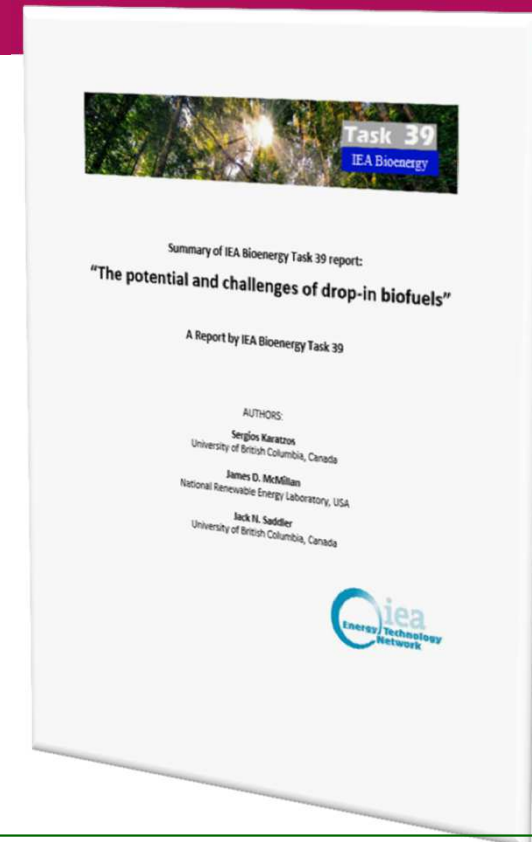
<http://task39.org/files/2014/03/2e-Finland.pdf>



Reports and presentations, eg. on drop in biofuels

The potential and challenges of drop in biofuels
Sergios Karatzos, Jim McMillan and Jack Saddler

Carbohydrate $\xrightarrow{H_2, -O_2}$ Hydrocarbon \rightarrow "Petroleum-like" biofuel

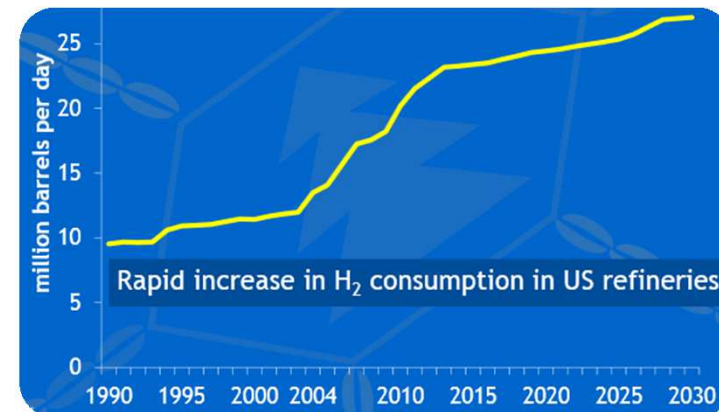


<http://task39.org/files/2014/03/Drop-in-presentation-IEA-Bioenergy-Task-39-Copenhagen-May-2014.pdf>
<http://task39.org/2014/01/the-potential-and-challenges-of-drop-in-fuels-members-only/>



Drop in biofuels report, summary

- Oleochemical biofuels: commercial, less H₂ dependent, potential for growth
- Thermochemical pathway well suited for long term drop in biofuels
- Biochemical products more valuable in growing chemical markets
- Key challenge for drop in biofuels and fossil fuel production:
Cheap & Renewable H₂





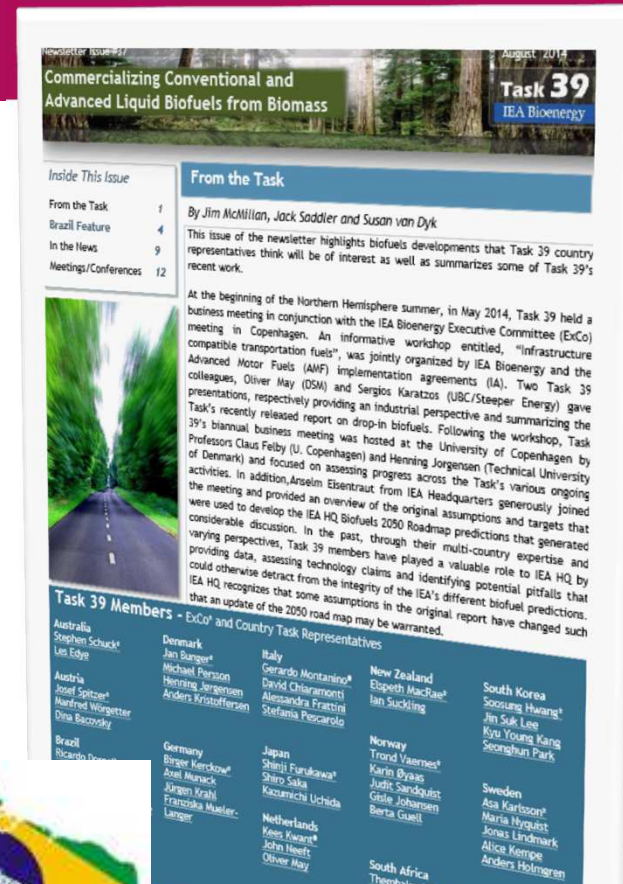
<http://task39.org/newsletters/>

- Issue 37 [Biofuels in Brazil](#)
- Issue 36 [Current status of biofuels development in the USA](#)
- Issue 35 [Canada – Recent Progress in Transportation biofuels](#)
- Issue 34 [Norway – Recent Progress in Transport Biofuels](#)
- Issue 33 [South Africa – Biofuel Developments in South Africa](#)

- Issue 32 [Australia – Transportation Biofuels in Australia](#)
- Issue 31 [South Korea – Progress on Transportation Biofuels](#)
- Issue 30 [Italy – Current Biofuel Policies and R&D Developments](#)
- Issue 29 [Germany – Recent Progress in the Development of Biofuels](#)
- Issue 28 [Austria – Transportation Biofuels Research in Austria](#)
- Issue 27 [Sweden – Recent Progress in Biofuels](#)
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- Issue 25 [Recent ABE Biofuel Progress in the UK](#)
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- Issue 23 [Recent Progress of Biofuels in Japan](#)
- Issue 22 [Biochemical Conversion R&D in Denmark and Inbicon A/S](#)
- Issue 21 [Special reports – Cork Symposium & Bioethanol R&D at NREL](#)
- Issue 20 [Food vs. fuel issues](#)
- Issue 19 [New EU Directive on Renewable Energy](#)
- Issue 18 [Implementation Issues](#)

