IEA Bioenergy
Technology Collaboration Programme

Country Report Germany

Task 33 Thermal Gasification of Biomass

Update

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Onlineworkshop, 30.06.2020

Folie 1

EC1 To replace photograph (while maintaning the shape): right click on image> choose FORMAT SHAPE > choose FILL > choose PICTURE OR TEXTURE > choose CHOOSE PICTURE in FROM FILE field > navigate to and choose an image to replace background > OK > this new image will now have been skewed to match the shape of the old image so, in order to correct the original shape, choose FORMAT PICTURE in the ribbon bar > under ADJUST, click the drop-down menu of the CROP button and choose CROP TO FIT > you can then resize the iage using the handles to fill the space better while holding down the SHIFT key in order to maintain theoriginal shape

Eleonora Chelazzi; 02.03.2020

Corona Special

Governments have a once-in-a-lifetime opportunity to reboot their economies and bring a wave of new employment opportunities while accelerating the shift to a more resilient and cleaner energy future

Dr Fatih Birol, IEA Executive Director

Corona Special

- Economic stimulus package with a volume of around 130 billion Euro by the German government
- A comprehensive package for the future with a volume of 50 billion euros is intended to ensure that the country's modernization is actively pursued and that Germany emerges from the crisis stronger. This includes numerous measures in various future fields.
- sustainable mobility
  - environmental bonus for e-vehicle increases from 3,000 to 6,000 euros.
  - 2.5 billion euros will be invested in the expansion of modern and safe charging point infrastructure
  - promotion of research and development in the field of electro mobility and battery cell production.
  - Future investments by manufacturers and suppliers in the automotive industry
  - vehicle tax will be more closely aligned to CO2 emissions
  - fleet exchange programs are intended to promote electric mobility.
  - bus and truck fleet modernization programs to promote alternative drive systems
  - funding for e-buses and their charging infrastructure
  - heavy goods vehicles with subsidies for the replacement of old vehicles with new Euro VI vehicles
  - Deutsche Bahn will receive additional equity capital to invest in the modernization, expansion and electrification of the rail network and in the railway system

Corona Special

- Energy system transformation and the achievement of climate targets
  - promotion of hydrogen technology with an ambitious investment package (National Hydrogen strategy)
  - reduce the EEG levy, so that it will be 6.5 ct/kwh in 2021 and 6.0 ct/kwh in 2022
  - the cap on the expansion of photovoltaics will be abolished
  - the expansion target for offshore wind energy will be raised
  - the CO2 building refurbishment programme will be increased
- Digitalization and Artificial Intelligence (AI)
  - …
- Protection against pandemics
  - …
- Promotion of education and research
  - …

National Hydrogen Strategy

General:
- Making hydrogen competitive
- Increase national green hydrogen production from renewable power
- Enable international green hydrogen production for import
- Open up new fields of application for hydrogen and **PtX** raw materials
- development and availability of an appropriate transport and distribution infrastructure
- Export of hydrogen and **power-to-X technologies (PtX)**
- Ramp-up an European and international hydrogen market
- International trading of hydrogen and PtX derivatives or bound to **LOHC (Liquid Organic Hydrogen Carriers)**
- support research, joint projects with partners from industry and science

Industry:
- make processes CO2-free → steel industry
- replaces grey hydrogen with green hydrogen

Mobility:
- hydrogen-based energy sources from **PtX processes** for air and sea transport
- **Fuel cell technology** in local public transport (buses, trains) and in parts of heavy road traffic
- Structural change in the German vehicle and supplier industry to fuel cells

National Hydrogen Strategy is very focused on hydrogen from renewable power or PtX energy carriers

