



bioenergy2020+

Overview of advanced biofuels technologies

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Brussels, 15 Oct 2014

<http://demoplants.bioenergy2020.eu>

European Industrial Bioenergy L... Energy: SET-Plan - Europes... nK-IV-4 (IEA) - Demoplants

demoplants.bioenergy2020.eu/projects/mapindex

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

Last update: 2014-09-23 09:38:29

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

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Please click here for more information

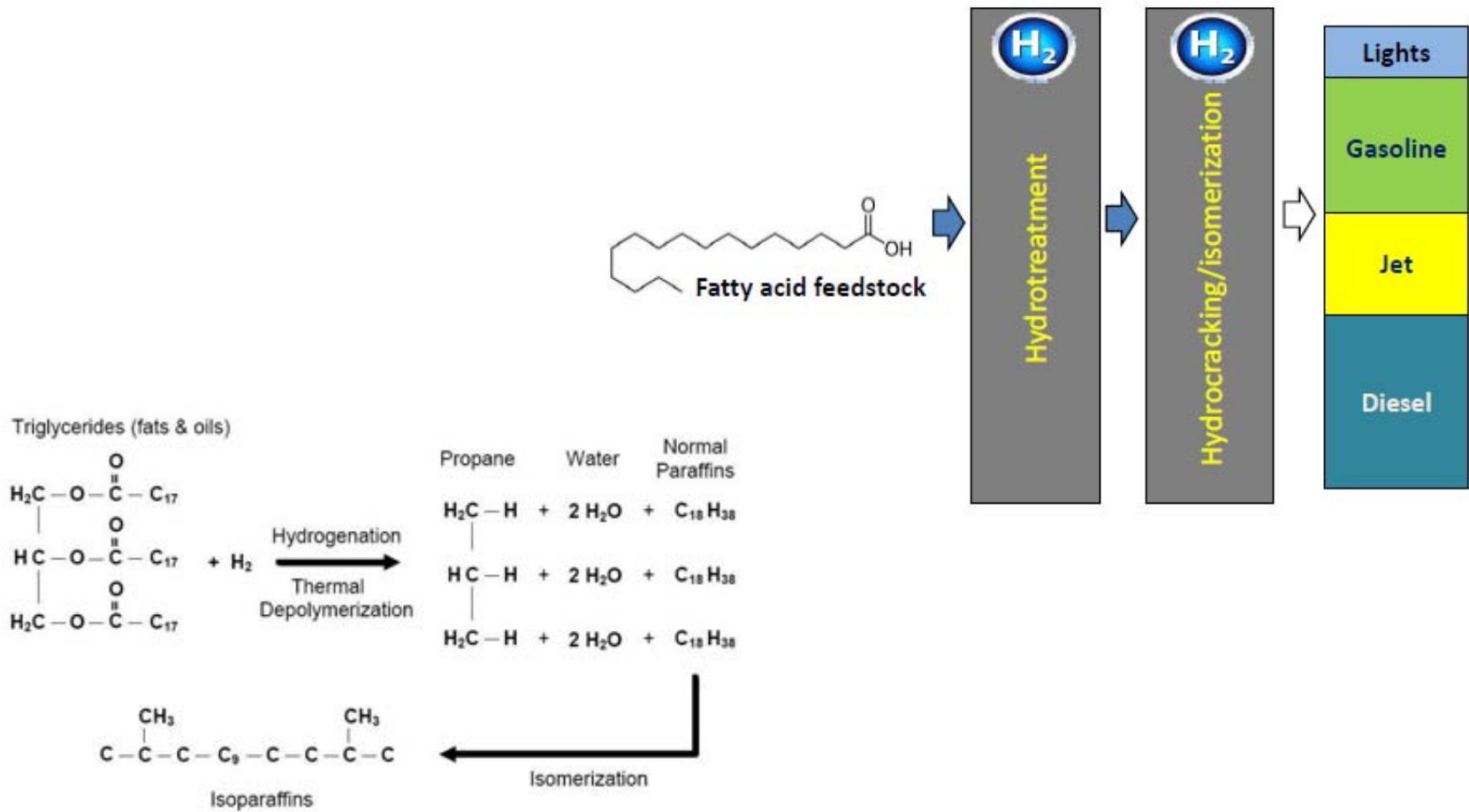
Company (Project)