- Issue 17 [Special report – Vancouver Workshop](#)
- Issue 16 [Research in Sweden](#)
- Issue 15 [Special report – Ystad Workshop](#)
- Issue 14 [1st International Biorefinery Workshop report](#)
- Issue 13 [27th Symposium on Biotechnology report](#)
- Issue 12 [Special report – Kyoto Workshop](#)



Biofuels in Brazil

Antonio Maria Bonomi, Paulo Barbosa and Susan van Dyk





<http://task39.org/>
<http://demoplants.bioenergy2020.eu>

IEA Bioenergy **Task 39** Commercializing 1st- and 2nd- Generation Liquid Biofuels from Biomass

This overview has been elaborated by ABC (now Bioenergy2020+) and FJ-BLT.

Austrian Bio Energy Centre

bioenergy2020+

F J BLT WIESELBURG

Status of 2nd Generation Biofuels Demonstration Facilities

Large efforts are dedicated to the production of biofuels from lignocellulosic raw materials. While only few production facilities are operational yet, many projects are under construction or planned. But which are the companies involved, where are production facilities under construction, and which technologies will be applied? In order to answer these questions, IEA Bioenergy Task 39 has collected data on pilot and demonstration projects and displays the results in a web-based, interactive map. (Click on map to obtain information)

New in April 2013: The 2nd report on the status of advanced biofuel facilities. The report features background information on operating companies, a technical chapter on the emerging industry of biorefineries, and a statistical chapter. ([Download the 2012 report](#))

For more information and for data upload please contact: dina.bacovsky@bioenergy2020.eu

Biofuel Demonstration Facilities

IEA Bioenergy Task 39 has compiled a database on Biofuel Companies. Find out more about the:

"Status of 2nd Gen Biofuel Demonstration Plants"





Advanced biofuel - status in Europe



- Oleochemical:
 - Neste Oil
 - UPM Biofuels
- Thermochemical:
 - Biomassekraftwerk Güssing
 - GoBiGas
 - Chemrec
 - KIT
- Biochemical
 - Abengoa
 - Beta Renewables
 - Borregaard
 - Butamax
 - Clariant
 - Inbicon



<http://task39.org/2013/12/report-on-the-status-of-advanced-biofuels-demonstration-facilities-in-2012/>



Biofuels in Austria





Since 2008:

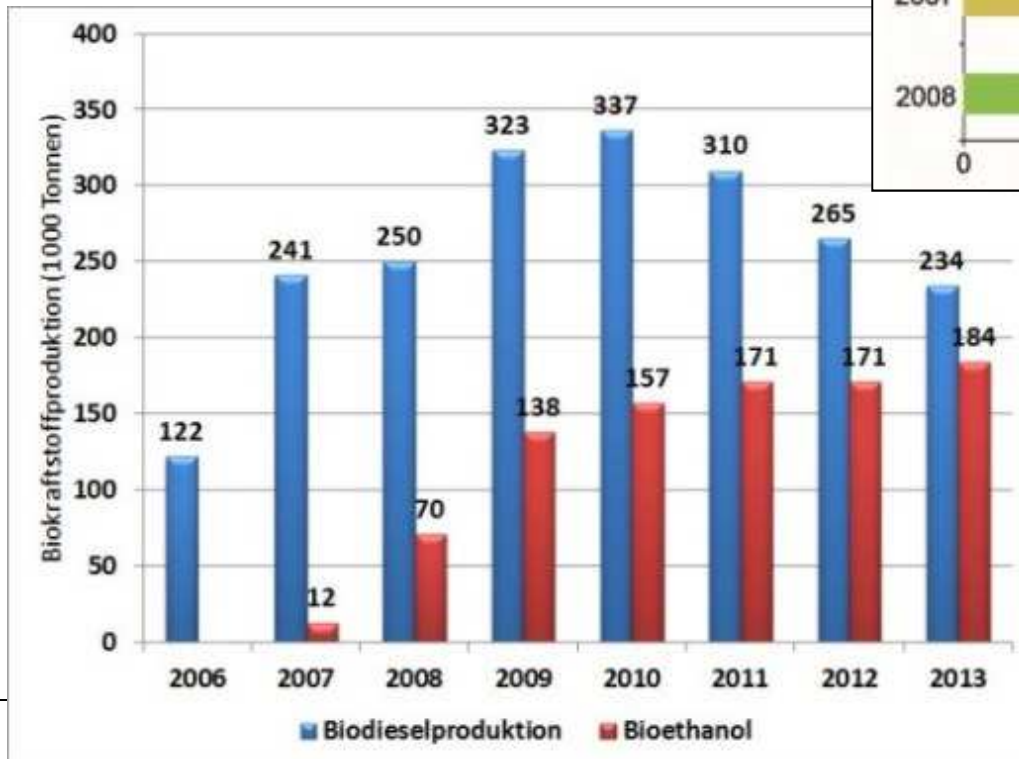
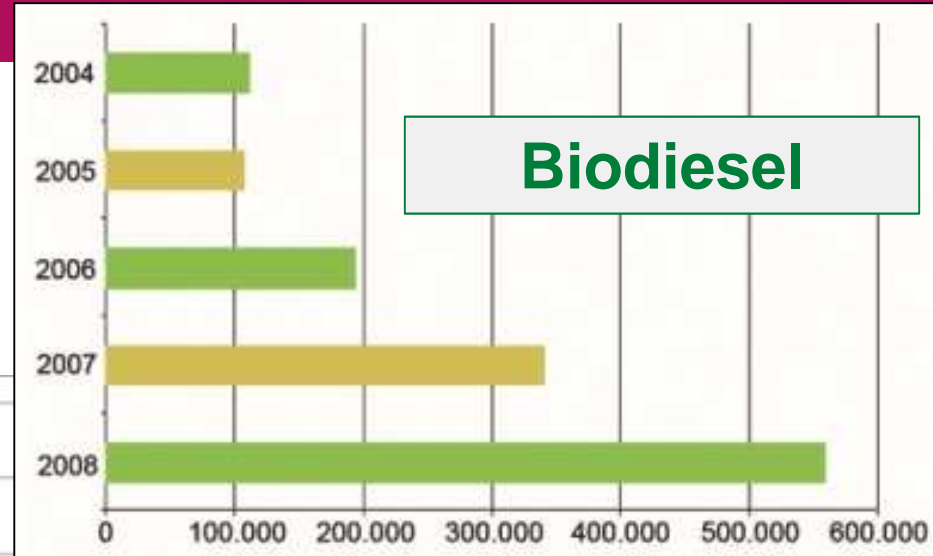
Concerns about Biofuels in Europe

