Výběr z prezentací konference

3rd Annual European Biofuel

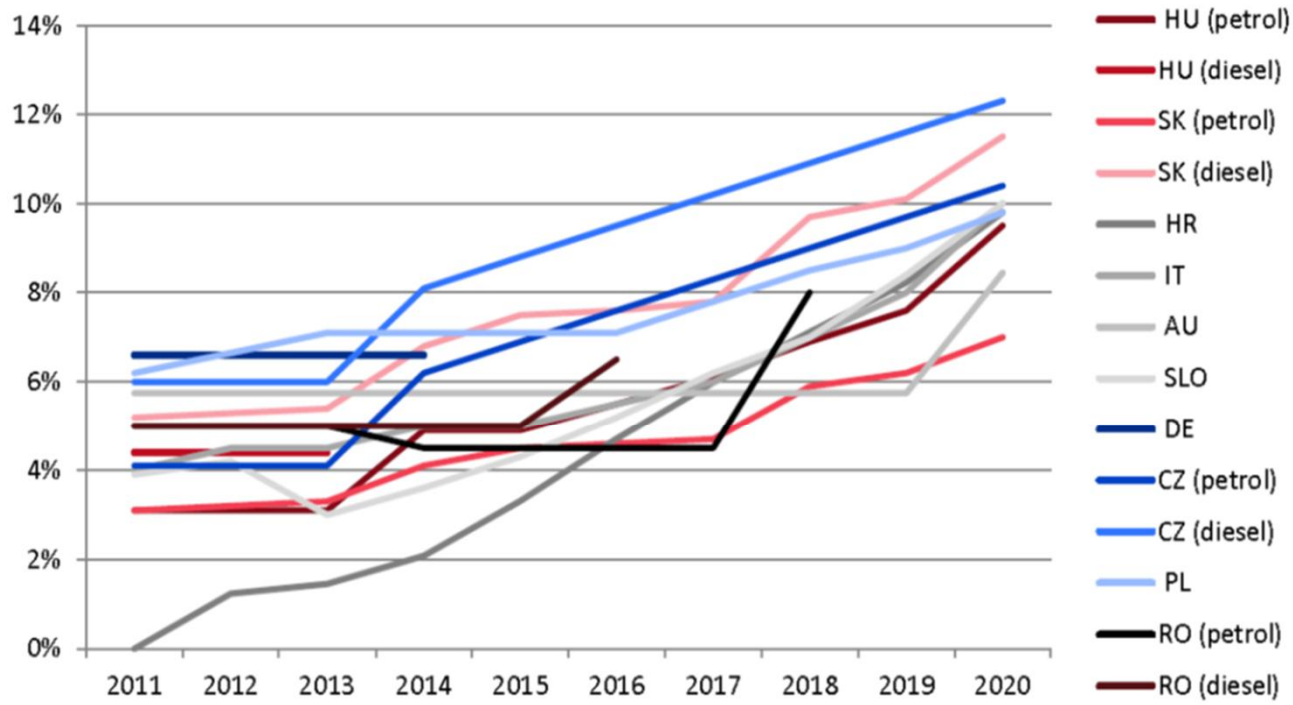
June 17-18, 2014, Prague

Zpracoval: Ing. Jaromír Hynek

Major biofuel related challenge for a refinery [especially in the CEE region] is the fragmented regulatory environment

Biofuel obligation in some of the CEE countries – There are no two identical …

	Obligation type	Fuel and % type
HU	pooled	Gasoline (e%)
		Diesel (e%)
SK	liter by liter	Gasoline (v%)*
		Diesel (v%)
HR	pooled	e%
IT	pooled	e%
AU	pooled**	e%
SLO	pooled	e%
DE	pooled	v%
CZ	pooled	Gasoline (e%)
		Diesel (e%)
PL	pooled	e%
RO	liter by liter	Gasoline (v%)
		Diesel (v%)



Blending and logistics

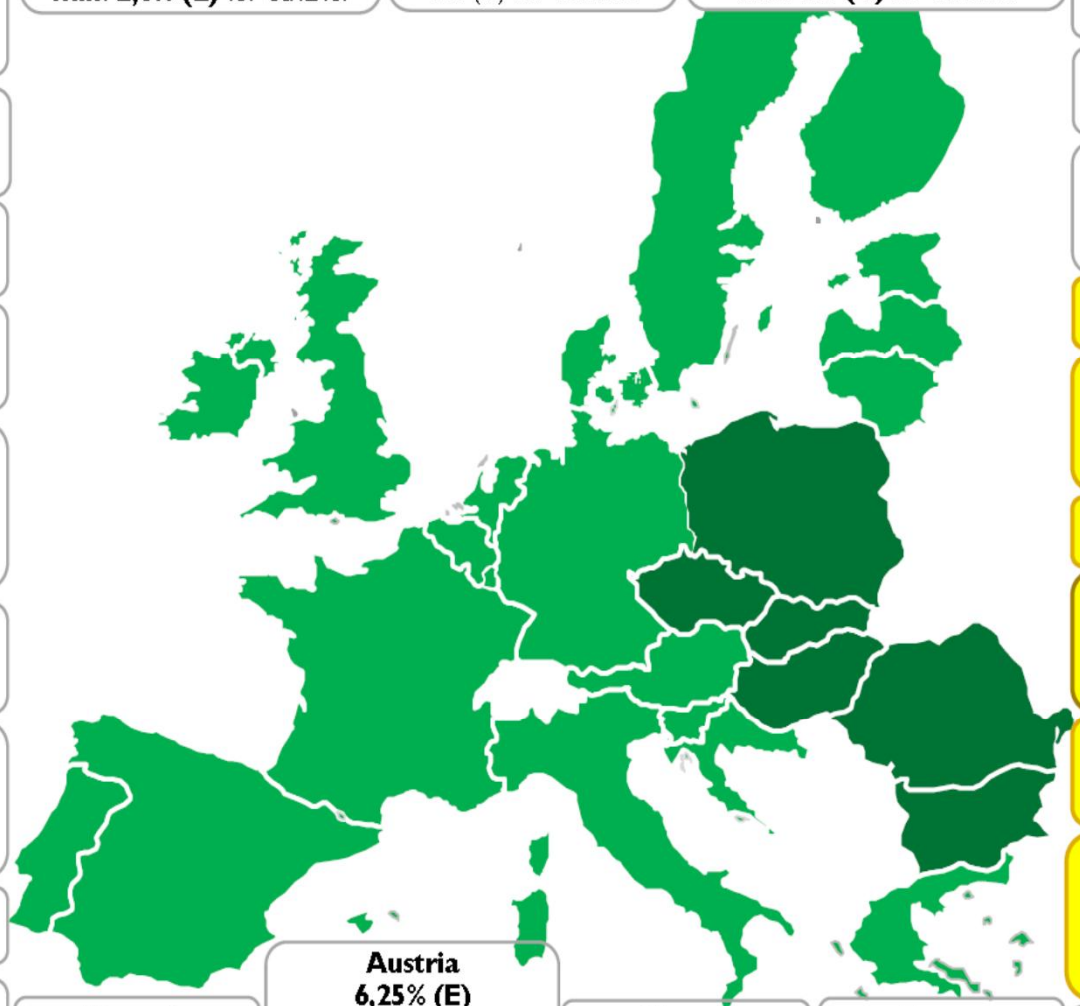
- Refinery **optimisation is significantly hindered** by fragmented bio obligations
- Very **complex and flexible logistic system** is required

(Un)expected game changers

- Increasing significance of **waste based biofuels**
- Increasing obligation can result the need of **higher blending walls** (E10, B10 etc.)
- **Uncertain regulatory envir.** (i.e.: ILUC, GHG)

Mandatory targets in CEE vs rest of EU

CEE countries- not top of the class but not stragglers



Belgium
4% (V)

Luxemburg
2% (E)

Netherlands
7.63% (E)

Ireland
6% (V)

UK
5% (V)

France
7.70% (E) for biodiesel
7% (E) for ethanol

Portugal
7% (V)

Spain
4,10 % (E)
min. 4,10% (E) for biodiesel
min. 3,90% (E) for ethanol

Malta
4,5% (E)

Italy
4,50% (E)

Germany
6,25% (E)
min. 4,4% (E) for biodiesel
min. 2,8% (E) for ethanol

Denmark
5.75% (E)
7% (V) for biodiesel
7% (V) for ethanol

Sweden
(from May'14)
min. 10% (V) for biodiesel
min. 5% (V) for ethanol

Finland
6% (E)

Estonia
5.75% (E)

Latvia
5,00% (V) for biodiesel
5,00% (V) for ethanol

Lithuania
5.75% (E)
5,00% (V)for biodiesel
5,00% (V) for ethanol

Poland
7,10% (E)

Czech Republic
5.75% (E)
6,00% (V)for biodiesel
4,10% (V) for ethanol

Slovakia
5,75% (E)

Hungary
4.40% (E)

Romania
5.00% (V) for biodiesel
4.50% (V) for ethanol

Bulgaria
5,75% (E)
5% (V) for biodiesel
4% (V) for ethanol until Sep'14
6% (V) for ethanol after Sep'14

Croatia
2.48% (E)

Slovenia
5% (E)