- Aalborg University Copenhagen (BornBiofuels optimization)
- Abengoa Bioenergy (demo)
- Abengoa Bioenergy Biomass of Kansas, LLC (commercial)
- Abengoa Bioenergy New Technologies (pilot)
- Abengoa Bioenergy, S.A. (Abengoa Arance EC demonstration)
- Aemetis (pilot)
- AlphaJet Inc. (AlphaJet Pilot Plant)
- Amyris, Inc. (Amyris Antibiotics)
- Amyris, Inc. (Amyris Biomin)
- Amyris, Inc. (Amyris Paraiso)
- Amyris, Inc. (Amyris Pilot & Demonstration Plant)
- Amyris, Inc. (Amyris Sao Martinho)
- Amyris, Inc. (Amyris Tate & Lyle)
- Amyris, Inc. (Amyris USA)
- BBI BioVentures LLC (commercial)
- BFT Bionic Fuel Technologies AG (OFT Alyssa)
- BP Biofuels (Jennings Demonstration Facility)
- Beta Renewables (joint venture of Mossi & Ghisolfi Chemtex division with TPG) (IBP - Italian Bio Fuel)
- Beta Renewables (joint venture of Mossi & Ghisolfi Chemtex division with TPG) (pilot)
- BioGasol (BornBioFuel 1)
- BioGasol (BornBioFuel 2)
- BioMCN (BioMCN commercial)
- Biomassekraftwerk Guessing (SNG demo)
- Blue Sugars Corporation (formerly KL Energy) (Blue Sugars)
- Borregaard AS (BALI Biorefinery Demo)
- Borregaard Industries AS (ChemCell Ethanol)
- Butamax Advanced Biofuels LLC (Biobutanol demo)
- CHOREN Fuel Freiberg GmbH & Co. KG (beta plant)
- CHOREN Industries GmbH (Sigma plant)

Technology	Type	Status
<input type="checkbox"/> biochemical	<input type="checkbox"/> commercial	<input type="checkbox"/> planned
<input type="checkbox"/> thermochemical	<input type="checkbox"/> demo	<input type="checkbox"/> under construction
<input type="checkbox"/> chemical	<input type="checkbox"/> pilot	<input type="checkbox"/> operational