- Food versus fuel debate
- Rising food and feed prices
- Direct and indirect land use change emissions
- Low GG emission reduction potential
- Biomass availability, competition with material use

COM (2012) 595 aims at a limit of 5 % food crop based bio fuels



Biofuels production in Austria and production capacity in t/year

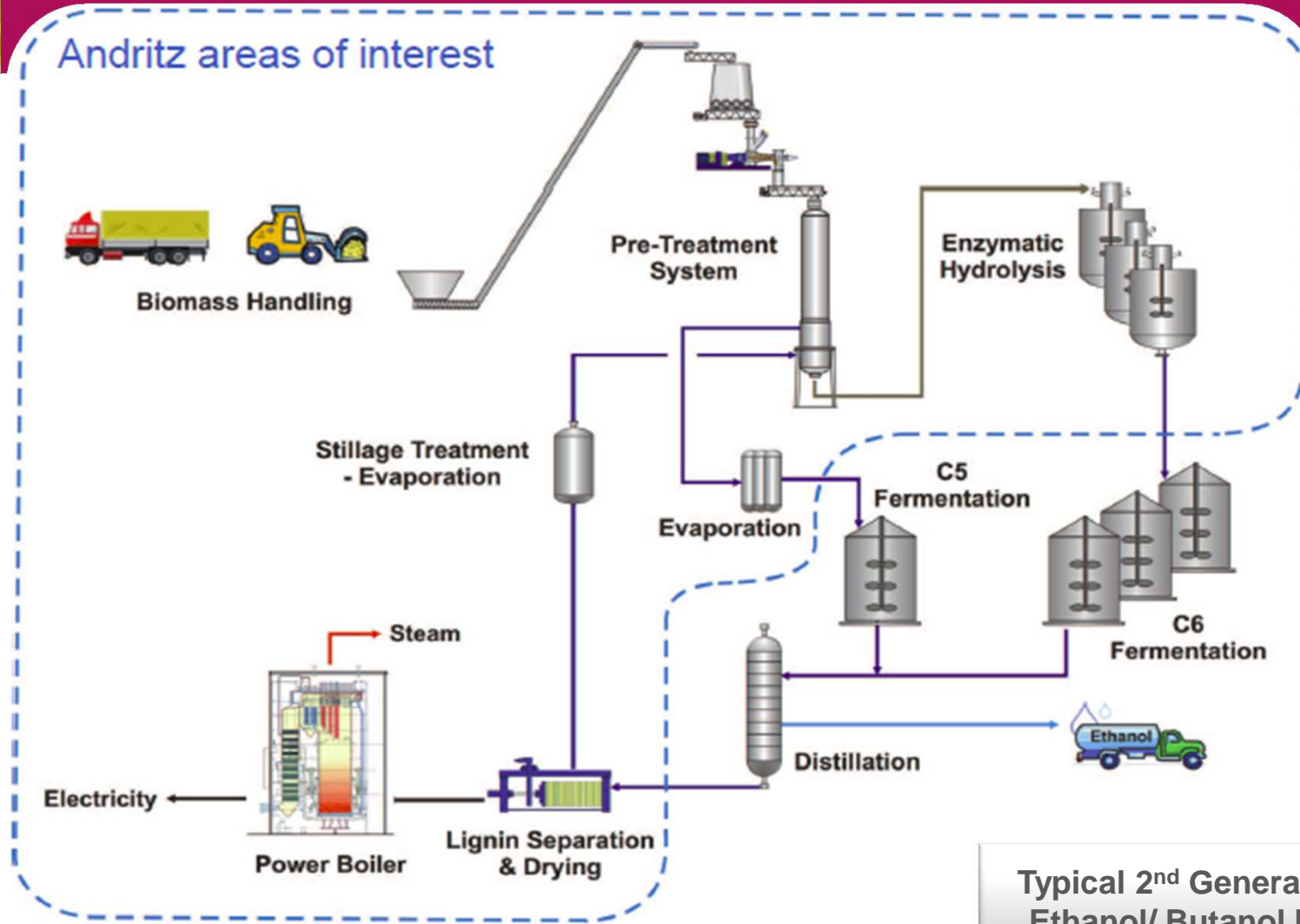




Austria biofuels technologies industries:

