

# Country Report GERMANY

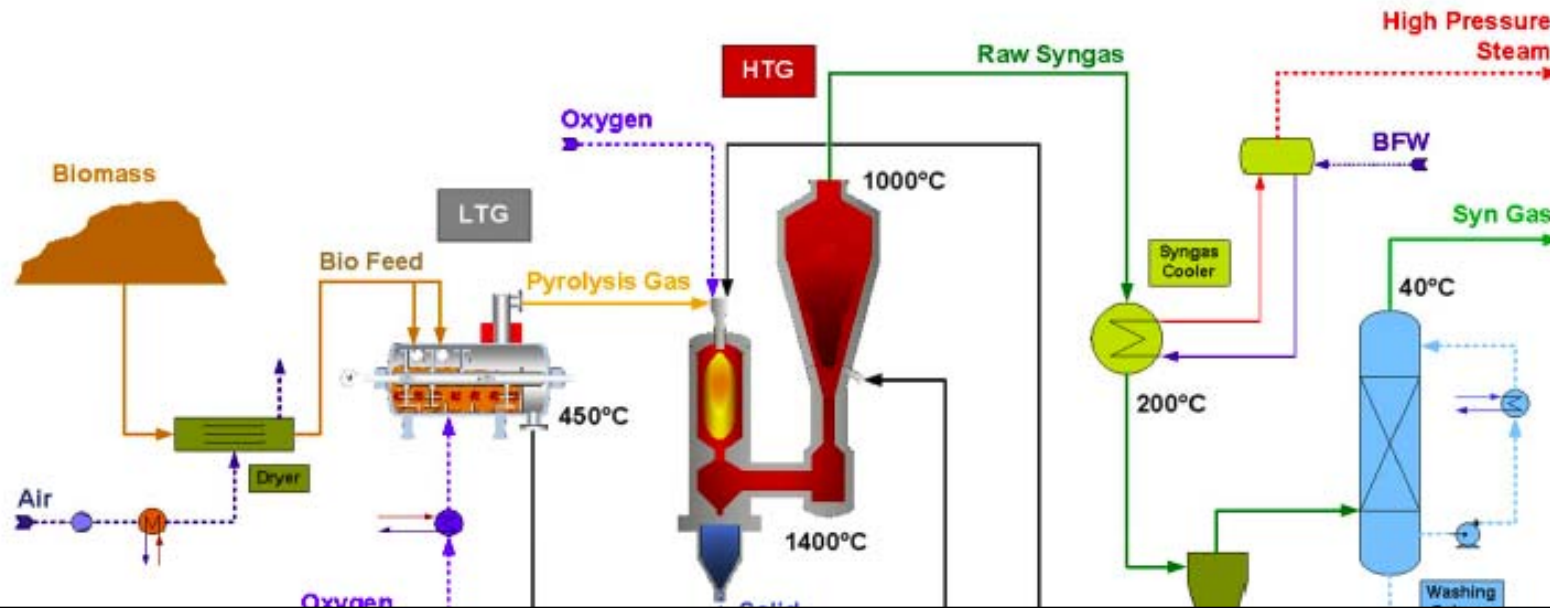
Engler-Bunte-Institute, Fuel Technology  
Institute for Technical Chemistry, Gasification Technology

Thomas Kolb / Mark Eberhard

**IEA Bioenergy: Task 33 Thermal Gasification of Biomass**

**Task meeting, October 29<sup>th</sup> 2015, Berlin, Germany**

# Carbo-V® - Process Flow Sheet



February 2012 Linde Engineering Dresden GmbH acquires Carbo-V® IP

January 2013 Linde has elaborated numerous technical corrections of Carbo-V process design

Linde and Forest BtL (Finland) sign agreement to apply Carbo-V process to provide Syngas for downstream Biodiesel and Naphta | Kemi, Finland