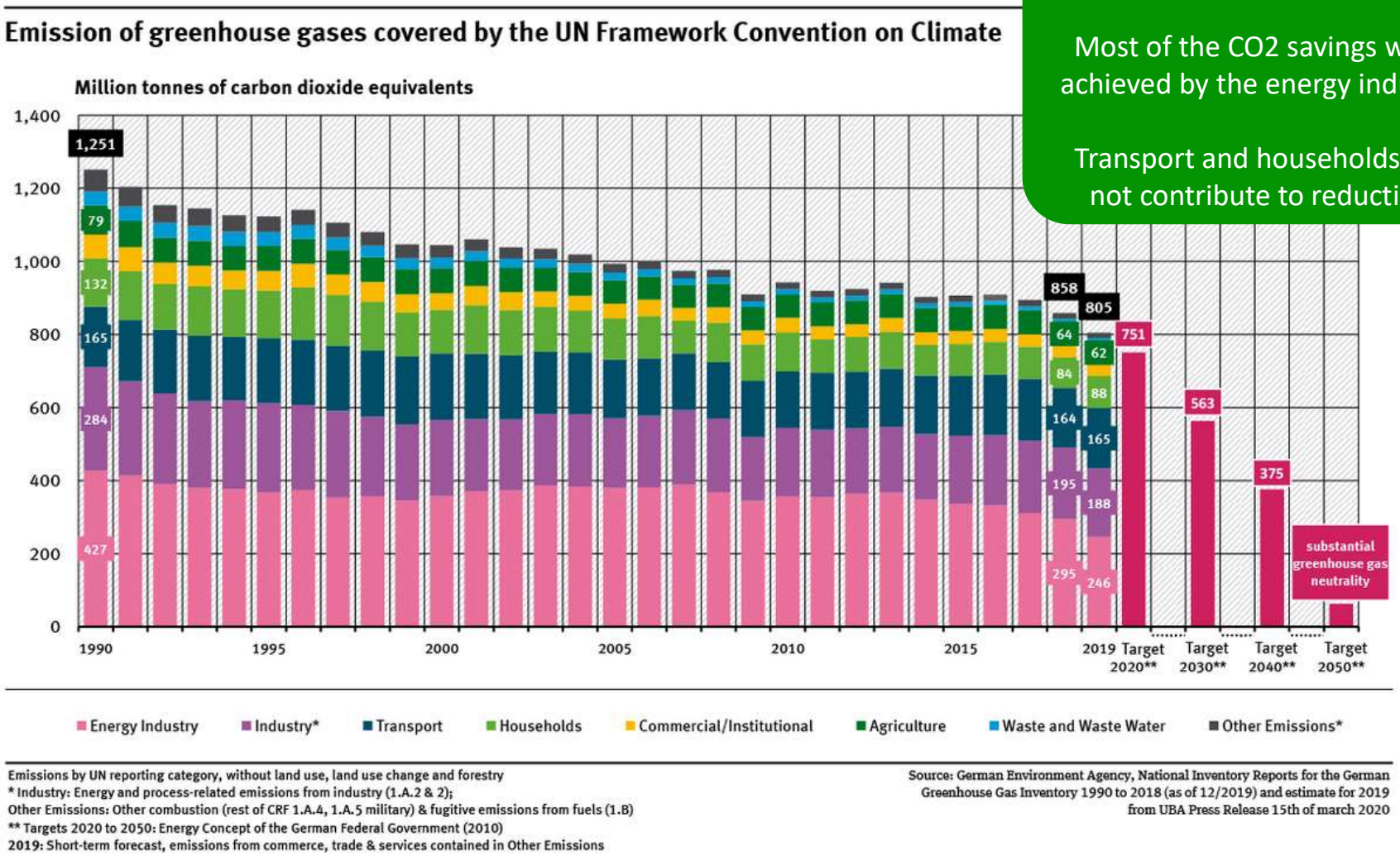
Action Plan
- New design of the state-induced price components of energy sources
- Funding for **electrolyzers**
- Better framework conditions for the offshore production of hydrogen or PtX
- RED II: Use of green hydrogen in the production of conventional fuels represents
- obligation on marketers to use **electricity-based aviation fuels**, for the production of which green hydrogen is required
- Market activation to support investments in hydrogen vehicles
- Further development of European infrastructure development
- long-term decarbonisation strategies on the basis of hydrogen
- **new carbon sources can be developed (CCU, DAC, etc.), which in turn provide a CO2-neutral raw material base for material transformation**
- ….