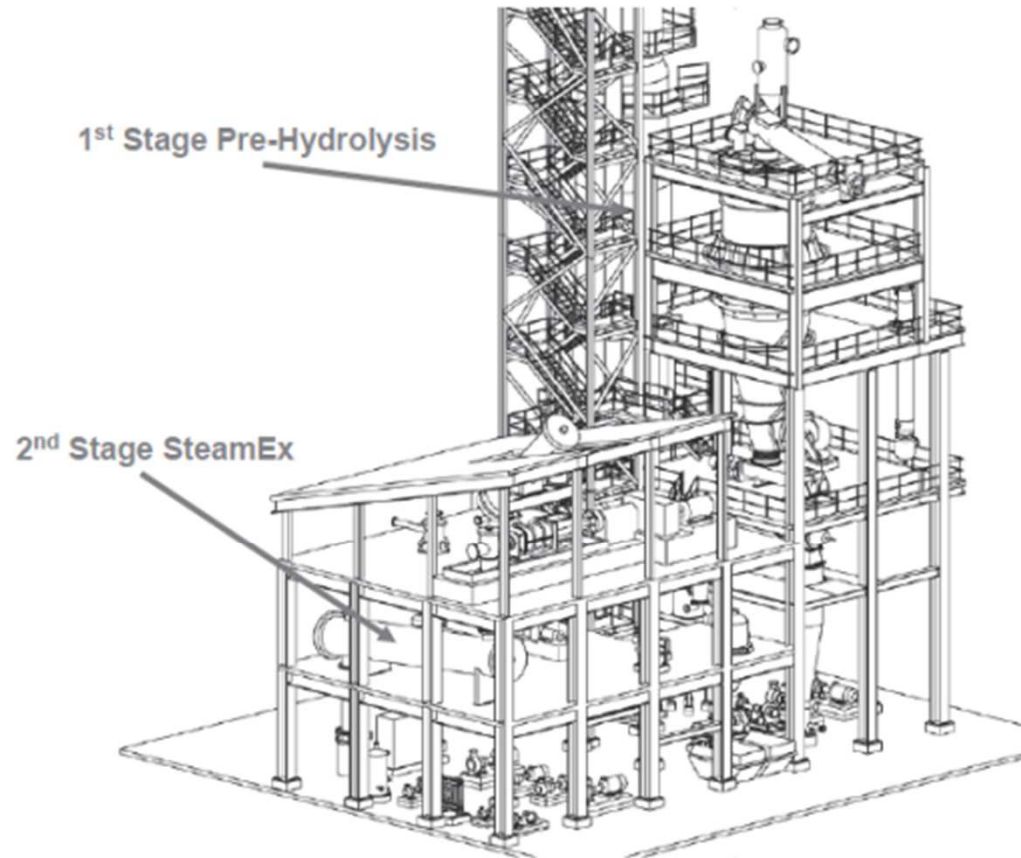
- Andritz
- BDI
- REPOTEC
- Vogelbusch

ANDRITZ in 2nd gen EtOH and Butanol Production





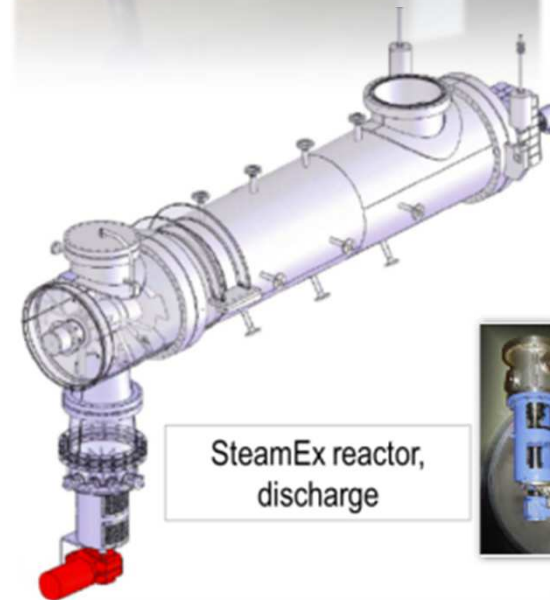
ANDRITZ Commercial scale advanced pre-hydrolysis and SteamEx



RioFuel Presentation – November 2012



Horizontal SteamEx reactor



SteamEx reactor, discharge





ANDRITZ in 2nd Generation Ethanol Production

References: customized demonstration and commercial scale systems:

14 Lab / Pilot / Demo Systems

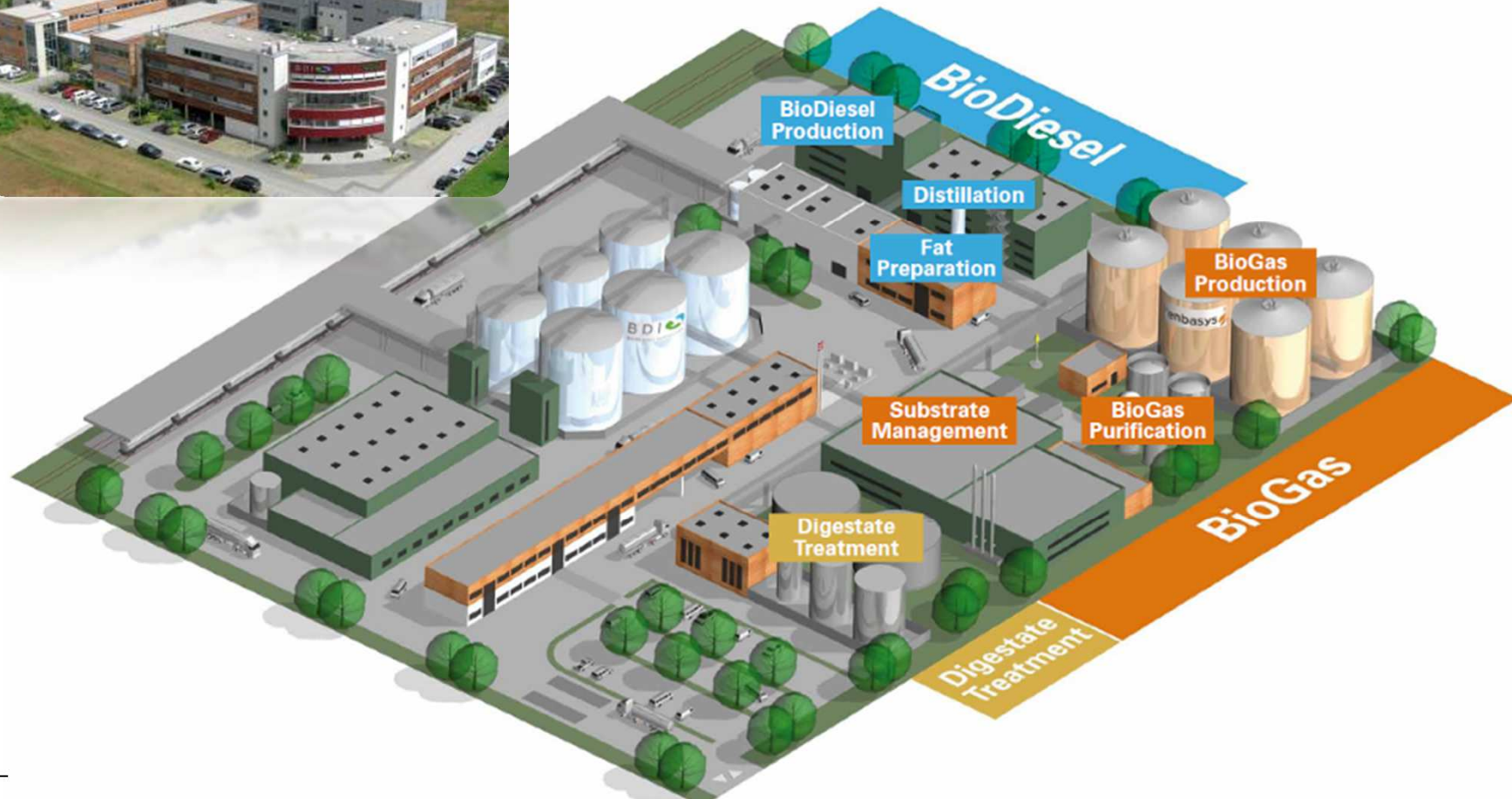
- FPInnovations (Canada)
- IHD (Germany)
- Queensland University of Technology (Australia),
- ZeaChem (USA)
- Chemtex Rivalta (Italy)
- Borregaard (Norway)
- State Grid Xinyuan Co (China)
- Rentech (Colorado)
- CTC demo system (Brazil)
- and others confidential clients