February 2014 ForestBtL / VAPO / NER300 canceled the project

**no feedback October 2015**

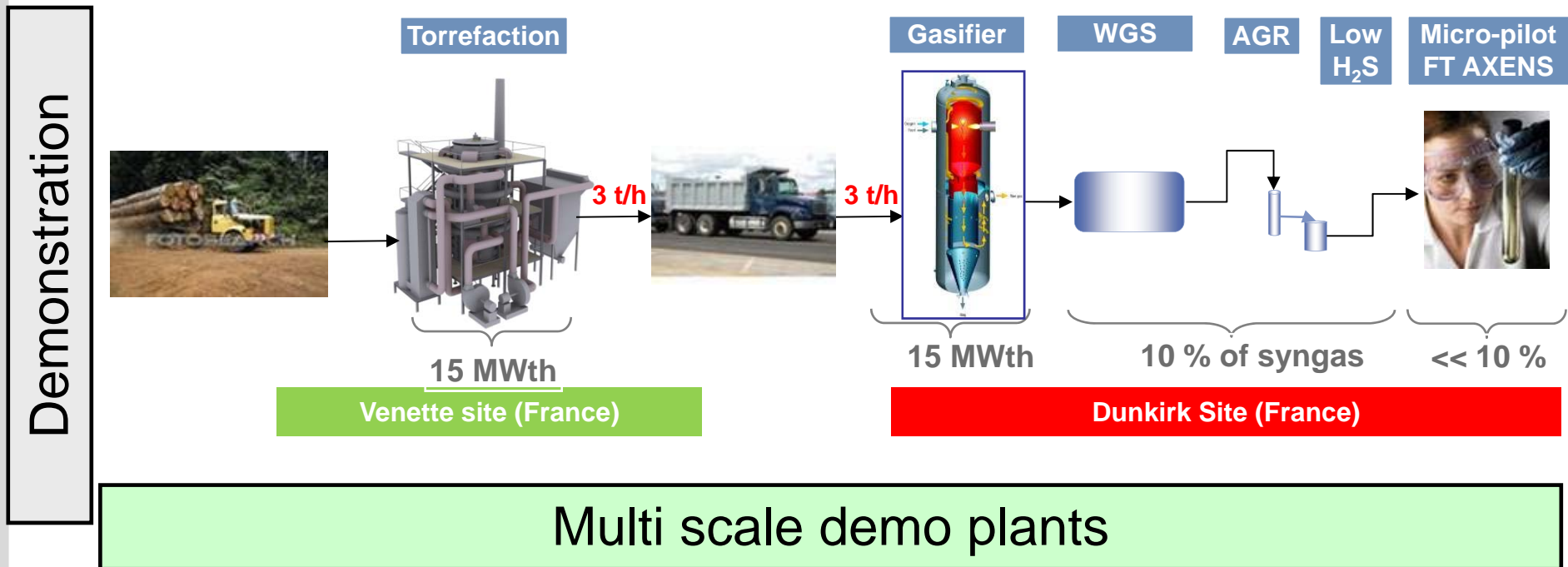
# BioTfuel-Projekt

## BioTfuel main figures & objectives



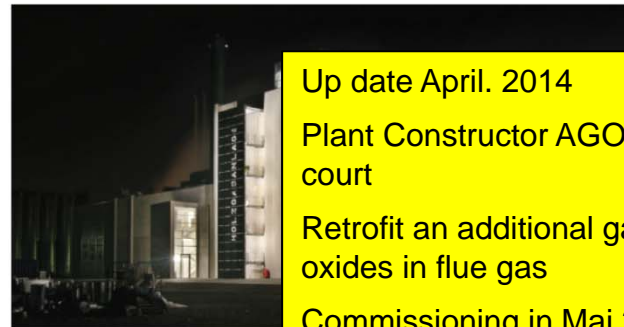
update October 2015  
construction work  
ongoing  
start of operation  
planned for 2017

- BioTfuel demo plants:
  - Two multiple scale demo plants will be located in France
    - to get scale-up data
    - to validate various scheme/configurations



# SWU Stadtwerke Ulm/Neu-Ulm CHP Demo Plant

## Biomass gasification plant Senden/Ulm, DE



Start of the construction	12/2009	
Actual status	commissioning	
Fuel	Wood chips	
Input	14,3	M
Output	5,0	M
	6,2	M
Total efficiency	78	%
Overall investment	33	M