Statistics

2018→2019

Most of the CO2 savings were achieved by the energy industry

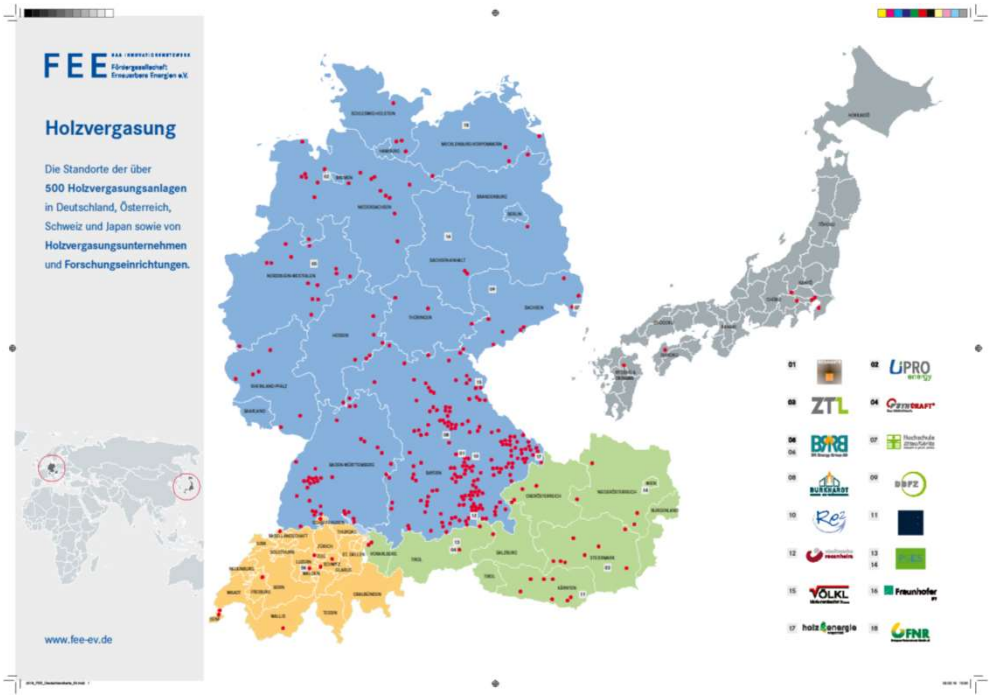
Transport and households did not contribute to reduction