2 Commercial Scale Systems

- Chemtex Cresecentino (Italy)
- Poet Liberty (USA)



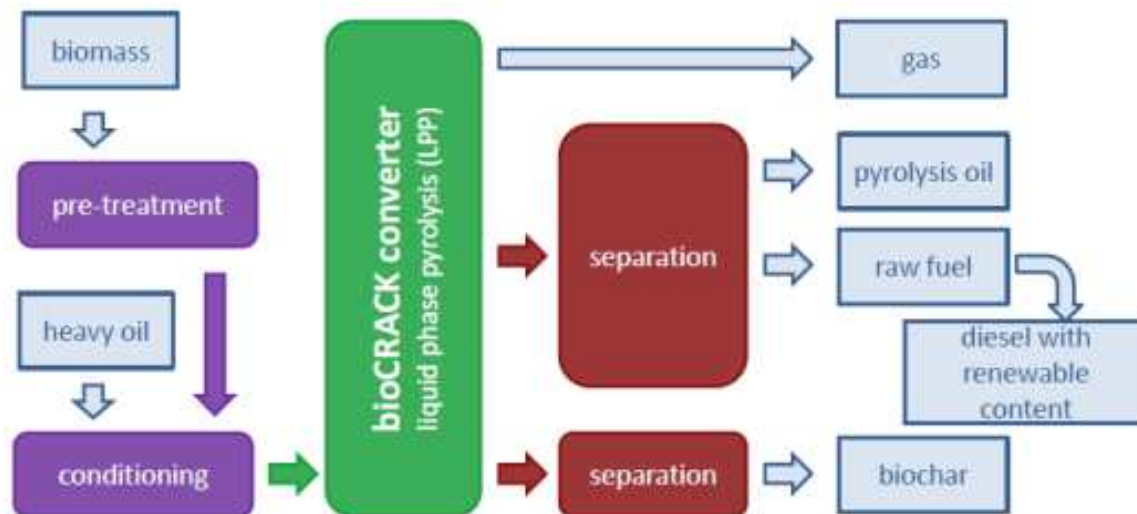
BDI's integrated waste-to-biofuels concept





BDIs integrated BioCrack pilot plant at the OMV refinery Schwechat

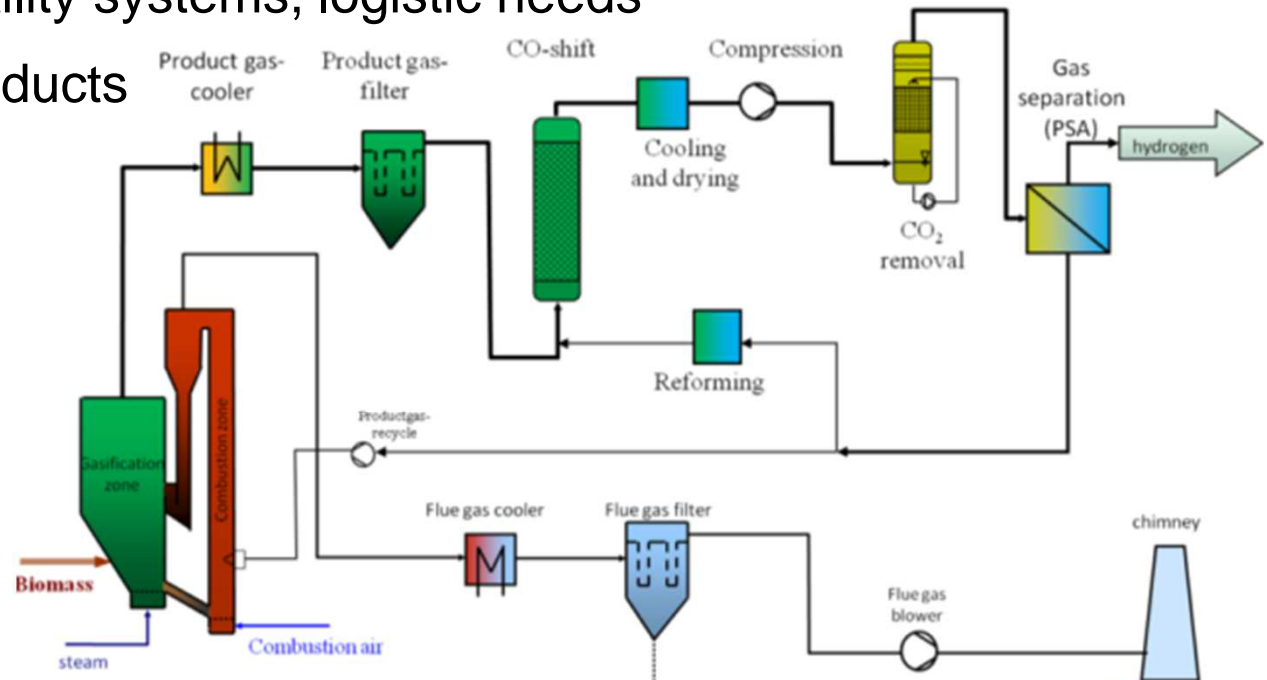
- Project duration: April 2010 - 2013
- Project cost: €7 Mio
- Basis: 7,5x7m, height: 21,5m
- Feed capacity: 100 kg biomass + 250 kg heavy oil
- Pressure: atmospheric; temp.: up to 400°C