Up date April. 2014

Plant Constructor AGO and SWU settlement out-of-court

Retrofit an additional gas cleaning to reduce nitrogen oxides in flue gas

Commissioning in Mai 2014

Up date May 2015

Plant is in operation still not full electrical power generation

In 2014 average 300 h/month in operation

In 2015 average 500 h/month in operation

Plant design is 600 h/month

**no feedback October 2015**

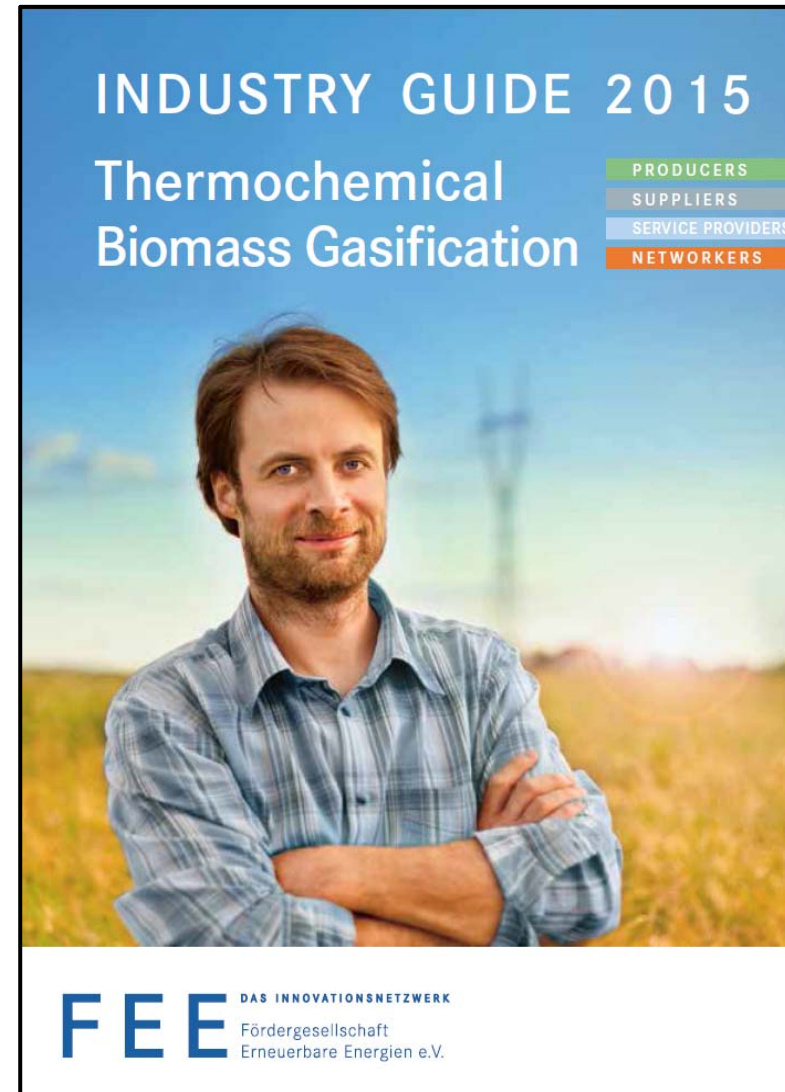
Source: R. Rauch, SGG Gasification Seminar 2012

# State of the bioliq<sup>®</sup>-Project

- Two measurement - campaigns in 2015
- 57 h operation with slurry in 3 week July campaign to review technical improvement
- Further optimization for November campaign
- 100h campaign for the process chain in summer 2016



- **> 400 plants in Germany, total installed capacity: 42 Mw<sub>el</sub>**
- **Total efficiency up to 85 % (combined heat and power generation)**
- **Capacity range: small scale plants of 15 kW<sub>el</sub> up to large scale plants of up to 5 Mw<sub>el</sub>**
- **Source: Fördergesellschaft Erneuerbare Energien e.V. (FEE), Industry Guide Thermochemical Biomass Gasification, Berlin, Germany, July 2015**
- **Web: <http://www.fee-ev.de/>**



# Biomass Gasification manufacturer

- **BR Engineering**
- **Burkhardt**
- **Holzenergie Wegscheid**
- **ReGaWatt**
- **Spanner Re<sup>2</sup>**
- **Stadtwerke Rosenheim SynCraft**
- **Xyloenergy**
- **Ettenberger**
- **KOPF SynGas**
- **Wood Gasifier System Werner**
- **Ligento green power**
- **Meva Energy AB**
- **Qalovis**
- **URBAS Maschinenfabrik**

Source: Fördergesellschaft Erneuerbare Energien e.V. (FEE), Industry Guide Thermochemical Biomass Gasification, Berlin, Germany, July 2015