Hydrotreatment of esters and fatty acids Oleo chemical technologies

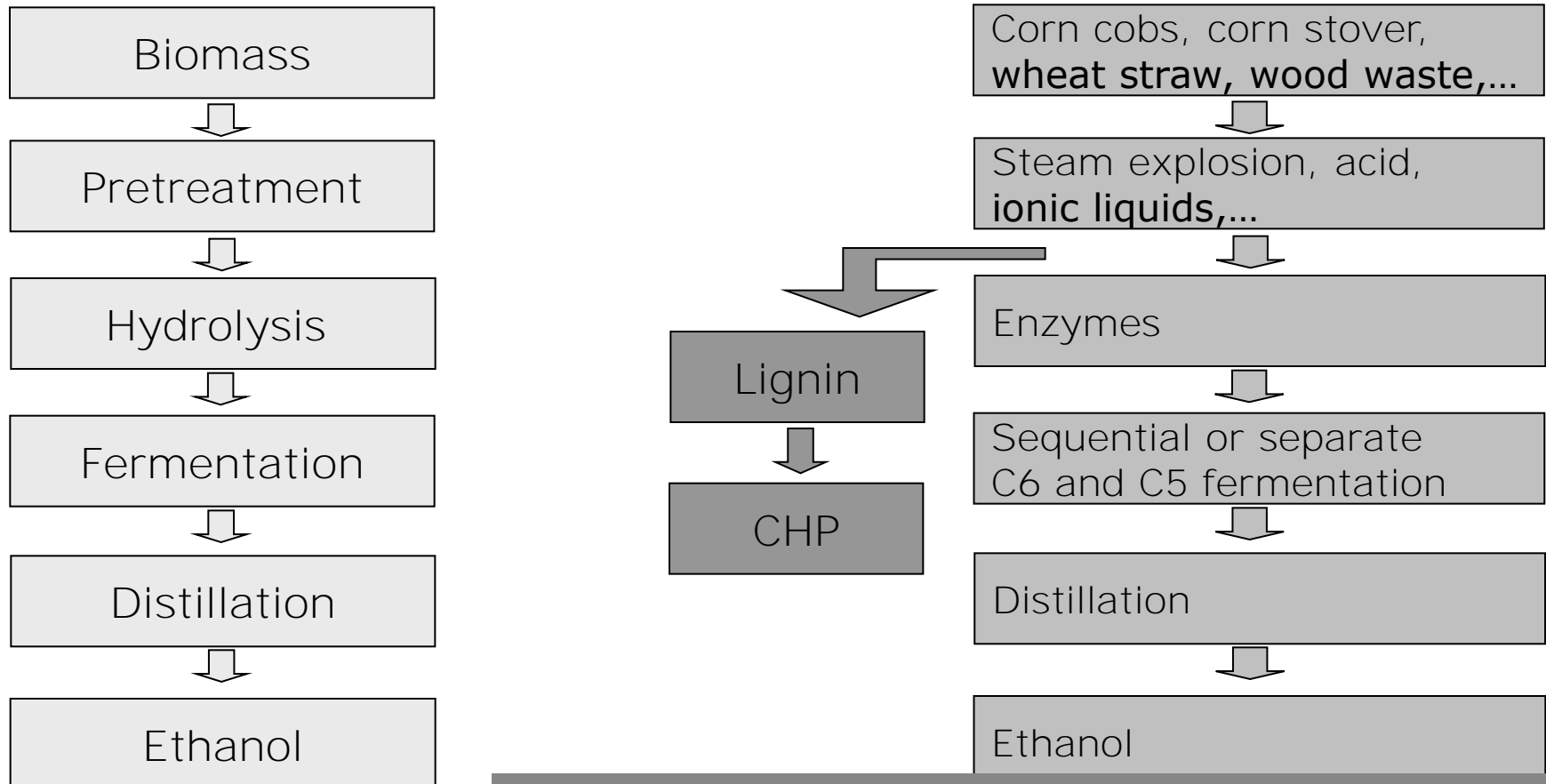




Largest operational oleo chemical facilities

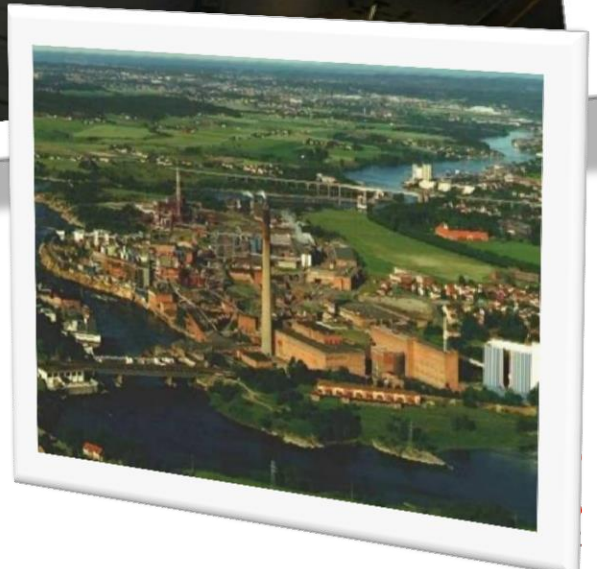
Company	Country	Capacity [t/y]	Start-up
Neste Oil	Singapore	800.000	2010
Neste Oil	Netherlands	800.000	2011
ENI	Italy	500.000	2014
Diamond Green Diesel	United States	412.000	2014
REG Geismar	United States	225.000	2010
Neste Oil	Finland	190.000	2007
Neste Oil	Finland	190.000	2009
UPM Biofuels (under commissioning)	Finland	100.000	2014/15

Biochemical technologies



Alternative routes:

- Syngas or flue gas fermentation to ethanol
- Fermentation to butanol
- Sugar fermentation to diesel-type hydrocarbons



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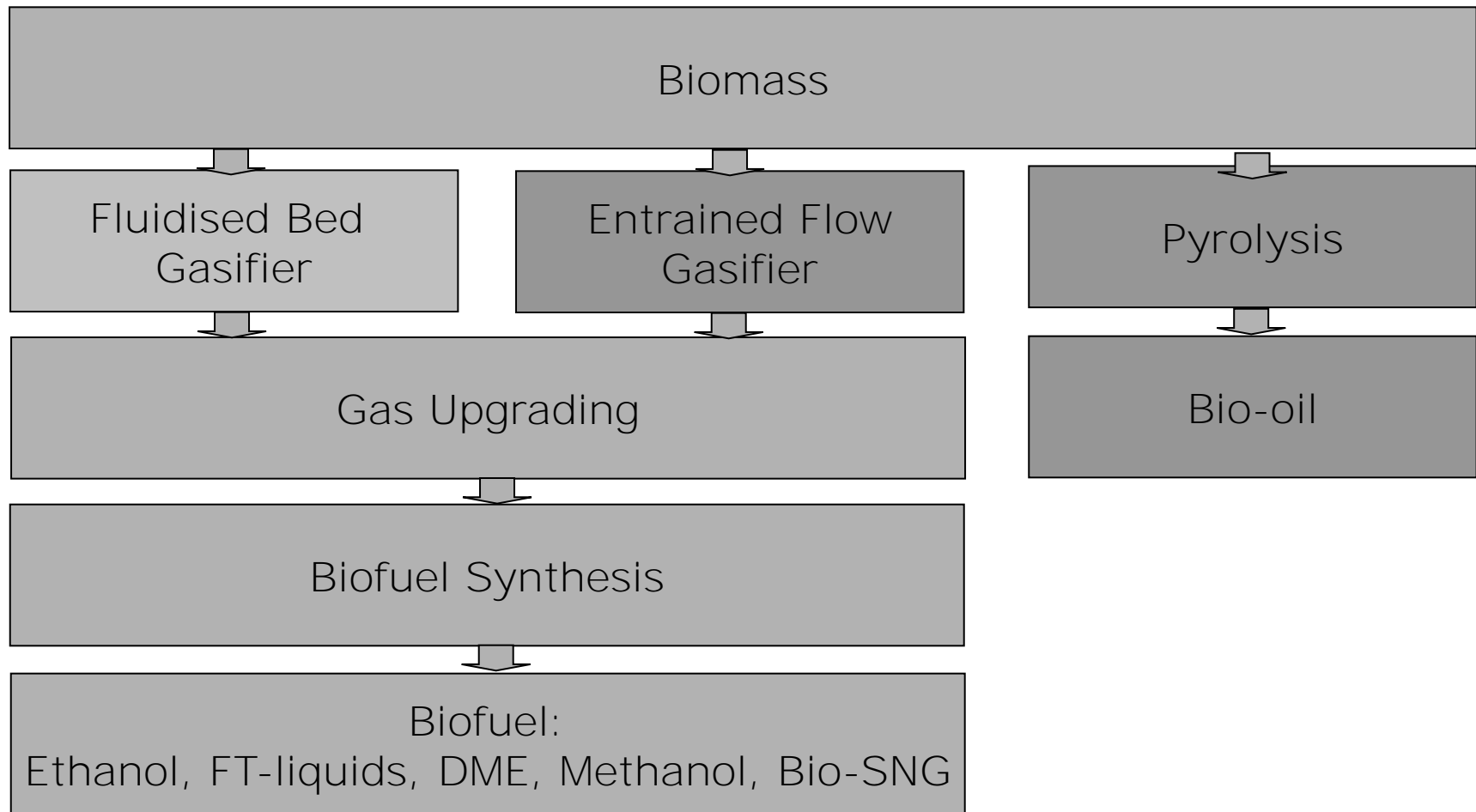
Largest operational biochemical facilities