BioH₂-4Refineries: Economic evaluation of production of Bio-hydrogen for a refinery

- 50 MW fuel plant to replace fossil hydrogen
- Evaluation of the biomass resources available for such a plant
- Basic - engineering of the gasifier as well as of all other sub units, including pipelines, utility systems, logistic needs
- Optimal use of by-products
- Economic evaluation

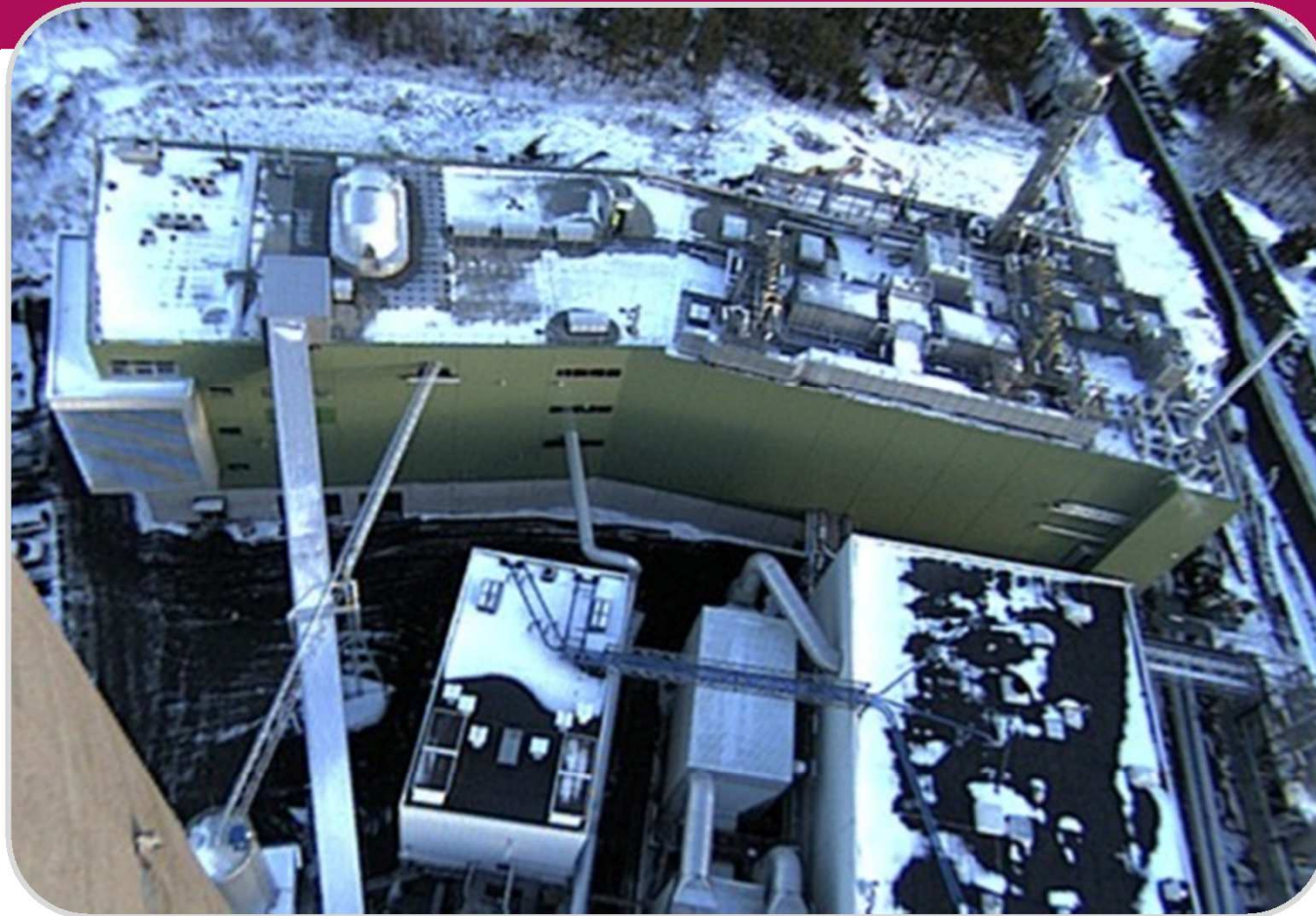


All components „Ready to market“

COMET



20 MW synthesis gas plant in Gothenburg;



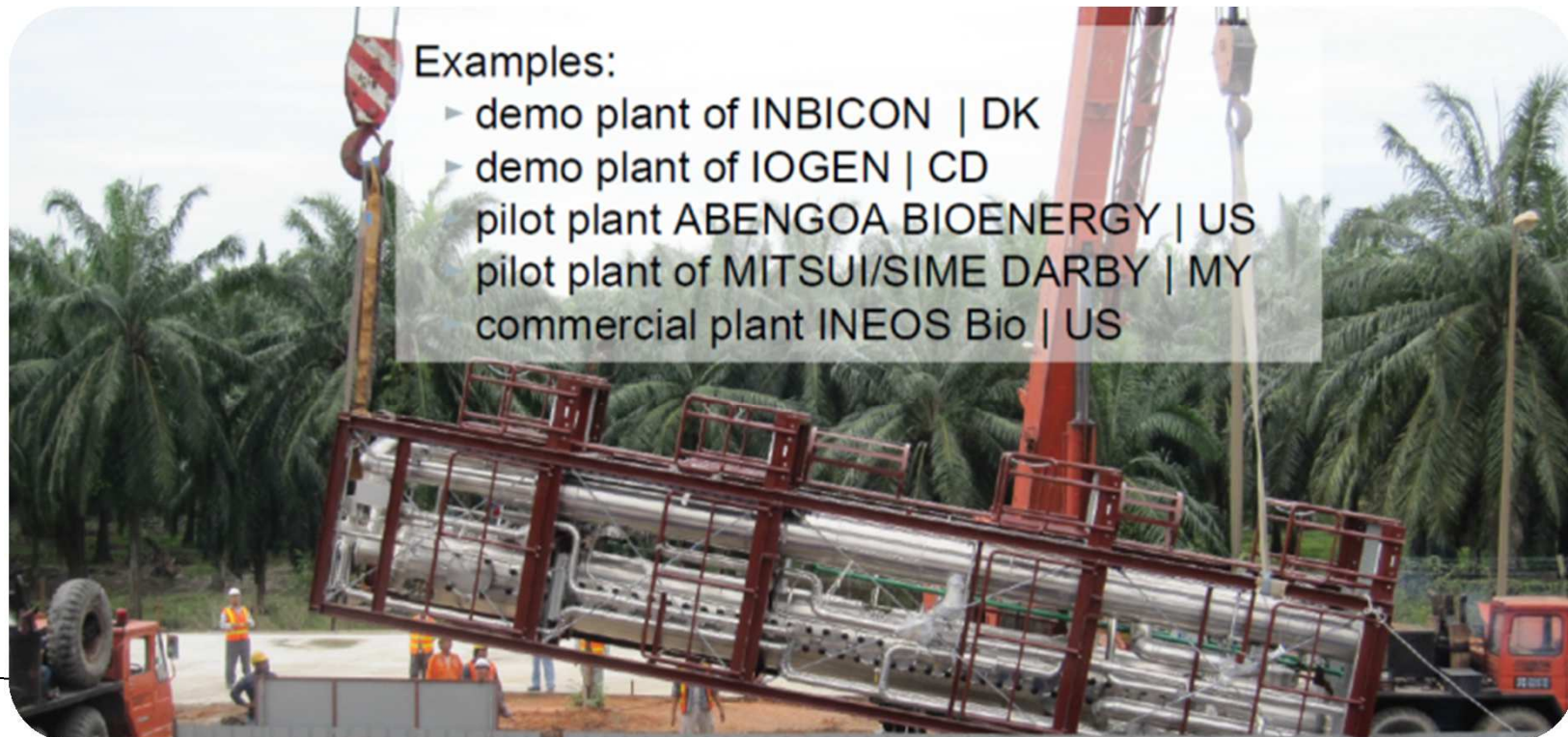
http://gobigas.goteborgenergi.se/En/The_plant/Follow_the_construction?Image=2014-01-20