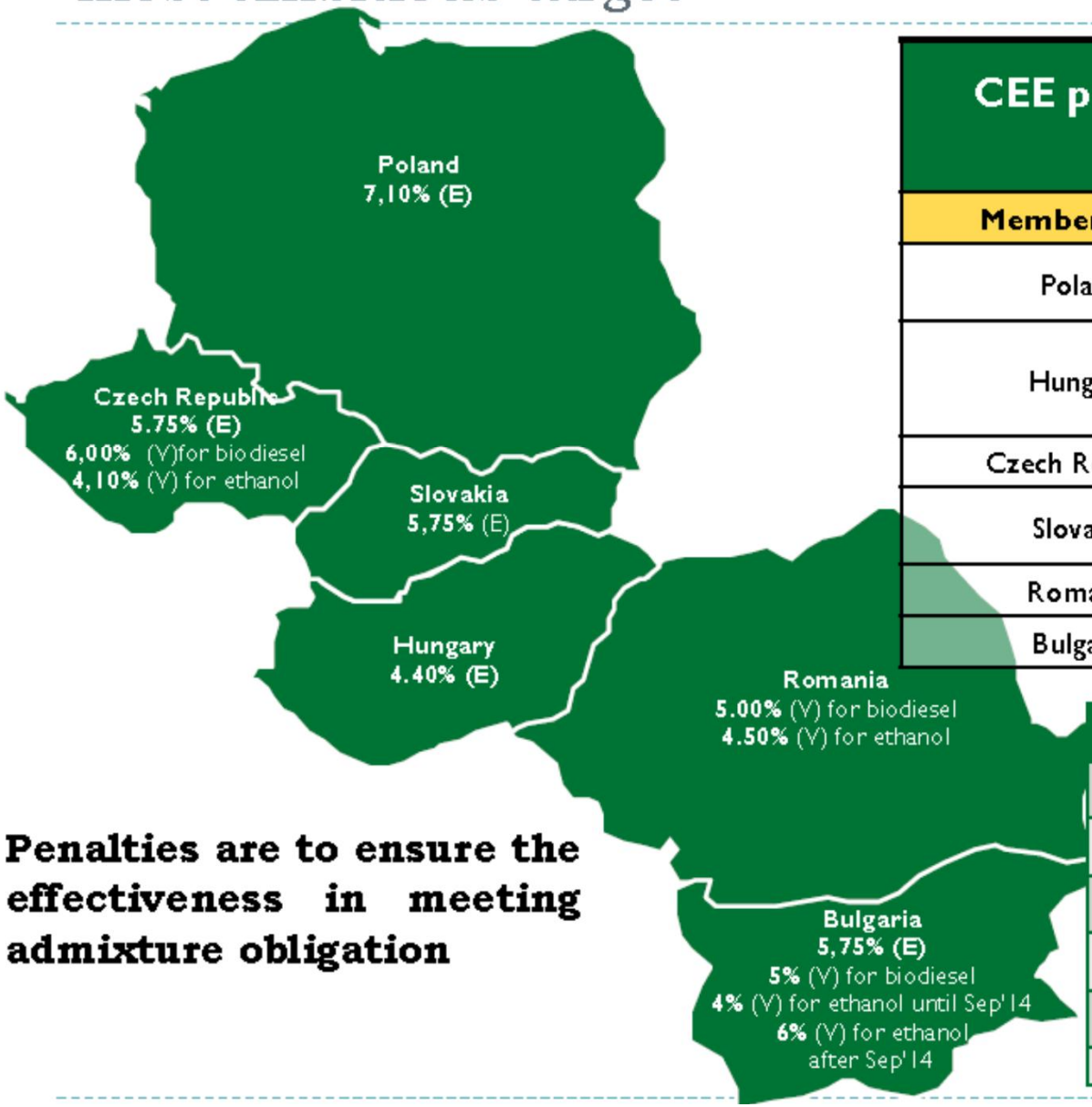
Austria
6,25% (E)
6,3% (E) for biodiesel
3,4% (E) for ethanol

Cyprus
2,5% (E)

Greece
5,75% (E)

CEE Mandatory targets and penalties

Poland and Hungary as most rigorous, Poland with the most ambitious target



Penalties are to ensure the effectiveness in meeting admixture obligation

CEE penalties for not fulfilling the biofuels mandate	
Member state	**Penalty**
Poland	~4100 EUR/Cbm of Ethanol or ~4100 EUR/Mt of Biodiesel
Hungary	~0.11 EUR/MJ ~2270 EUR/Cbm of Ethanol or ~4497 EUR/MT of Biodiesel
Czech Republic	1.50 EUR/litre of Biofuel
Slovakia	no penalty (tax concessions are available)
Romania	up to 3540 EUR fine
Bulgaria	up to 10'000 EUR fine

National mandates starting period:	
Poland	January 2008
Czech Republic	September 2007
Slovakia	January 2007
Hungary	June 2009
Romania	July 2007
Bulgaria	January 2008

UPM Lappeenranta Biorefinery commissioning in summer 2014

The Biofore Company UPM

Commercial scale investment

- 150 MEUR investment
- 100 000 tons/a of renewable diesel
- 150 UPM patents & applications
- Commissioning in summer 2014
- Employs 200 persons
- Contributes to 25% of Finland's 2020 biofuel target

A global production capacity of more than 2,500 ML/year of bioethanol

2nd generation bioethanol from biomass

- Location: US (2014)
- 95 ML/year from agricultural waste

Other examples

- Location: Spain (2008)
- 200,000 t biodiesel

- Location: Netherlands (2010)
- 480 ML/year 360,000 t DDGS (Dried Distillers Grains with Solubles)
- **Largest biofuel plant in Europe**

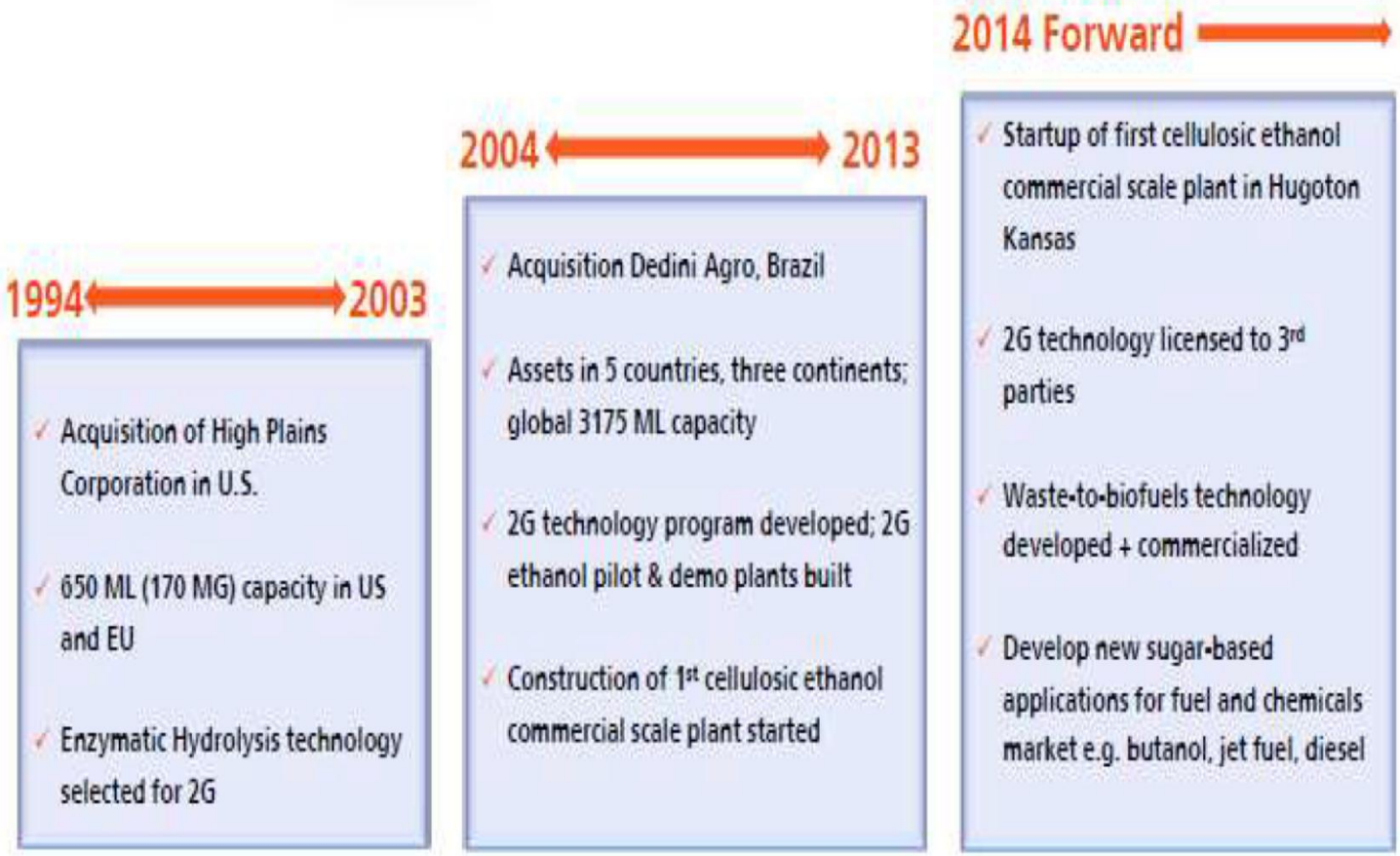
- Location: US (2010)
- 333 ML/year, 230,000 t DDGS