# Biomass gasification plants

Manufaktur	Technology	Feedstock	Grid feeding plants	Note
BR Engineering GmbH (CH)	Fixed-bed process (optional: moving bed) in combination of cocurrent and countercurrent flow	Unadulterated wood, wood chips, other biomasses (among others hogged fuel)	2	<ul style="list-style-type: none"> <li>• Since 1997</li> <li>• Cold gas efficiency: up to 90%</li> <li>• Production of biochar</li> <li>• USP: proven for demolition wood/ ash free of char</li> </ul>
Burkhardt GmbH (D)	Fluidized bed process in cocurrent flow	Pellets	120	<ul style="list-style-type: none"> <li>• Since 2011</li> <li>• wood gas cogeneration plants</li> <li>• wood gasifier with downstream CHP</li> <li>• Electric efficiency of more than 30 %</li> </ul>
Holzenergie Wegscheid GmbH (D)	Fixed-bed process in cocurrent flow	Unadulterated wood, briquettes & maxi-sized pellets, wood chips	34	<ul style="list-style-type: none"> <li>• Distributing countries: D, A, CH, I, SLO, J, CDN, F, PL</li> </ul>
ReGaWatt GmbH	Fixed-bed in countercurrent flow	Wood chips from various sources up to 30 % bark and landscape management chips	4	<ul style="list-style-type: none"> <li>• Since 2010</li> <li>• Distributing countries: EU</li> </ul>

Source: Fördergesellschaft Erneuerbare Energien e.V. (FEE), Industry Guide Thermochemical Biomass Gasification, Berlin, Germany, July 2015

USP: Unique selling point



# Biomass gasification plants

Hersteller	Technologie	Feedstock	Grid feeding plants	Note
Spanner Re <sup>2</sup> GmbH	Fixed-bed process in cocurrent flow	Unadulterated wood, forest chips (at 30 kWel), wood chips	440	<ul style="list-style-type: none"> <li>Spanner Re<sup>2</sup> wood cogeneration plants</li> <li>Since 2008</li> <li>Distributing countries: D, A, CH, I, CZ, SLO, LV, CDN, GB, FIN, HR, J, PL</li> </ul>
Stadtwerke Rosenheim GmbH & Co. KG	Fluidized bed and tiered process, combination of concurrent and eddy flow (Rosenheimer Process)	Unadulterated wood, wood chips		<ul style="list-style-type: none"> <li>Since 2015</li> <li>Distributing countries: DE, AT, I</li> </ul>
SynCraft (A)	Tiered process in cocurrent flow (floating fixed-bed)	Unadulterated wood, tree and shrub cuttings, waste wood class A, wood chips	3	<ul style="list-style-type: none"> <li>By-product bio char</li> <li>Fuel flexibility</li> <li>No additives needed</li> <li>Electric efficiency 30 %</li> </ul>
Xyloenergy GmbH	Fixed-bed process in cocurrent flow	Unadulterated wood, wood chips	1	<ul style="list-style-type: none"> <li>capacity via 100 % diesel/ bio-diesel as well;</li> <li>utilization of waste wood</li> <li>Distributing countries: EU</li> </ul>

Source: Fördergesellschaft Erneuerbare Energien e.V. (FEE), Industry Guide Thermochemical Biomass Gasification, Berlin, Germany, July 2015

# Biomass gasification plants

Manufakturer	Technology	Feedstock	Grid feeding plants	Note
Ettenberger GmbH & Co. KG	Tiered gasification process in combination	Unadulterated wood, wood chips, short rotation plants	3	
KOPF SynGas GmbH & Co. KG	Fluidized bed process	Sewage sludge (10 % moist. cont.)	2	<ul style="list-style-type: none"> <li>• Since 2000</li> </ul>
Wood Gasifier System Werner	Fixed-bed process in cocurrent flow	Unadulterated wood, wood chips	1	
Ligento green power GmbH	Fixed-bed process in cocurrent flow	Unadulterated wood, residual wood from forestry, short rotation plants, wood chips	2	
Meva Energy (S)	Entrained flow in cocurrent flow	Unadulterated wood, wood chips, pellets, saw dust, husks, straw	1	
Qalovis GmbH	Fixed-bed process in cocurrent flow	Unadulterated wood, residual wood from forestry and landscape conservation, wood chips, pellets	1	<ul style="list-style-type: none"> <li>• USP: no scrubbing of gas needed</li> </ul>
URBAS Maschinenfabrik GmbH (A)	Fixed-bed process in concurrent flow	Unadulterated wood, wood chips	14	<ul style="list-style-type: none"> <li>• Since 2008</li> </ul>