VOGELBUSCH- experienced in 2nd gen ethanol: complementing client's 2ndg process with proven EtOH technology

Source: IEA Bioenergy Conference 2012 Vienna

- Process design for pilot and demo plants
- Assist in developing fermentation and separation strategies
- Equipment supply for separation, distillation and dehydration



Examples:

- ▶ demo plant of INBICON | DK
- ▶ demo plant of IOGEN | CD
- ▶ pilot plant ABENGOA BIOENERGY | US
- ▶ pilot plant of MITSUI/SIME DARBY | MY
- ▶ commercial plant INEOS Bio | US



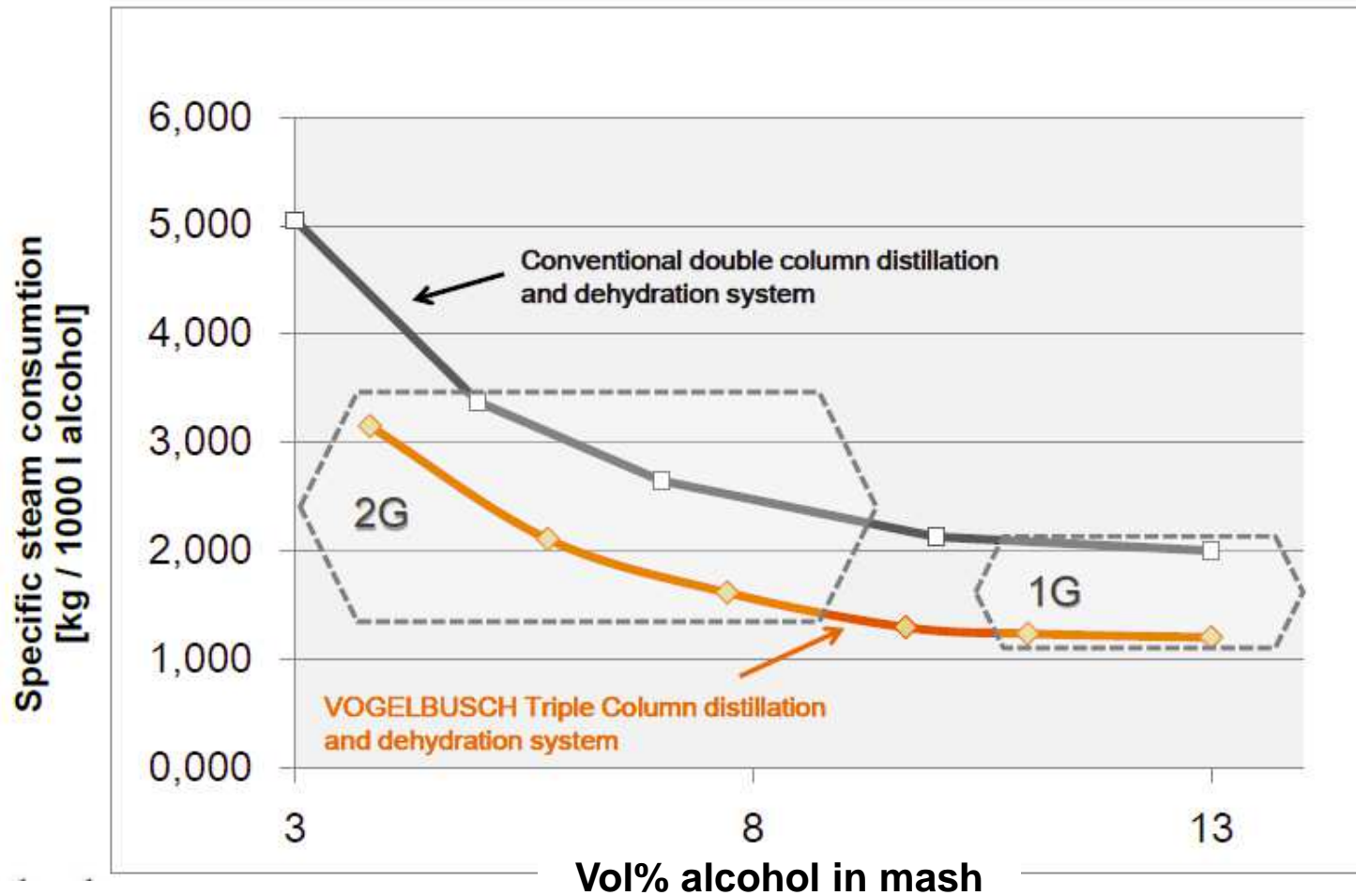
VOGELBUSCH: Showcase Projects

Demo- and pilot plants comprising VB technologies

- IOGEN, Canada
6,000 l/d ethanol derived from straw
- INBICON, Denmark
53,000 l/d bioethanol derived from wheat straw
- INEOS BIO, USA
90,000 l/d bioethanol derived from green biomass
- MITSUI, Malaysia
1,000 l/d hydrous alcohol derived from EFB (empty fruit bunches)
- ABENGOA Energy, USA
270,000 l/d bioethanol derived from corn cobs