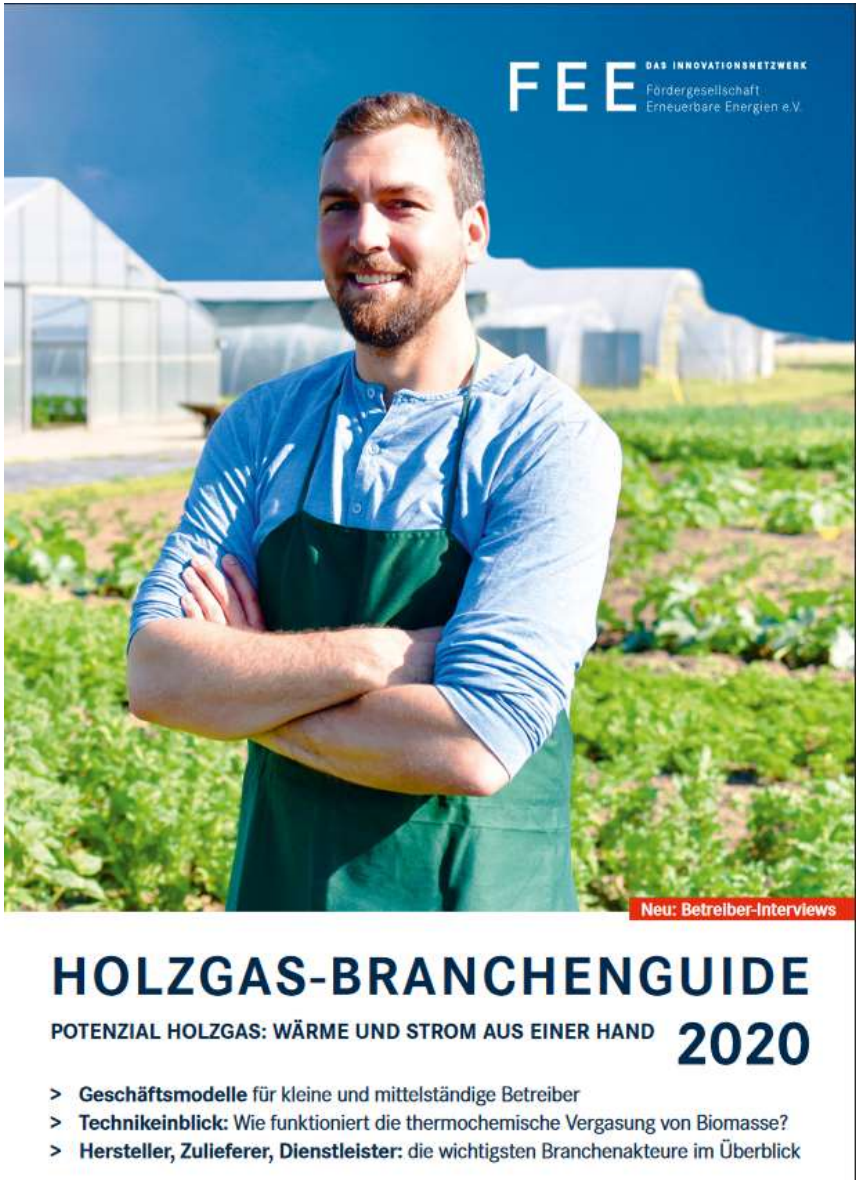


Source: https://www.umweltbundesamt.de/en/indicator-greenhouse-gas-emissions

FEE Industry Guide 2020

Wood gas potential: Heat and electricity from one source





Source: https://fee-ev.de/images/FEE__Holzgas_Branchenguide_2020.pdf

Biomass gasification plants

Manufacturer	Technology	Feedstock	Grid feeding plants	Note
Biotech Energietechnik GmbH	Fixed-bed process, co-current	wood chips	3	
BR Engineering GmbH (CH)	Fixed-bed process (optional: moving bed) in combination of co-current and countercurrent flow	Unadulterated wood, wood chips, other biomasses (among others hogged fuel)	2	• Since 1997 • Cold gas efficiency: up to 90% • Production of biochar • USP: proven for demolition wood/ ash free of char
Burkhardt GmbH (D)	Fluidized bed process in co-current flow	Pellets	260	• Since 2011 • wood gas cogeneration plants • wood gasifier with downstream CHP • Electric efficiency of more than 30 %
Glock Ökoenergie GmbH (A)	Fixed-bed process, co-current	wood chips	43	• Since 2010 • Distributing countries: D, A, CH
Holzenergie Wegscheid GmbH (D)	Fixed-bed process in co-current flow	Unadulterated wood, briquettes & maxi-sized pellets, wood chips	120	• Distributing countries: EU, JP, CA, ID, CH
ReGaWatt GmbH	Fixed-bed in counter-current flow	Wood chips from various sources up to 30 % bark and landscape management chips	6	• Since 2010 • Distributing countries: EU