Source: Fördergesellschaft Erneuerbare Energien e.V. (FEE), Industry Guide Thermochemical Biomass Gasification, Berlin, Germany, July 2015

# Biomass gasification datasheet



## Stadtwerke Rosenheim GmbH & Co. KG

### FEATURES

- 95 kW<sub>th</sub> | 50 kW<sub>el</sub>
- Unadulterated wood, wood chips
- Quality of charge material:  
12% moist. cont.,  
lumpiness 30 x 30 x 30 mm,  
5% fine content at max. 2 mm,  
max. 60 mm chip
- Fluidized bed and tiered process,  
combination of concurrent and  
eddy flow
- 42 kg/h fuel requirement:  
12% moist. cont.
- Gas utilization via motor
- USP: very high gas quality,  
energy-efficient  
(>75% fuel utilization rate)
- Staff: 12
- Since 2015
- Distributing countries: DE, AT, I

The Stadtwerke Rosenheim (Rosenheim Municipal Utilities) introduces its own wood gasifier:

A reliable, effective and safe technology that converts wood-derived energy efficiently. Therefore operators achieve exceedingly higher power and heat outputs. During the development of the wood gasifier starting in 2007, we were able to profit from our long lasting experience in the operation of power plants.

This makes our process, the so-called 'Rosenheimer Verfahren', unique. Starting in 2015, our first gasifiers will be delivered to reference customers. We, as a municipal utility, can provide an all-in-one solution: From the energy concept and the engineering to the operation of the plant.

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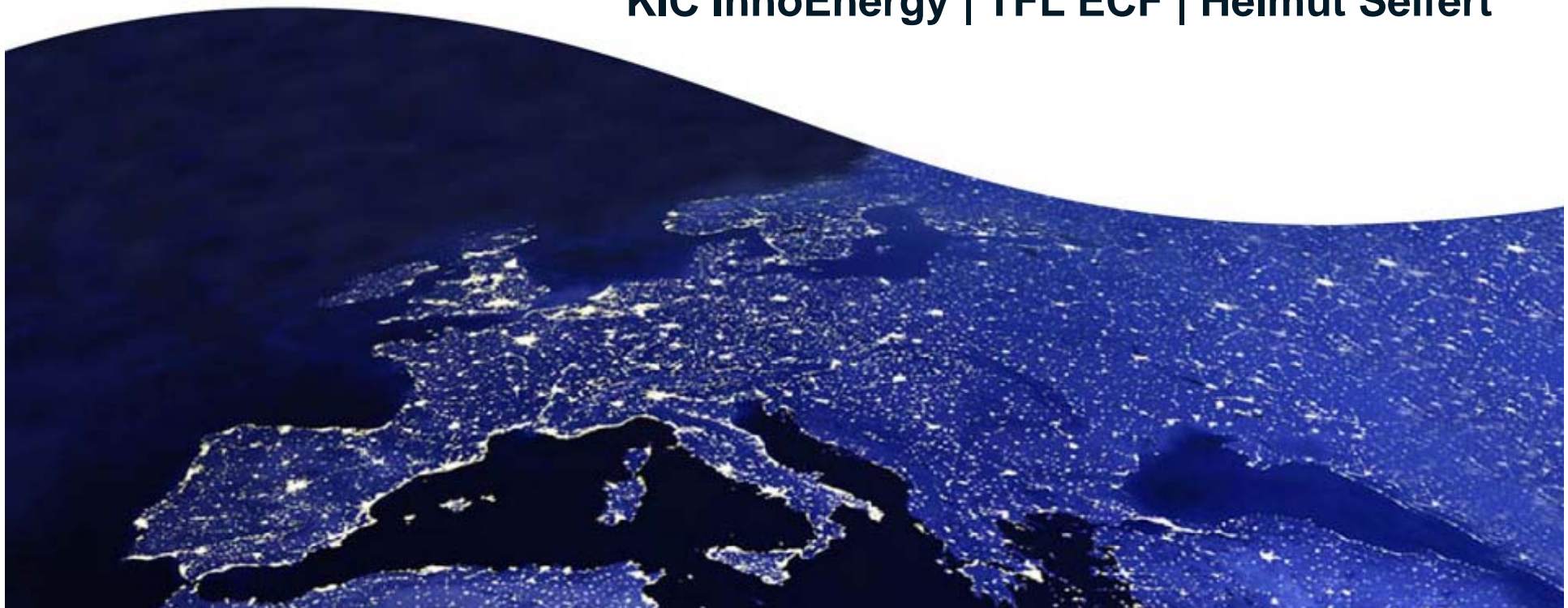
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## Energy from Chemical Fuels @ KIC InnoEnergy