Company	Country	Capacity [t/y]	Start-up
POET-DSM Advanced Biofuels	United States	75.000	2014
GranBio	Brazil	65.000	2014
Beta Renewables	Italy	40.000	2012
Gevo (butanol and ethanol from corn)	United States	54.000	2006
Longlive Bio-technology Co. Ltd.	China	50.000	2012
Cane Technology Center (CTC)	Brazil	40.000	2012
INEOS Bio	United States	24.000	2013
Borregaard Industries AS	Norway	15.800	1938

Abengoa will bring 75.000 t/y ethanol online in late 2014
 Du Pont will bring 87.000 t/y ethanol online in late 2014



Thermochemical technologies





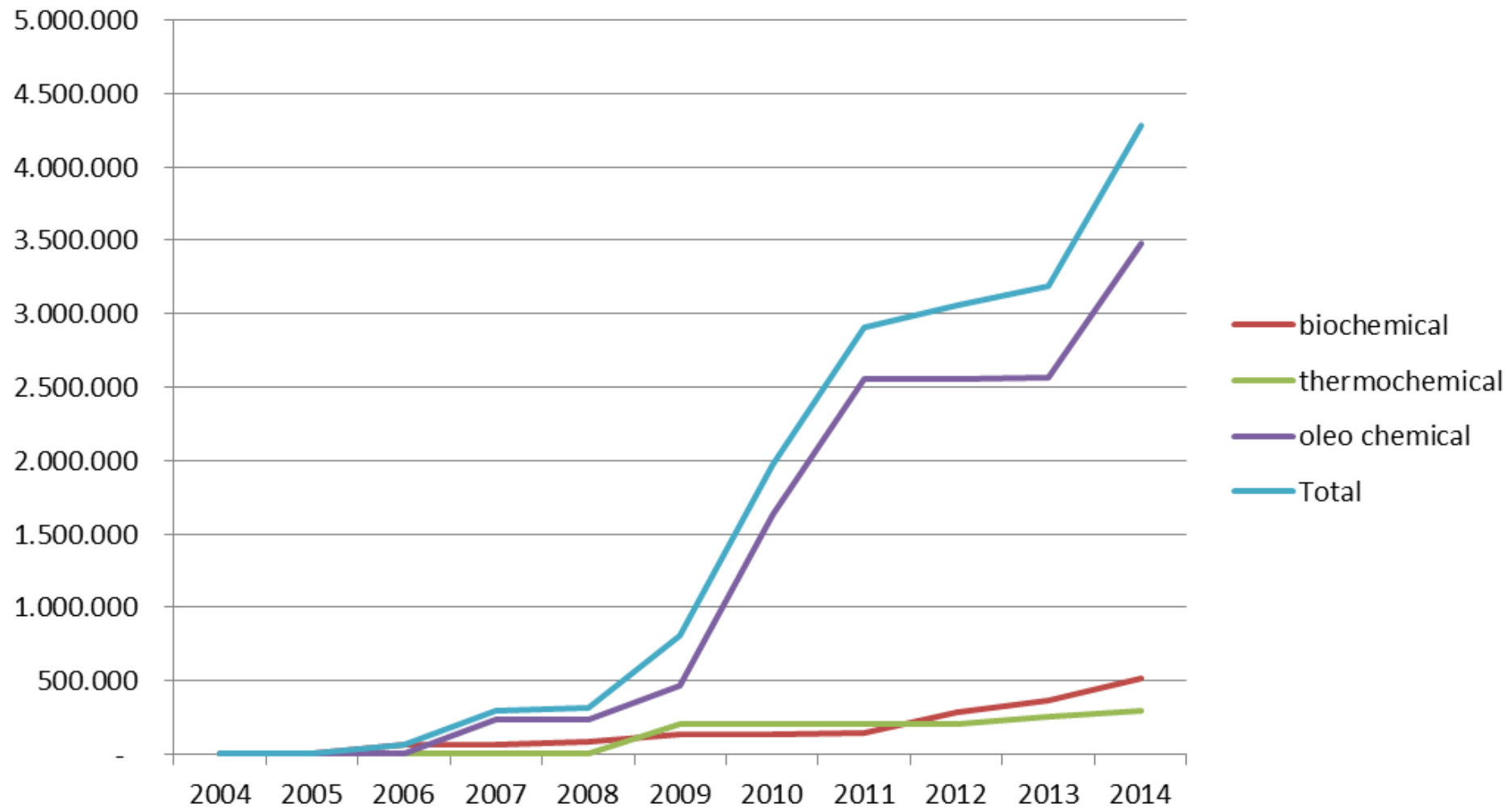
Largest operational thermochemical facilities