- Location: Uruguay (2015)
- 70 ML/year, 49,000 t of DDGS

ABENGOA

Abengoa Bioenergy Evolution

Abengoa has developed simultaneously its 1G and 2G business since 1994



ABENGOA

Main Installed Cap

Significant Installed capacity in first and second generation

York, NE
208 ML
since 2001

Colwich, KS
95 ML
since 2001

Portales, NM
114 ML
since 2001

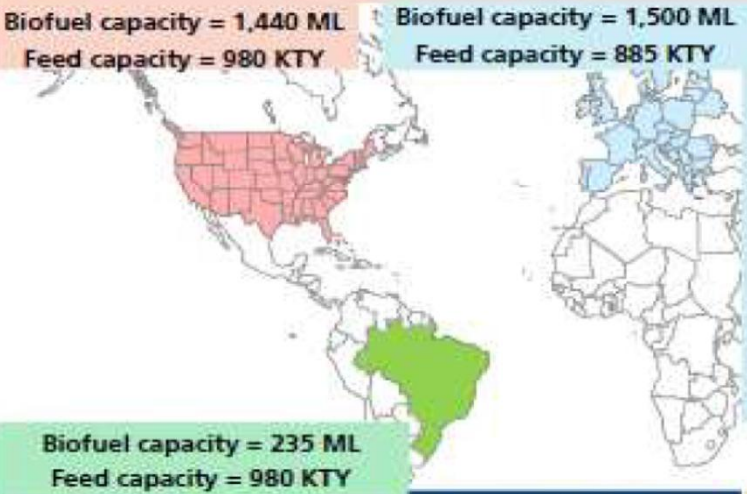
Ravenna, NE
341 ML
since 2007

Evansville, IN
341 ML
since 2011

Granite City, IL
341 ML
since 2011

Biofuel capacity = 1,440 ML
Feed capacity = 980 KTY

Biofuel capacity = 1,500 ML
Feed capacity = 885 KTY



Cartagena, Sp
150 ML
since 1999

La Coruña, Sp
195 ML
since 2001

Salamanca, Sp
200 ML
since 2006

Lacq, FR
250 ML
since 2007

Cadiz, Sp
225 ML
since 2009

Rotterdam, NE
480 ML
since 2010

Biofuel capacity = 235 ML
Feed capacity = 980 KTY

Sao Luis, SP
91 ML
since 2007

Sao Joao, SP
144 ML
since 2007

San Antonio de Posse (SAP), SP
0.3MT
since 2011

Camilo Ferrari, SP
0.3MT
since 2011

Global production	
Ethanol (ML):	2,950
Sugar (KTPY):	570
Feed (KTPY):	1,865
Electricity (MW):	259
Biodiesel (ML):	225
Corn oil (Kt)	30

2G Assets

Commerical biomass plant Hugoton (KS, US)
95 ML
2013e

Biomass demonstration plant in BCyL (Salamanca, Spain)
5ML
since 2009

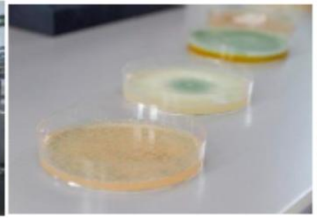
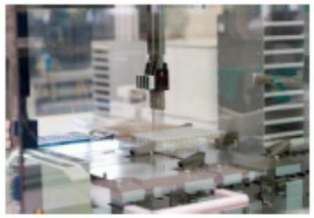
Biomass pilot plant in York (NE, US)
0.1 ML
since 2007

CLARIANT

Munich & Straubing – the two Biotech & Renewables sites

Munich
- Since 2006
- 79 employees
- Main Research & Development Center
- Lab and office space: 3,300 m²
- Pilot plant since 2009

Straubing
- Since 2011
- 16 employees
- sunliquid demonstration plant
- Area: 2,500 m²


CLARIANT

Status of cellulosic ethanol development (sunliquid®)

2006
Start of the development (Süd-Chemie)

2009
Pilot plant operational, capacity 1t/a

2012
Demo plant in Straubing (DE) operational

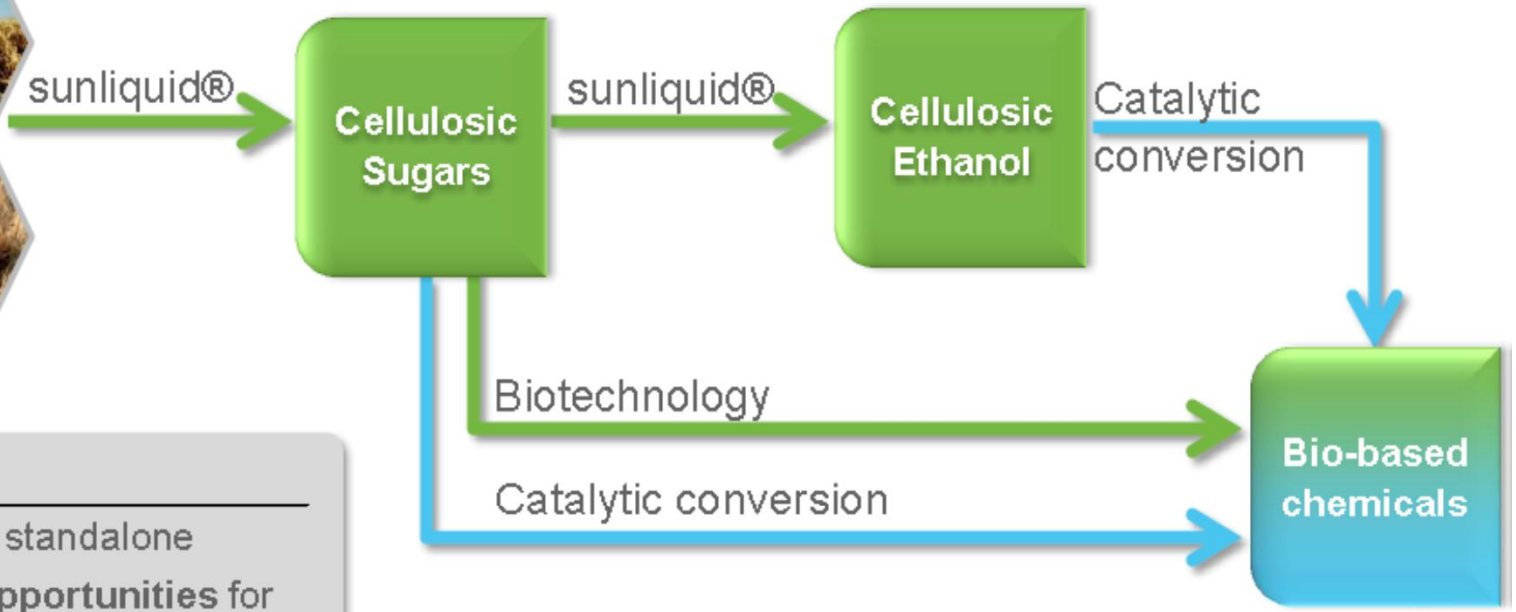
2013
ISCC certification
License package ready

2014
Fleet test E20 with Mercedes-Benz

Next step
First commercial production plants

CLARIANT

sunliquid® is the ideal technology platform for highly sustainable bio-based products