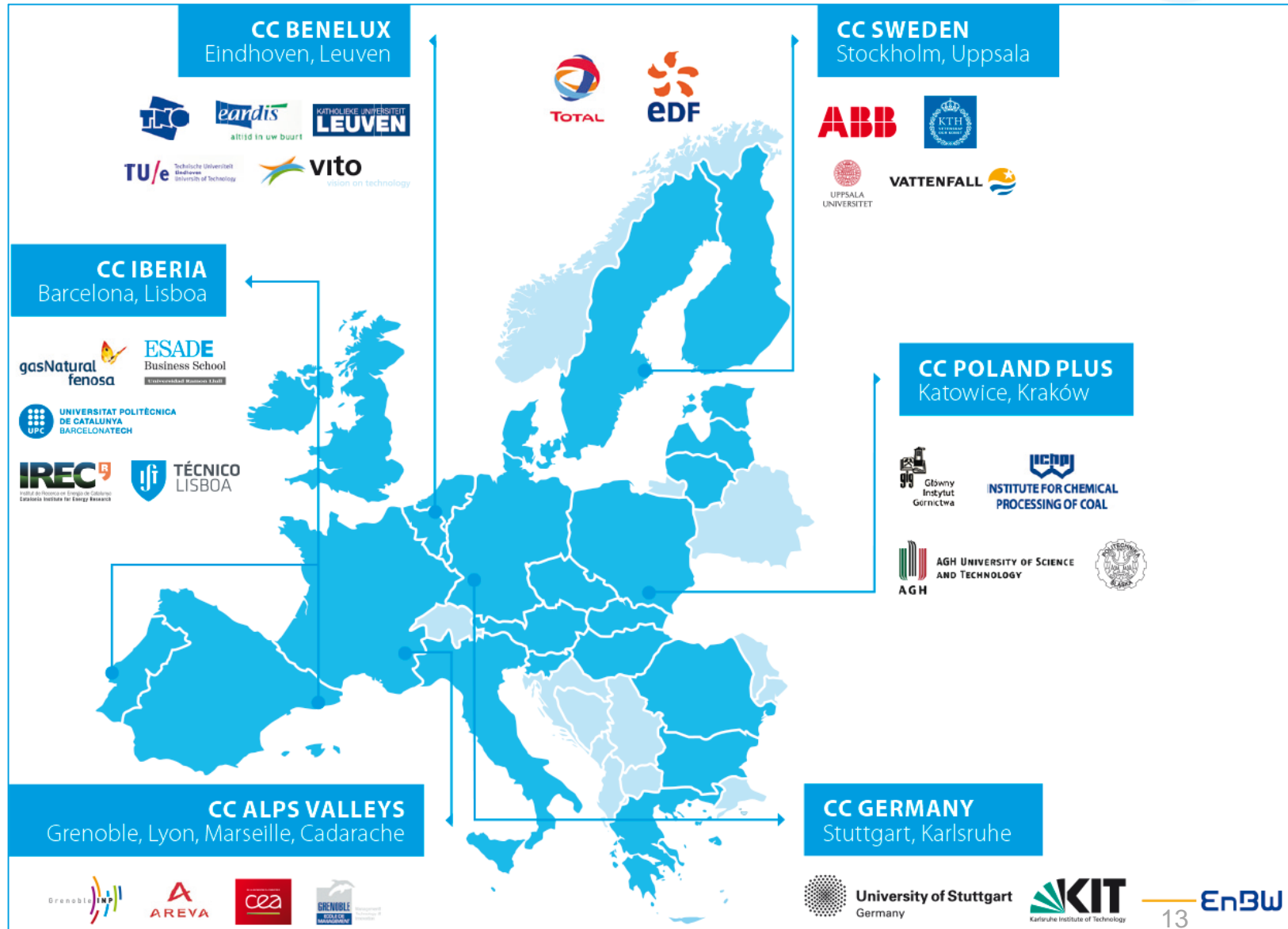
3<sup>rd</sup> Energy from Chemical Fuels Conference