Company	Country	Capacity [t/y]	Start-up year
BioMCN methanol from glycerine	Netherlands	200.000	2009
Fortum pyrolysis of wood residues	Finland	50.000	2013
Enerkem ethanol from MSW	Canada	30.000	2003
Goteborg Energi SNG from forest residues	Sweden	11.200	2014

Plans announced or facilities under construction with a range of thermochemical technologies by:

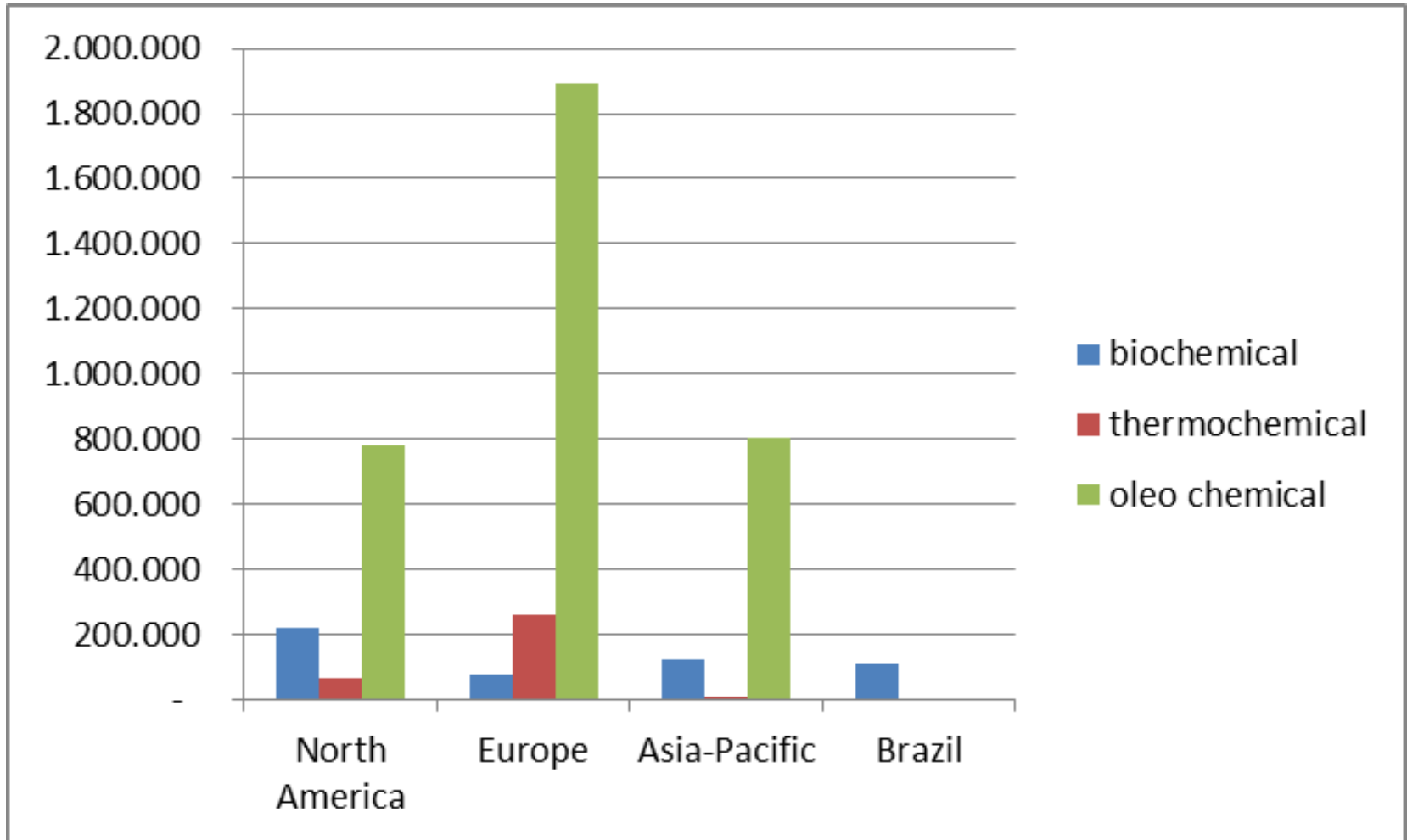
BioMCN, Sundrop Biofuels, Akwawit, Gulf Coast Energy, Virent, Clearfuels, Solena, Clearfuels, CORE Biofuel, Fulcrum, Cool Planet, Vanerco (Enerkem & Greenfield Ethanol), Enerkem Mississippi Biofuels, ORG