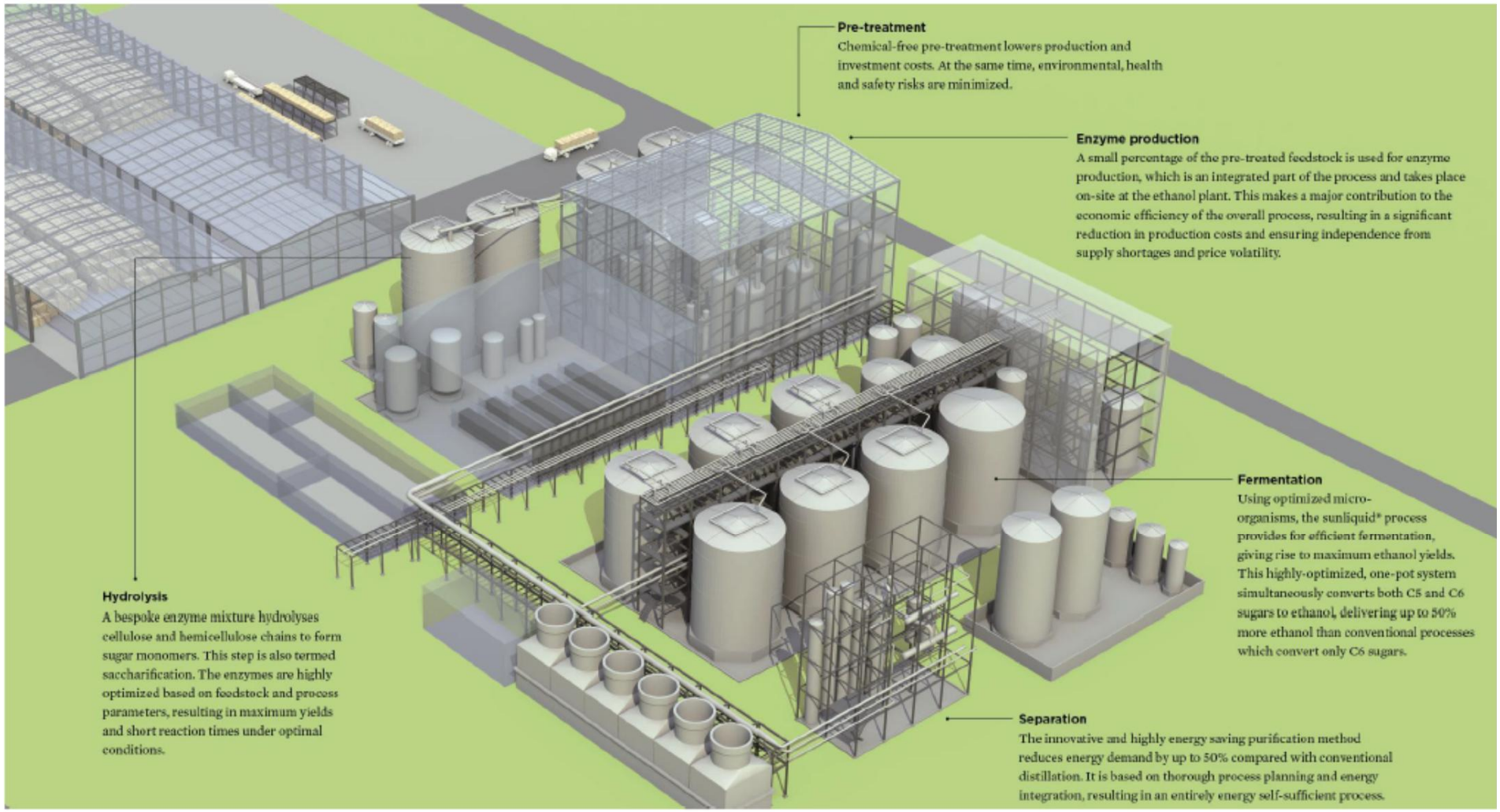


sunliquid®

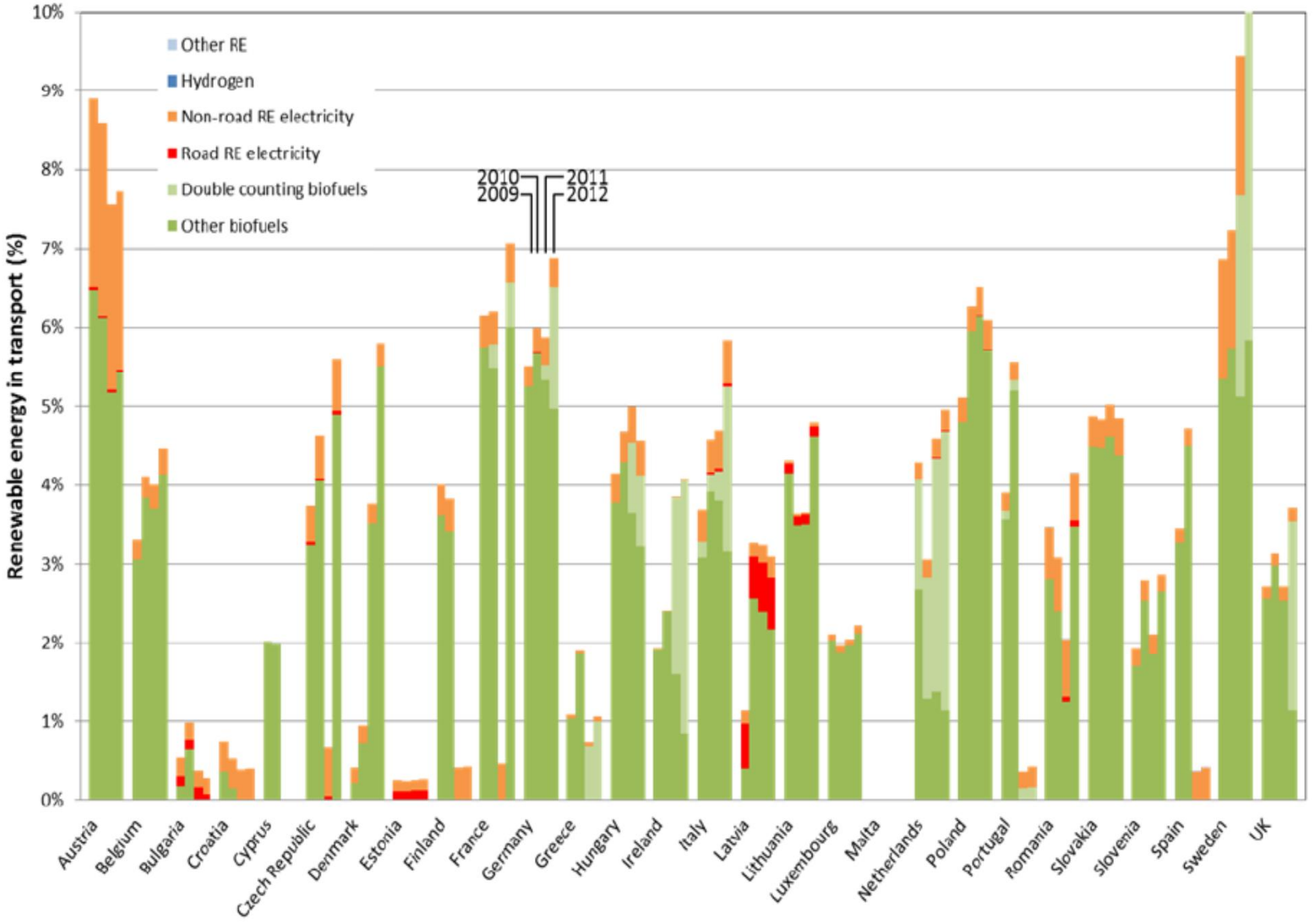
- **Sugar platform** standalone
- **Development opportunities** for biobased products
- **Extensive know-how** in biocatalysis, strain optimization and heterogenous catalysis

CLARIANT

Scheme of commercial scale plant



EU transport renewables in 2012



ILUC proposal

	Commission's Proposal October 2012	European Parliament , first reading 11 September 2013	Council's position 13 June 2014
Cap	**5%** - food-crop based biofuels	**6%** - land based (food and energy crops)- FQD and RED >6% ≠ sustainable	**7%** - food-crop based
Sub-targets		**2.5%** advanced biofuels, (0,5% by 2016) **7,5%** renewables in petrol	Non-legally-binding sub-target of **0,5%** advanced biofuels (excl. UCO/ TME)
Multiple counting	**2x** – non-food cellulosic material and ligno-cellulosic material **4x** – non-land based biofuels	**1x** – waste and residues, cascading principle **2x** - UCO and animal fat, cannot be counted towards 2,5% sub-target **4x** – algae, RE of non-biological origin; CCU for transport	**2x** – non-food cellulosic material and ligno-cellulosic material, incl. UCO and animal fats **5x** - RES_E in road transport (2,5% - now) **2,5x** – RES_E in non-road
ILUC factors	Reporting for information purpose in FQD and RED	ILUC-factors in the FQD accounting as of 2020 o be accounted towards **6% GHG target** under FQD. By 2016: review of ILUC values	Reporting for information purpose in FQD and RED, including a range. December 2017: review of both, effectiveness of measures and best available science on ILUC factors

Long term growth is broadly expected, but projected future supply will come from non-food based biofuels

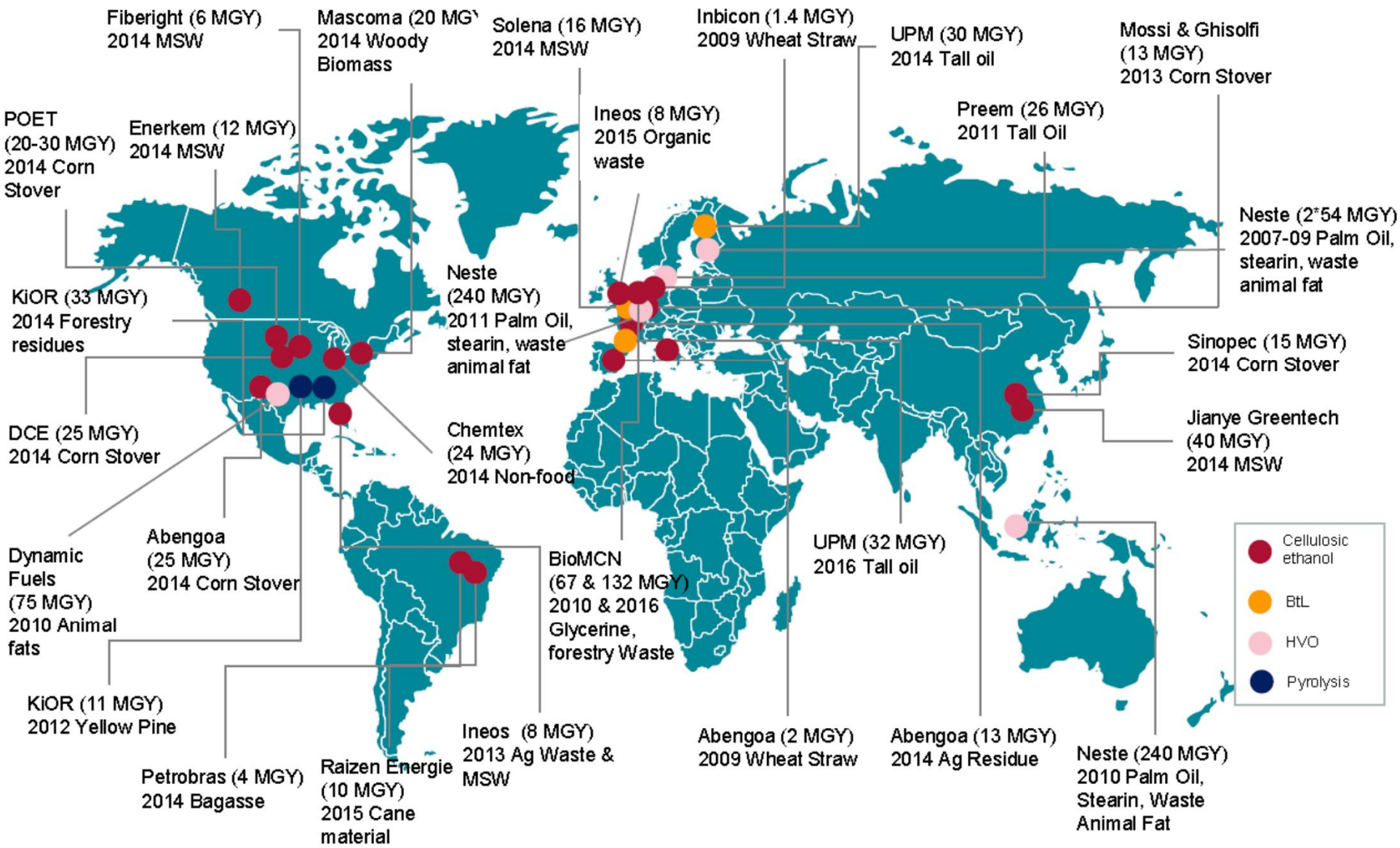
Demand by scenario (mb/d	2000	2012	New Policies		Current Policies		450 Scenario	
			2020	2035	2020	2035	2020	2035
OECD	44.6	40.8	39.4	32.8	40.1	37.1	38.0	24.9
Non-OECD	26.5	39.6	48.3	59.2	49.2	64.2	45.6	45.6
Bunkers	5.2	7.0	7.8	9.3	7.8	9.7	7.5	7.7
World Oil	**76.3**	**87.4**	**95.4**	**101.4**	**97.1**	**111.0**	**91.1**	**78.2**
World biofuels	0.2	1.3	2.1	4.1	1.9	3.3	2.6	7.7

- Market potential: according to the latest IEA WEO, biofuels use more than triples in the New Policies Scenario, to 4.1 mboe/d in 2035 (market equating to ~$140bn pa (@$0.6/litre)).
- Biofuels meet 37% of road fuel demand in 2035 in Brazil, 19% in US and 16% in EU.
- Legislative support remains, focus on advanced biofuels.
- Governments appear committed to biofuels - looking for supply to come from advanced (non-food based crops) with v specific targets and support mechanisms.