5<sup>th</sup> October 2015, Frankfurt am Main, Germany

**KIC InnoEnergy | TFL ECF | Helmut Seifert**



# KIC InnoEnergy SE: owned by leading industries, research organisations and industries of the European energy system





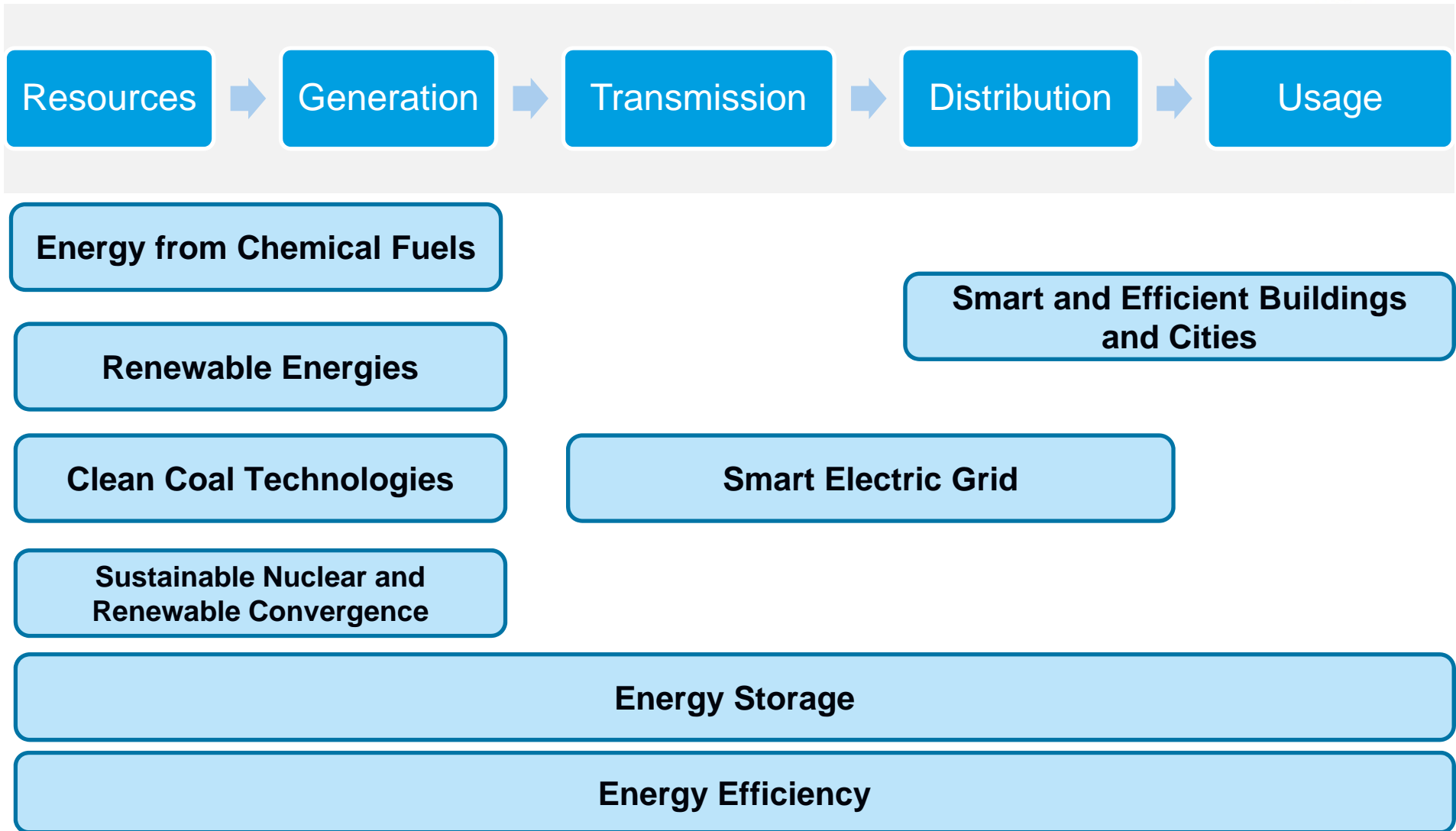
## KIC InnoEnergy SE – European Company

- we invest
  - in innovative business ideas in the area of sustainable energy
  
- we make
  - brilliant ideas marketable and profitable
  - young and established businesses successful
  
- we offer
  - investment, financial support
  - know-how transfer
  - active support on the way to commercial success
  - access to an international business network
  - partnership, without any financial risk for the participants
  - application-oriented education programmes for entrepreneurs in the energy market