Cumulative Advanced Biofuels Production Capacities [tons per year]



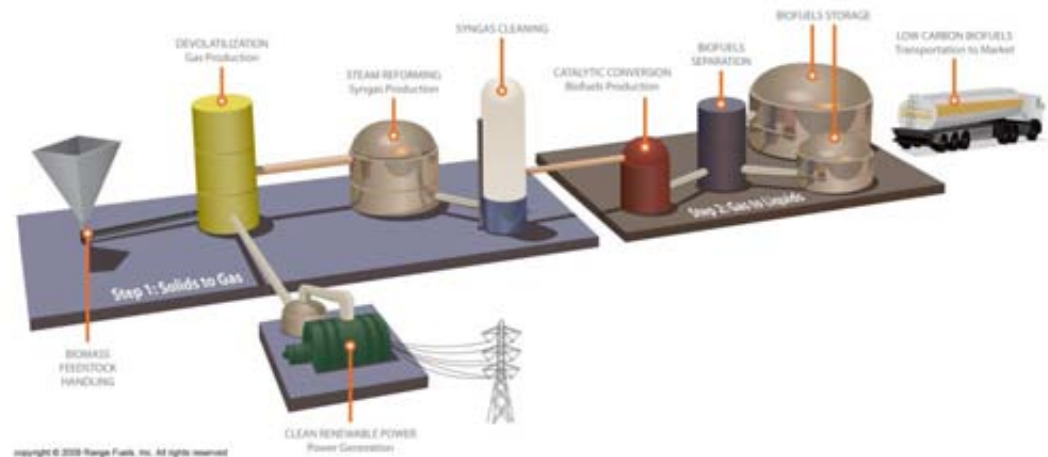
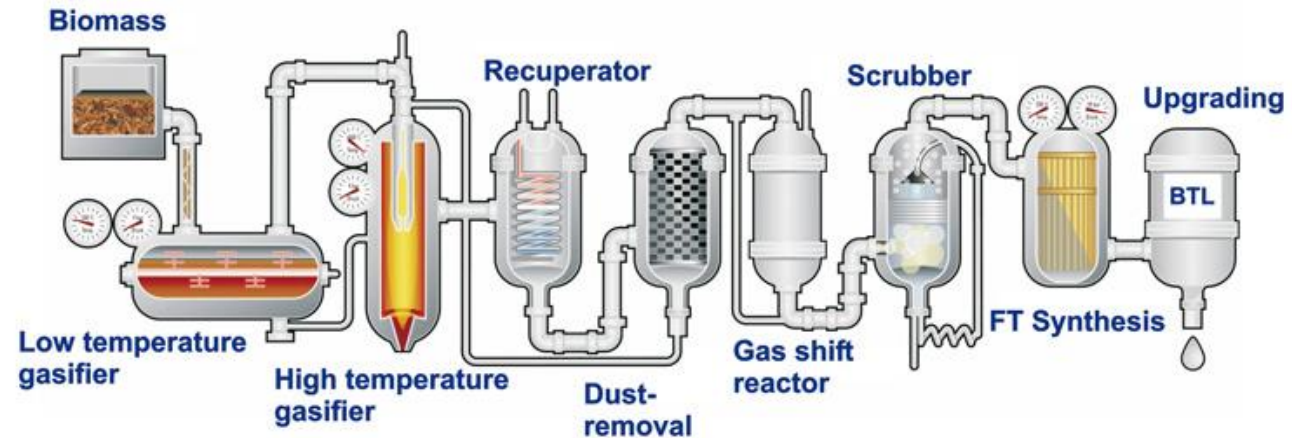


Capacities per Region



What happened to...?

- Choren
- Range Fuels
- KiOR
- RenTech
- Lignol
- Pacific Ethanol
- New page
- Flambeau River
- Gevo
- Coskata
- ...