Drivers remain the same:

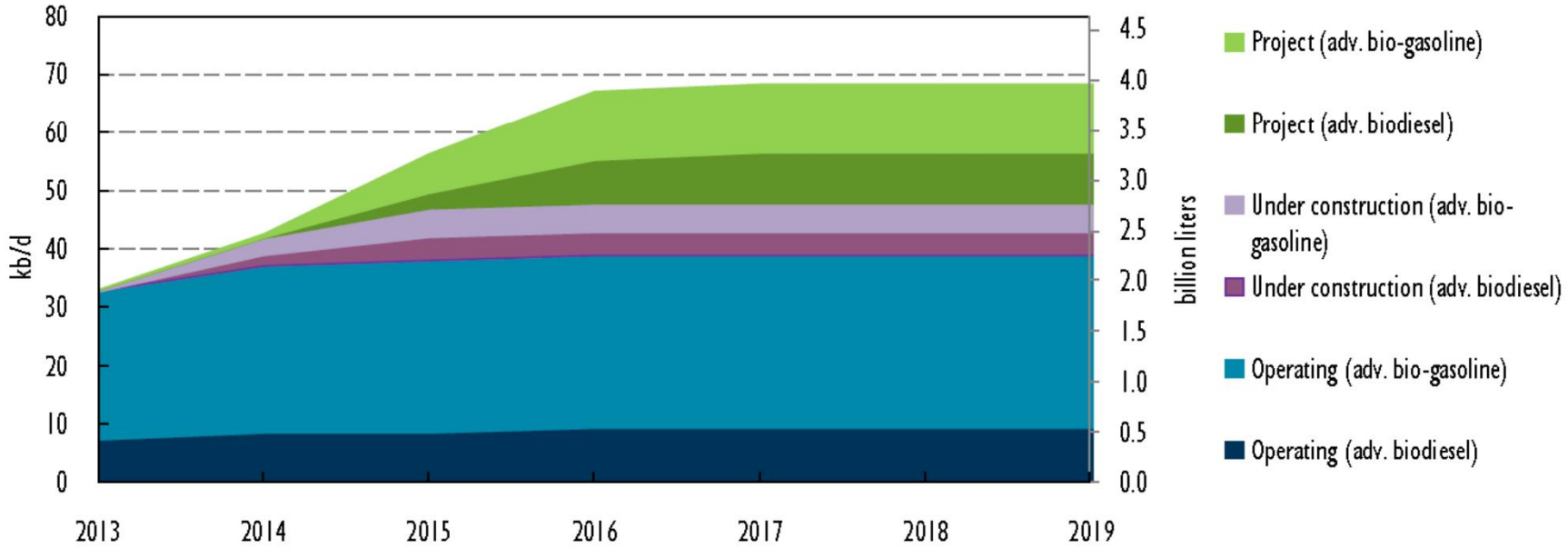
- Government have concluded that biofuels offer one of the few solutions to decarbonising the transport sector, whilst supporting economic development and energy security.
- Whilst electric vehicles, natural gas and other renewable transport fuels will all play a part in the overall solution, biofu represent the main technology available at **reasonable scale** and **cost** in the **medium term**.
- As you move from geography to geography the reasons are always the same – a wish for energy security, economic development or carbon reduction - it is just the emphasis that changes.

Hope springs eternal: Selected active and planned advanced biofuel plants worldwide (Existing / Planned)



Source: Ethanol Producer magazine, BNEF

Advanced biofuels expand - slowly



Note: Does not include hydrotreated vegetable oil (HVO)

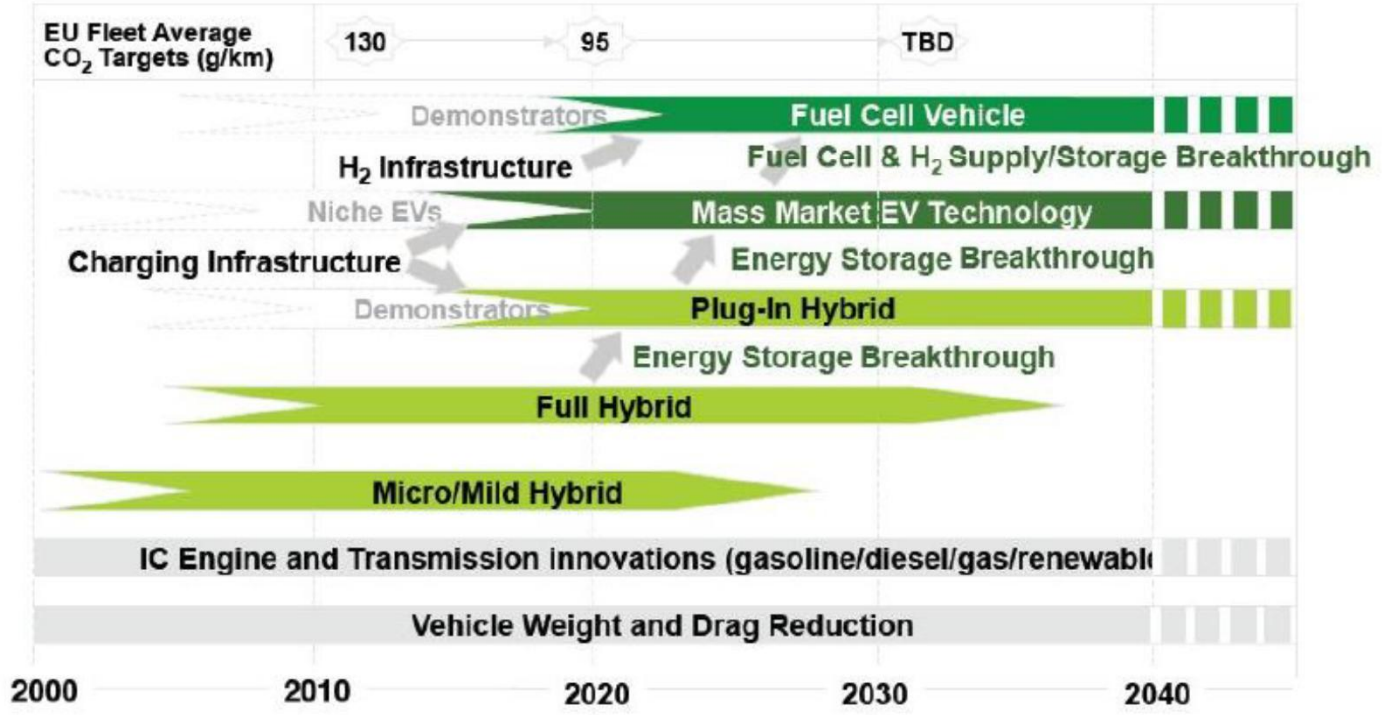
- **Industry currently enters large-scale production with first commercial plants coming online**
- **Operating capacity at 2 billion litres in 2013 could grow to 4 billion litres (65 kb/d) in 2019**
  - → **However: projects continue to get cancelled, or companies go bankrupt**
- **Perceived investment risk is most important barrier to more rapid deployment**
  - → **long-term policy framework is needed to spur growth**

Biofuels production falling behind targets of IEA Biofuel Roadmap

- In a low CO2 scenario (IEA 2°C Scenario) biofuels' share in total transport increases to 27% in 2050
- Advanced biofuels play key role → only low-carbon fuel alternative for long-distance, heavy transport modes
- Without significant improvements of the policy framework for advanced biofuels, targets in the 2DS will not be met!