**Sustainability** by fulfilling at least one of the three objectives:

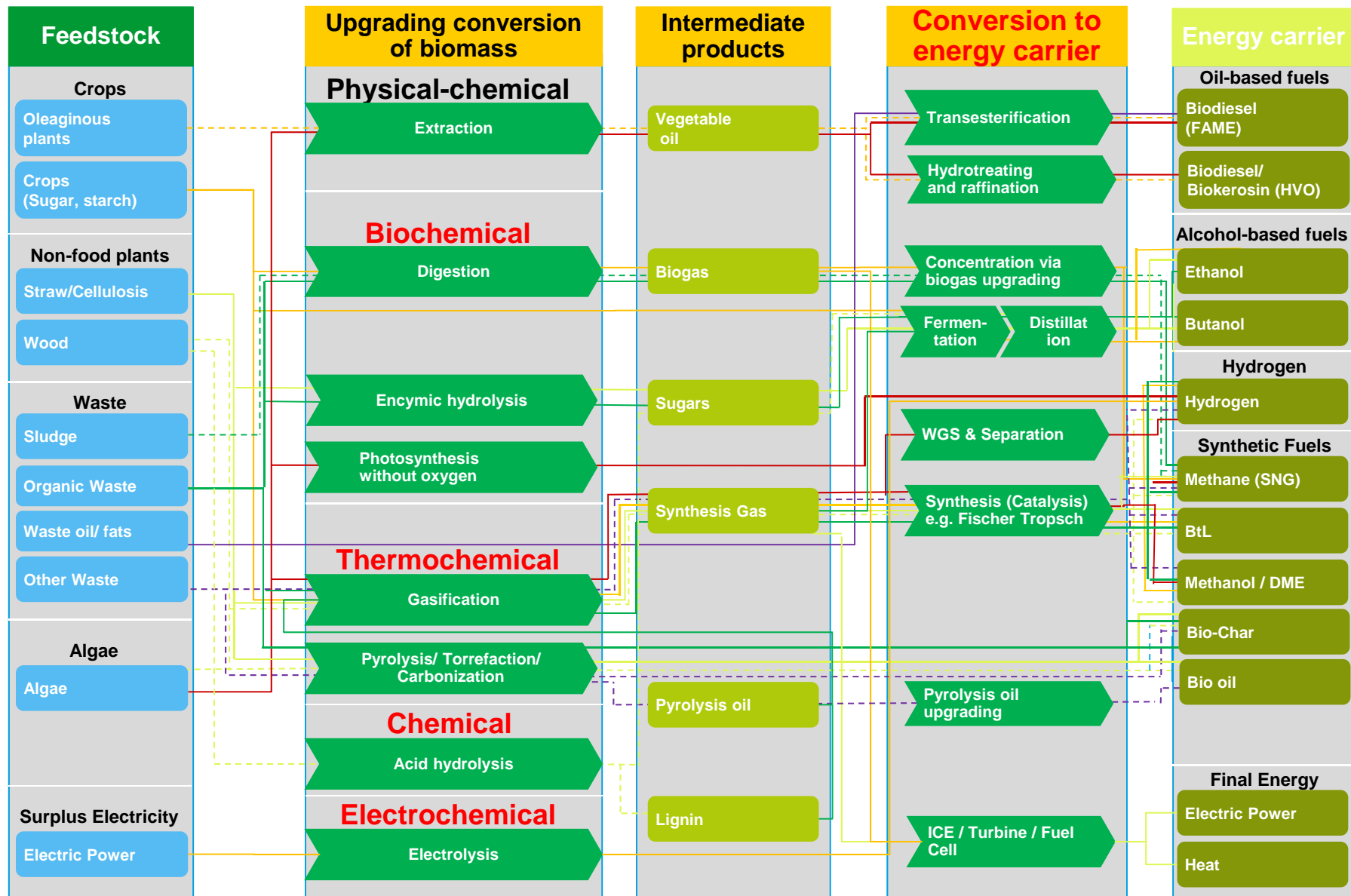
- Reducing the cost in the energy value chain
- Increasing the energy security
- Reducing CO<sub>2</sub> and other green house gas emissions

# KIC InnoEnergy covers the whole value chain





# Conversion routes from biogenic resources





**[www.kic-innoenergy.com](http://www.kic-innoenergy.com)**

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