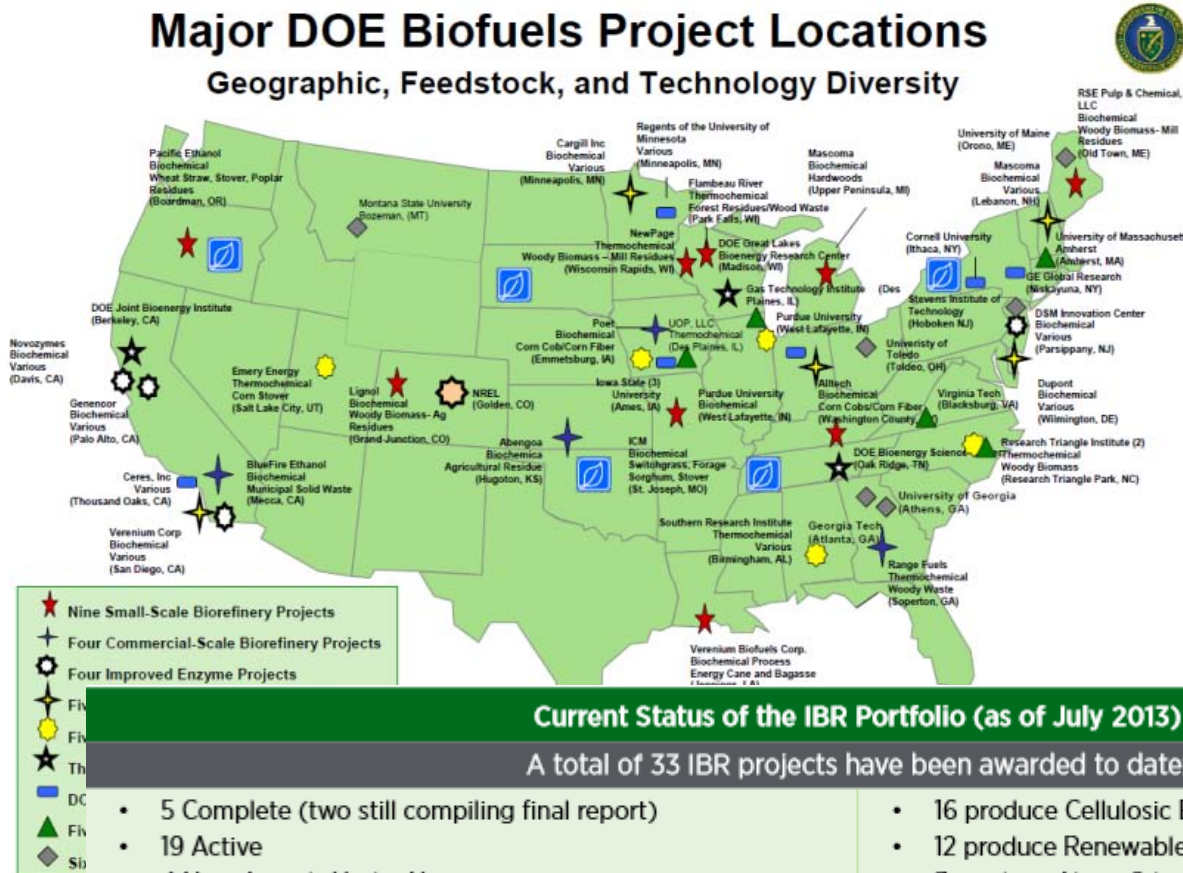
NER 300 Projects first call announcements Dec 2012

Project	Company	Country	Funding [m €]	Status
BEST	Beta Renewables	Italy	28	operational since Oct 2013
CEG Plant Goswinowice	SEKAB	Poland	31	planned
VERBIO Straw	VERBIO	Germany	22	under construction
Ajos BTL	Vapo Oy	Finland	89	frozen in Feb 2014
UPM Stracel BTL	UPM	France	170	investment decision pending
Woodspirit	BioMCN	Netherlands	199	investment decision pending
Gobigas phase 2	Goteborg Energi	Sweden	59	planned
Pyrogrot	BillerudKorsnäs	Sweden	31	cancelled in Dec 2013