Existing roadmaps: focus on powertrain and efficiency technologies but lack a cross-cutting view on fuels

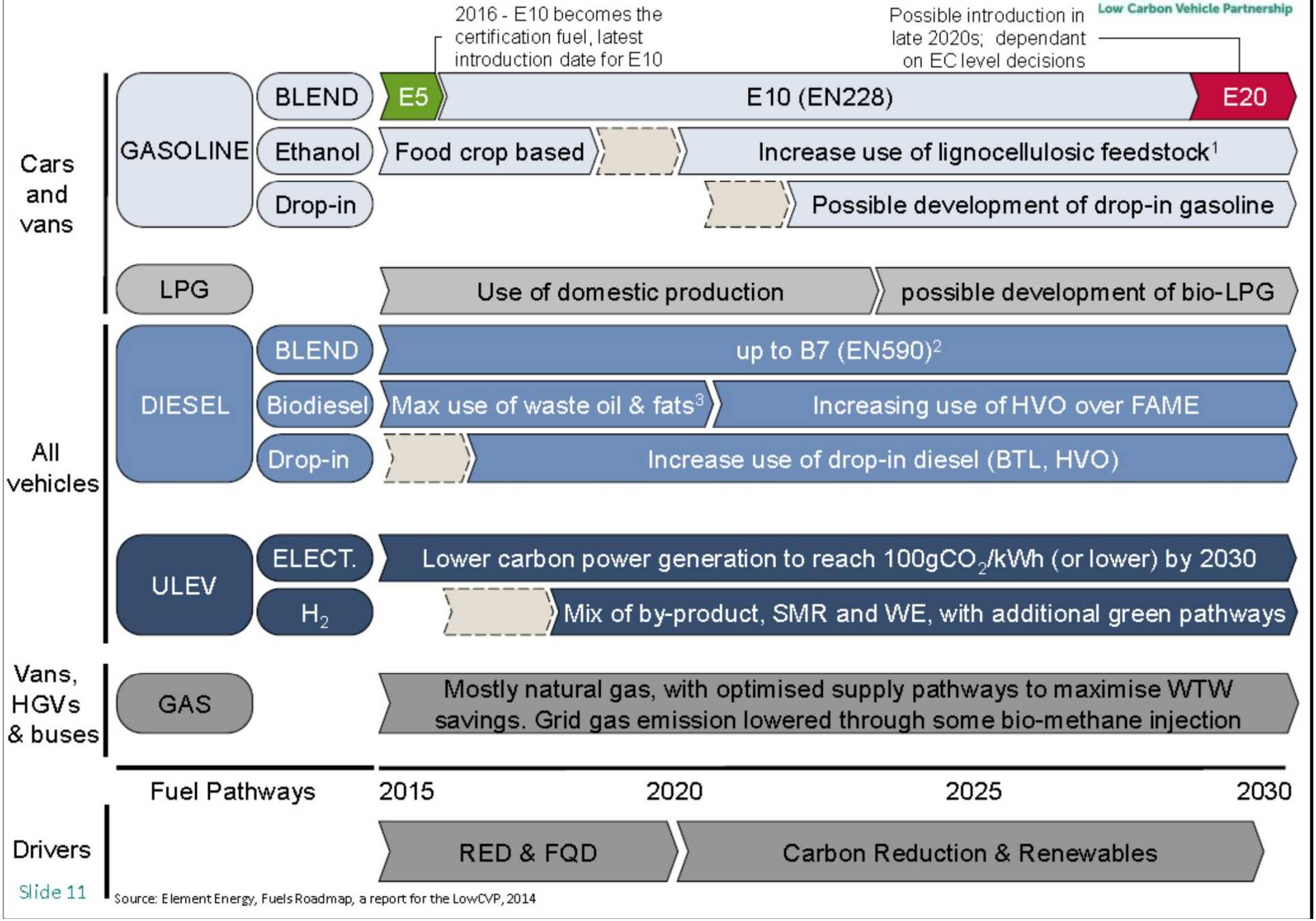
Passenger Cars Roadmap
Source: Auto Council



- **Efficiency improvements, driven by EU level tailpipe emissions** targets and air quality regulations, underpin the roadmap.
- The **2020-2030 period is the decade when EVs (PHEVs, BEVs and/or FCEVs) become a mainstream** offer – under energy storage breakthrough condition, assuming adequate grid capacity. Development of these technologies driven by the need to meet the long term EU CO_2 targets[1].
- The **EC transport goals are also expected to become a driver for Zero Emission Vehicles**, e.g. CO_2-free city logistics in major urban centres by 2030 and phasing out conventionally fuelled cars in cities by 2050[2]

1 – A Roadmap for moving to a competitive low carbon economy in 2050, 80%-95% GHG emission reduction by 2050 compared to 1990

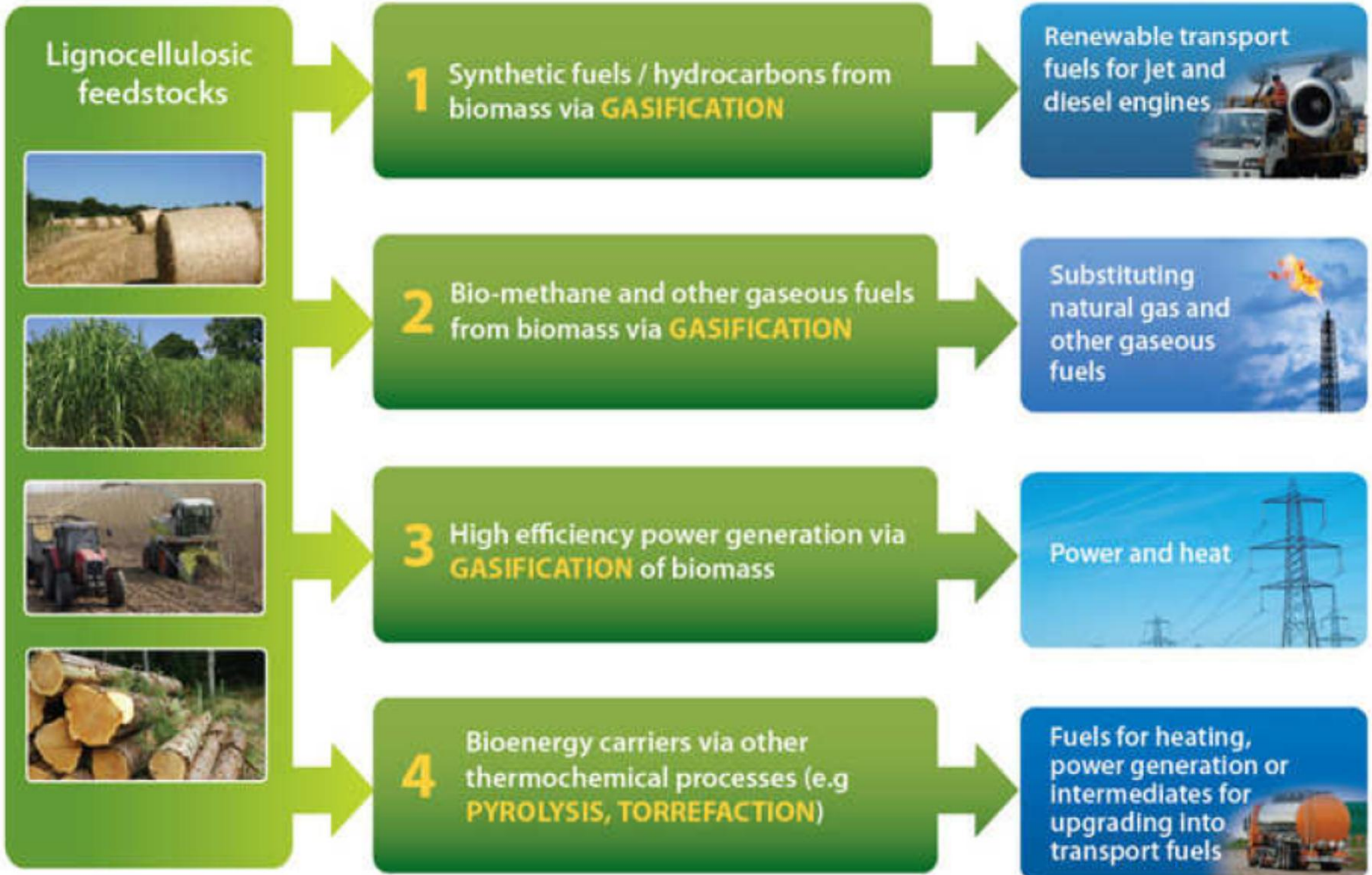
Fuel roadmap, including fuel types and blends fulfils this objective



Source: Element Energy, Fuels Roadmap, a report for the LowCVP, 2014

European Biofuels
TECHNOLOGY PLATFORM

Value Chain 1-4 (Thermo-chemical)



Source : EBTP

1. Synthetic fuels (oxygenates or Hydrocarbons) through gasification

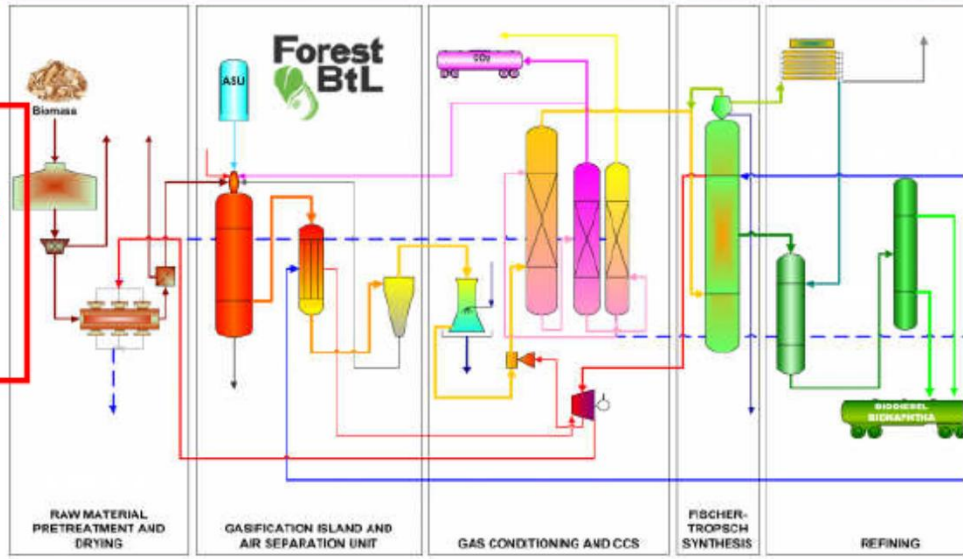
The Forest BtL Project, FI

480 MW_t / FT products / 2016-17

Gasification technology: Carbo-V

88 million € *NER300 grant*

FEED contract for Gasification, gas cleaning, synthesis and OSBL signed.