Multipressure distillation Influence of alcohol content in mash on steam demand



3 ecoduna hanging gardens algae production sites already in operation:

1. ecoduna-plant in Bruck/Leitha, Austria
2. Vattenfall Corp. in Senftenberg, Germany
3. Kalundborg Symbiosis Cluster, Denmark:

www.symbiosis.dk





Outlook





Roadmap to a Single European Transport Area

- Competitive transport system in 2050
 - *No more conventionally-fuelled cars in cities*
 - *Shift of medium distance journeys from road to rail and water*
 - *60% reduction of greenhouse gas missions*
 - **40% low carbon fuels in aviation**



EUROPEAN COMMISSION

Brussels, 28.3.2011
COM(2011) 144 final

WHITE PAPER

Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system

SEC(2011) 359 final
SEC(2011) 358 final
SEC(2011) 391 final

http://ec.europa.eu/transport/themes/strategies/2011_white_paper_en.htm





IEA Technology Roadmap Biofuels for Transport 2050

- **27% of total transport fuel possible** - 65 EJ feedstock needed
- *Improve conventional technologies: efficiency, cost*
- *Support demonstration of advanced technologies*
- **Manage competition for land for food & fibre, and biomass for heat & power carefully**
- **Trade: from high productive areas to areas with high consumption**
 - ... backed by policies which ensures sustainability:
 - food security
 - biodiversity
 - positive social impacts
 - sustainable land-use, processing technologies.

www.iea.org/publications/freepublications/publication/biofuels_roadmap.pdf



Biofuels 2050

- **Biofuels** are stored solar energy with high energy density and **can use existing infrastructure**
- Biofuel can play **the** major role in future transport
- especially where high energy density is needed: **long distance transport, aviation, farm tractors**
- Cooperation between industry, agriculture and policy is a must
- **Feedstock supply is crucial:**

„No biomass – no biofuels“



Stay informed ...

... about that what happens in the Austrian and global biofuels scene

- Subscribe to the rss newsfeed

www.netzwerk-biotreibstoffe.at/news/rss

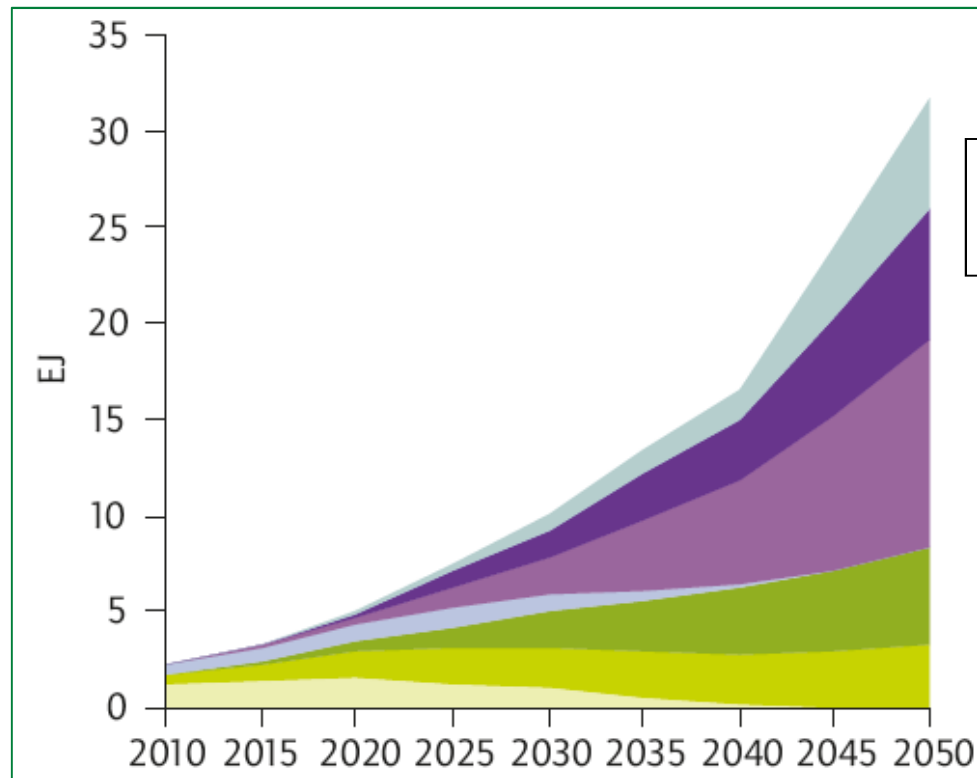




**Thank you for your
attention!**



IEA Biofuel Roadmap: Vision



2050:
32 EJ = 760 Mtoe

- Biomethane
- Biojet
- Biodiesel - advanced
- Biodiesel - conventional
- Ethanol - cellulosic
- Ethanol - cane
- Ethanol - conventional



Transport in 2050 differ from Today

Worldwide increase of

- Fright transport caused by growing economy
- Private transport caused by rising living standard

New traffic system

- More public transport
- Innovative solutions in cities

Better vehicles with less consumption

- Highly efficient hybrid powertrains
- Diffusion of BEV and FCV



New biofuel drivers - the “BIG CHALLENGES”

- **Eradicate extreme poverty and hunger**
- Recognize the right of all human beings to the same level of prosperity
- Aim at a global partnership
- Develop a “**bio economy**” based on renewable resources
- **Minus 50 % GGE global, more than 80 % in developed countries**
- **Liveable traffic system needed**

WE
CAN

World population growth:
from 7 billion in 2012 to 9 billion in 2050

MILLENNIUM DEVELOPMENT GOALS AND BEYOND 2015