USDOE Integrated Biorefinery Program

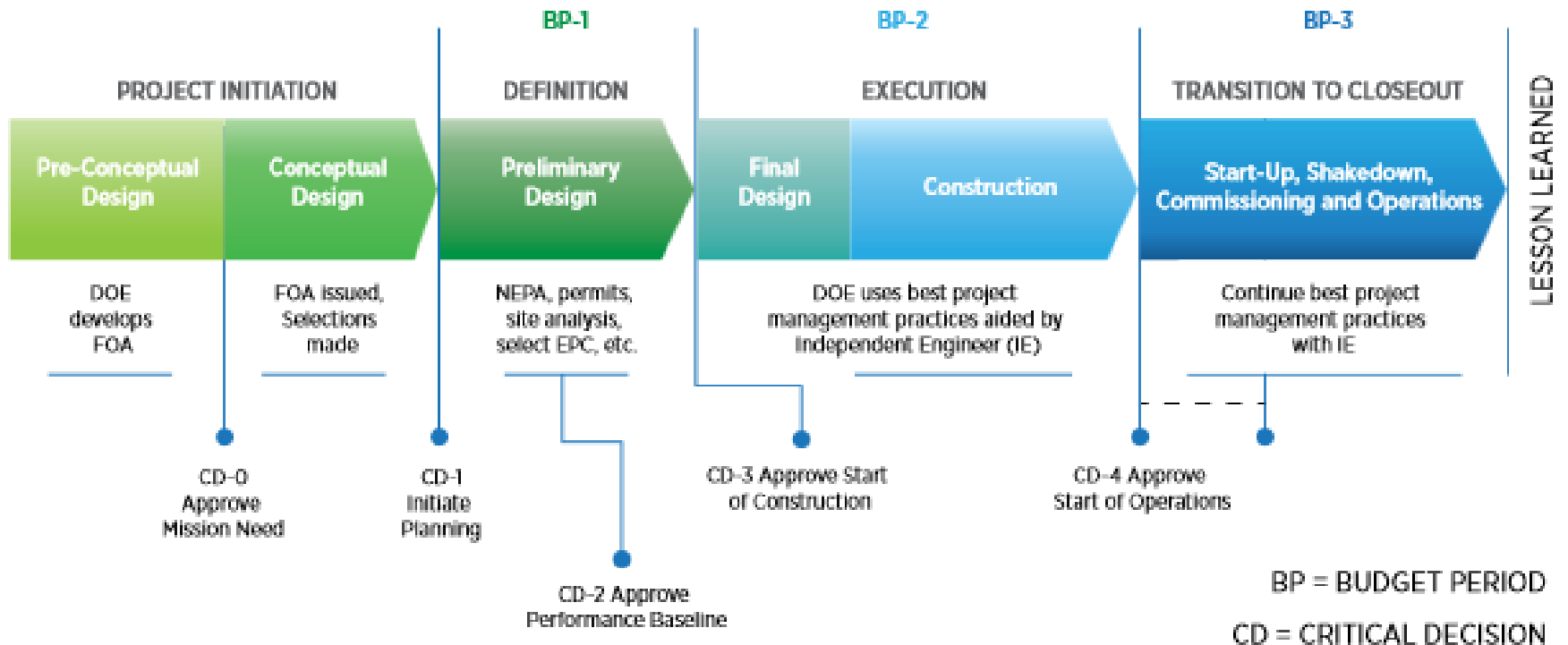
<http://www.energy.gov/eere/bioenergy/integrated-biorefineries>

Major DOE Biofuels Project Locations Geographic, Feedstock, and Technology Diversity





DOE's Key Role: Through investment in first-of-a-kind technologies at scale, reduce the risk such that the return on investment can be demonstrated as attractive to private investment, especially related to scaling up new technology. The process of bringing an IBR online takes time and careful planning. This framework is divided into four main sections that correlate contractual Budget Periods (BP) to the Critical Decision Points identified in the DOE Order.





Lessons learned - USDOE Biorefinery program

- Proper integrated pilot testing
- Feedstock procurement
- Risk management throughout the project
- Partnership for construction rather than standard EPCM contract
- Mechanical completion \neq operational
- Secure adequate financing, incl. contingency
- Independent engineer review

<http://www.energy.gov/eere/bioenergy/downloads/response-ig-recommendation-create-formal-lessons-learned-process>



Thanks for your attention!

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China – operational facilities

LanzaTech plans to open 90.000 t/y ethanol from steel flue gas in 2015

Company	Feedstock	Capacity t/y	Start-up
Longlive Bio-technology	Corn cob	50.000	2012
Henan Tianguan Group	Wheat/corn stalks	50.000	2013
Anhui BBKA Biochemical	Corn cob/corn stover	5.000	2009
Shandong Zesheng Biotech	Straw	3.000	2006
Jilin Fuel Alcohol	Corn/sorghum stover	3.000	2008
Jilin Fuel Alcohol	Corn/sorghum stover	3.000	2008
Henan Tianguan Group	Wheat/corn stover	3.000	2007
East China University of Science and Technology	Crop and forestry residues	650	2005
COFCO Zhaodong	Corn stover	350	2006
LanzaTech BaoSteel New Energy	steel flue gas	300	2012
Beijing Shougang LanzaTech New Energy Technology	steel flue gas	300	2013



Brazil – operational facilities

Company	Feedstock	Capacity t/y	Start-up
GranBio	bagasse	65.000	2014
Cane Technology Center (CTC)	bagasse	40.000	2012
Cane Technology Center (CTC)	bagasse	2.300	2014
Amyris	fermentable sugars	several facilities for the production of farnesene	2009 onwards

Raizen is currently building a 30.000 t/y facility in Costa Pinto, São Paulo