Forest BtL flowshee

Bioliq® Project, DE

2 MW_t / Synthetic Gasoline / 2013

Pyrolysis and gasification in oper.
Synthesis in commissioning

Fast pyrolysis of straw+Gasification (5MW_t) + DME/gasoline synthesis

European Biofuels TECHNOLOGY PLATFORM

1. Synthetic fuels (oxygenates or Hydrocarbons) through gasification

Chemrec Projects, SE

a. BioDME project

~3 MW_t / DME / 2011

b. Domsjö and Vallvik mills

~200 MW_t / Methanol and DME / **On hold** (Currently awaiting new national regulation on biofuels)

Proposed Domsjö Site

The BioDME Project

Pilot tests in Chicago at GTI

UPM Project

a. Pilot testing at GTI, Chicago, USA

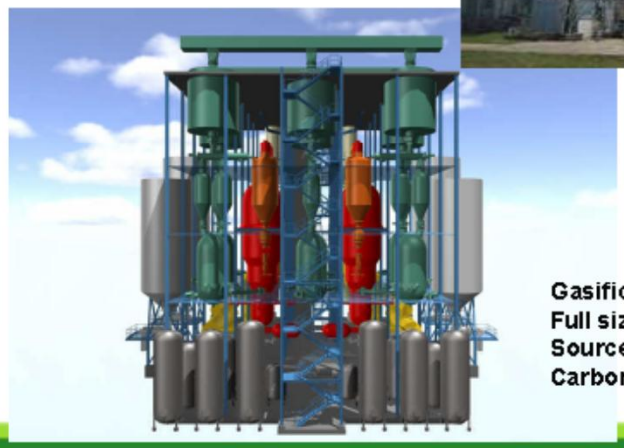
~5 MW_t / syngas production / Ongoing

b. Commercial Demonstration, FR

~300MW_t / FT products(100 000 t/a) /

Investment decision by 2014;

170 million € *NER300 grant*



Gasification Module
Full sized plant
Source: UPM, Andritz, Carbona

1. Synthetic fuels (oxygenates or Hydrocarbons) through gasification

The Woodspirit Project, NL

Forest resid / Methanol / Dec 2016

>225 000 tpa Biometnanol

Biomass feedstock into entrained flow gasif.

199 million € *NER300 grant*

Consortiun of BioMCN, Siemens, Linde and VS Hanab

Site for the Woodspirit Plant

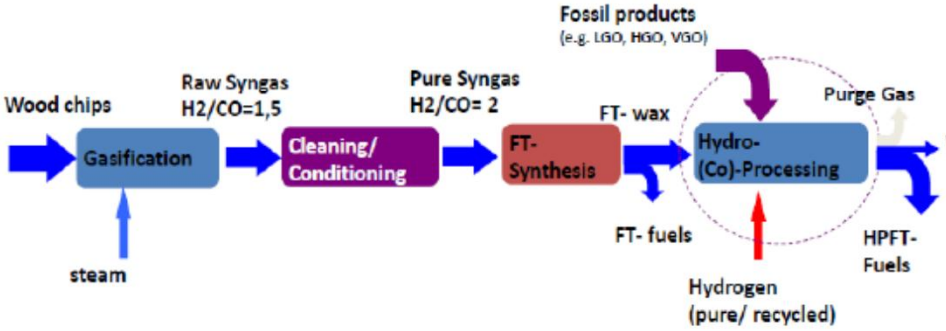
Güssing, AT

8 MW_t / Heat and Power / 2002

H&P plant but also test site for

FT, SNG, higher alcohols and H2

Güssing FT production flow scheme



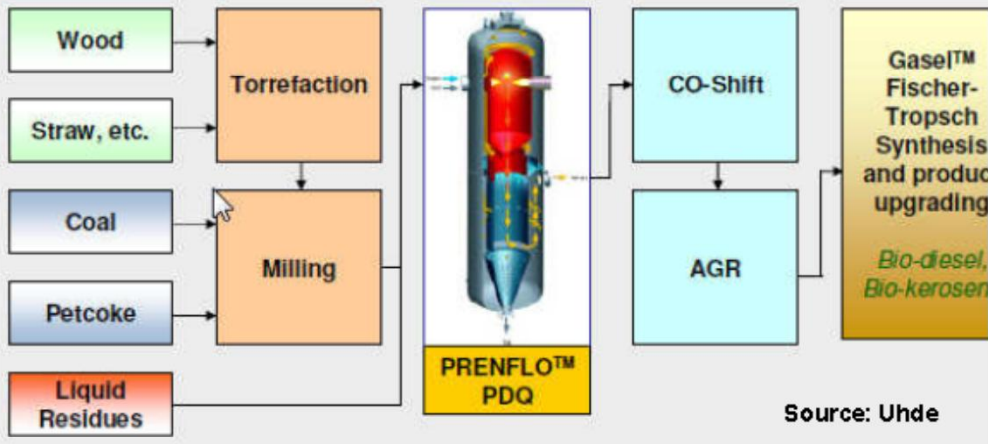
1. Synthetic fuels (oxygenates or Hydrocarbons) through gasification

BioTfueL Project, FR

~ 12 MW_t / FT products / 2014

Fuel mix of fossil and renewable

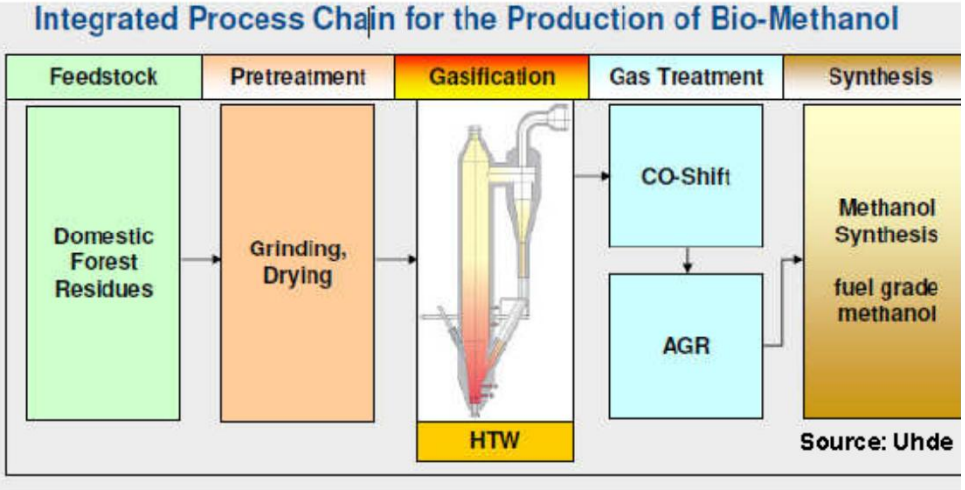
Including torrefied biomass



Värmlandsmetanol, SE

~ 111 MW_t / Methanol / 2017

CFB Gasification



2. Bio-methane through gasificatio

GobiGas – Gothenburg Energy, SE

a. Phase 1

Wood pellets / 20 MW_t of SNG / 2013

FICFB techn. (type Güssing)

b. Phase 2

Biomass / 80 – 100 MW_t of SNG / 2016 ?

59 million € *NER300 grant*

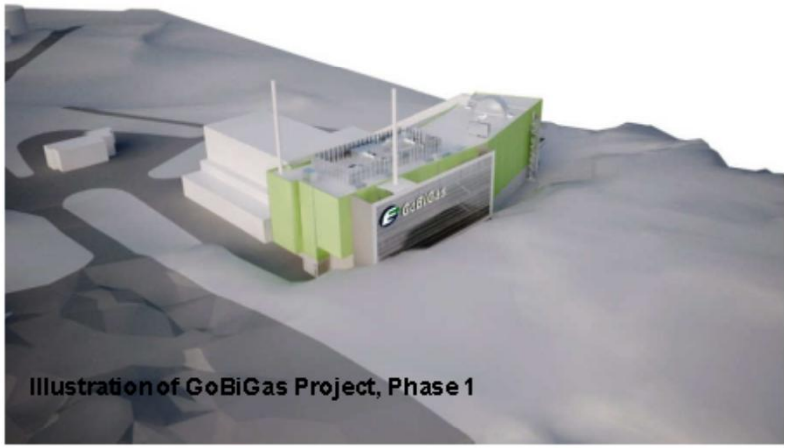


Illustration of GoBiGas Project, Phase 1

E.On Bio2G Project, SE

a. Pilot testing at GTI, Chicago, USA

~5 MW_{th} / syngas production / Ongoing

b. 1st Commercial plant, Landskrona or Malmö

~200 MW_{SNG}/ SNG / 2018

PreFEED performed - 4 years to plant completion after decision. Ccurrently awaiting new national regulation on biofuels.

European Biofuels
TECHNOLOGY PLATFORM

Value Chain 5-7 (Bio-chemical)

Lignocellulosic feedstocks

Sustainable energy crops

SUGARS

5 Ethanol and higher alcohols from sugar via **FERMENTATION**

6 Renewable hydrocarbons from sugar-containing biomass via **BIOLOGICAL PROCESSES** and/or **CHEMICAL PROCESSES**

Aquatic biomass (e.g. macroalgae, microalgae)

7 Bioenergy carriers from CO_2 and light through **MICRORGANISM-BASED PRODUCTION** and upgrading into transport fuels and valuable bioproducts

Main markets: Renewable transport fuels as gasoline components, E85

Main markets: Renewable transport fuels for jet and diesel engines

Source : EBTP

5. Ethanol and higher alcohols from sugars through fermantatio

Main cellulosic EtOH running demos (>1000 t/y) in EU

Plant Owner	Location	Input capacity (t/year)	Output capacity (t/year)
Clariant (ex Sud Chemie)	Straubing, Germany	Agriculture residues, wheat straw	1 000
Abengoa Bioenergy, Biocarburantes Castilla y Leon, Ebro Puleva	Babilafuente, Salamanca, Spain	25 000 t/year (barley/wheat straw, corn stover)	4 000
Inbicon (Dong Energy)	Kalundborg, Denmark	30 000 t/year (wheat straw, other lignocellulosics)	4 300
Chempolis	Oulu (Chempolis R&D Center), Finland	25 000 t/year (non-wood, non-food raw material) formicobio ™ process	running ?
Beta Renewables (JV Chemtex (M&G), TPG, Novozymes)	Crescentino, Italy	Non-food biomass (giant cane and wheat straw)	40 000

6. Hydrocarbons from biomass via Biological and / or chemical processes

Piteå, SE

Close to100 000 tpy / 2012
(capacity increase announced)

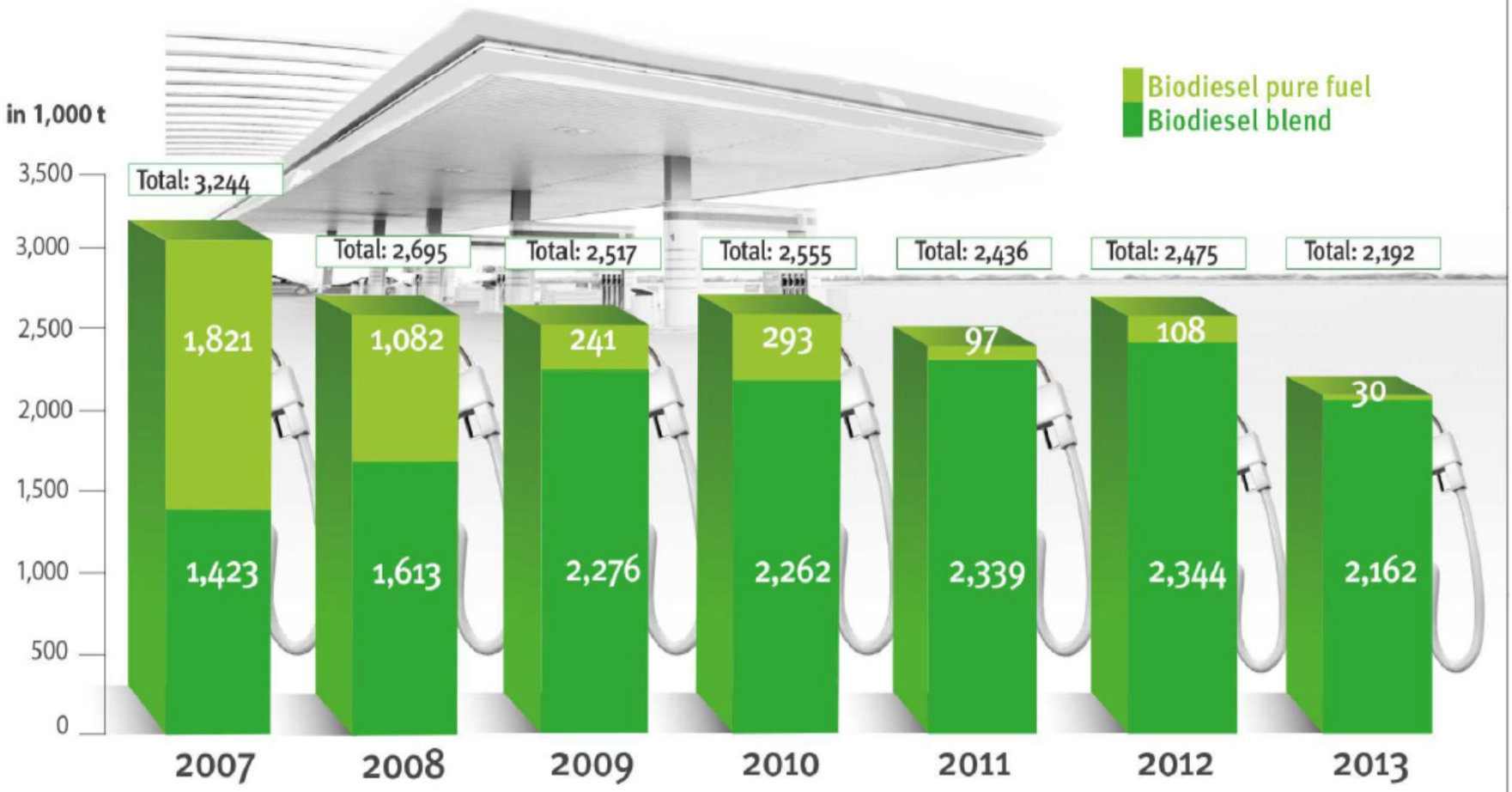
Tall oil (residue of chemical pulping)
via hydrotreatment to HQ diesel
using the Sunpine technology

Lappeenranta, FI

100 000 tpy/ 2014

Tall oil (residue of chemical pulping)
via hydrotreatment to HQ diesel
using the UPM BioVerno tecnology

Domestic Consumption of Biodiesel 2007–2013



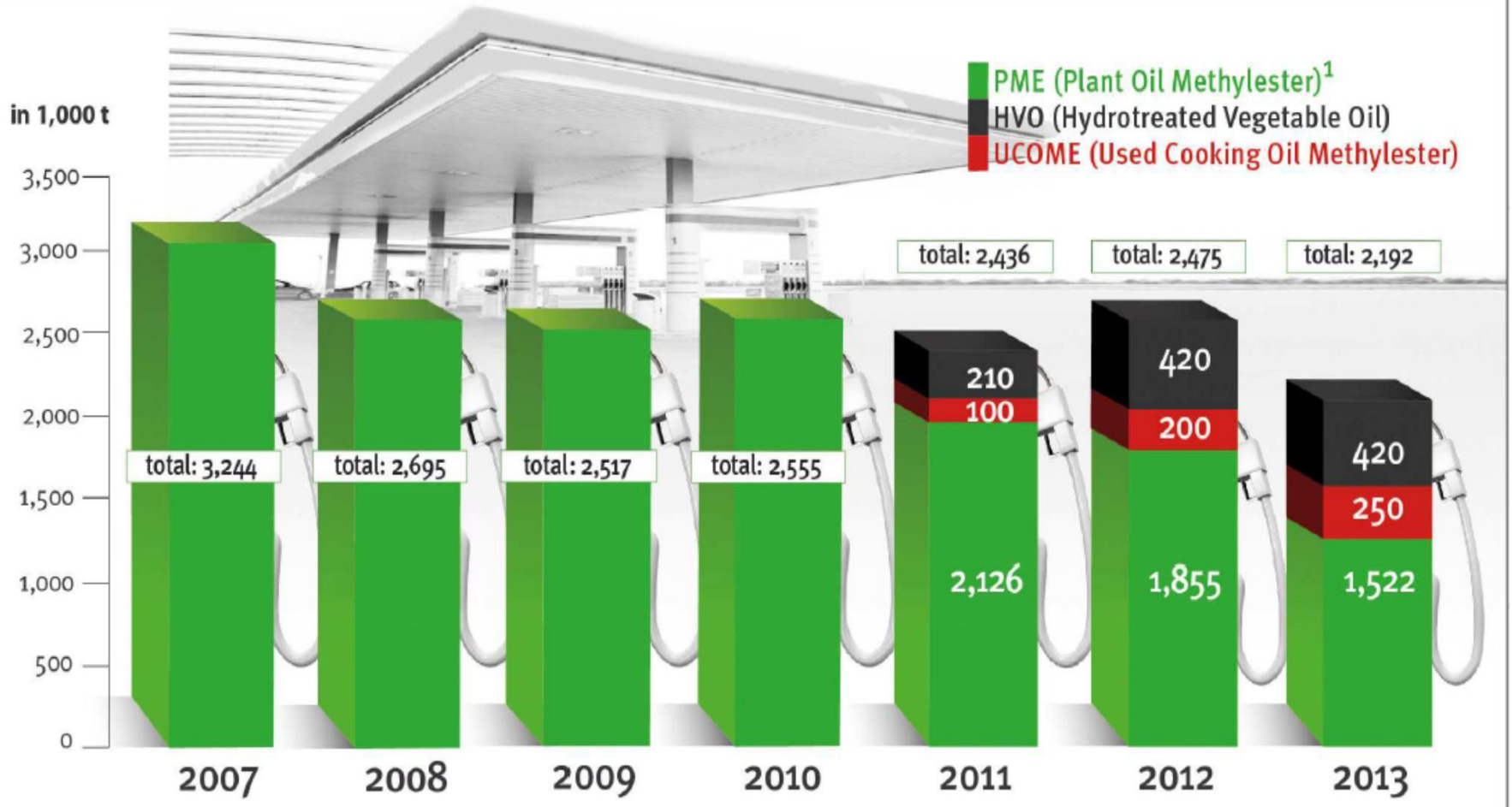
0,7 / 0,3 / 0,05 Mio. t veg. Oil (rape seed oil)

ufop

Source: BAFA

Increasing share of HVO and UCOME in Biodiesel

Consumption in Germany 2007–2013



[1] PME – Plant Oil Methylester: Rapseed Oil-, Soy Oil-, Palm Oil Methylester

ufop

Source: BAFA, BLE, UFOP

DĚKUJI ZA POZORNOST