Source: https://fee-ev.de/images/FEE__Holzgas_Branchenguide_2020.pdf

Biomass gasification plants

Manufacturer	Technology	Feedstock	Grid feeding plants	Note
LiPRO Energy &CO KG (D)	Pyrolysis with moving bed	wood chips	12	• Since 2016
Spanner Re² GmbH	Fixed-bed process in co-current flow	Unadulterated wood, forest chips (at 30 kWel), wood chips	>800	• Spanner Re² wood cogeneration plants • Since 2008 • Distributing countries: D, A, CH, I, CZ, SLO, LV, CDN, GB, FIN, HR, J, PL
Stadtwerke Rosenheim GmbH & Co. KG	Fluidized bed and tiered process, combination of co-current and eddy flow (Rosenheimer Process)	Unadulterated wood, wood chips	1	• Since 2015 • Distributing countries: DE, AT, I
SynCraft (A)	Tiered process in co-current flow (floating fixed-bed)	Unadulterated wood, tree and shrub cuttings, waste wood class A, wood chips	6	• By-product bio char • Fuel flexibility • No additives needed • Electric efficiency 30 %
Xyloenergy GmbH	Fixed-bed process in co-current flow	Unadulterated wood, wood chips	1	• capacity via 100 % diesel/ bio-diesel as well; • utilization of waste wood • Distributing countries: EU

Source: https://fee-ev.de/images/FEE__Holzgas_Branchenguide_2020.pdf

Biomass gasification plants

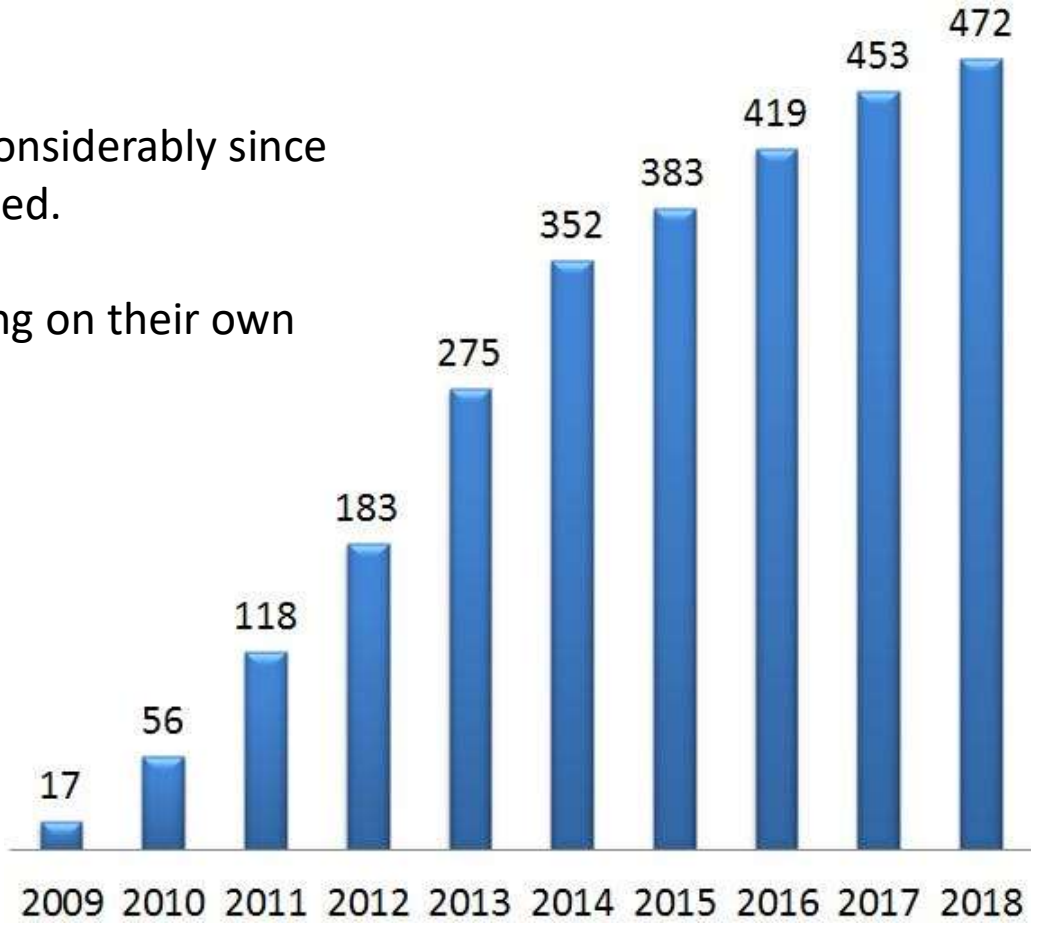
Manufakturer	Technology	Feedstock	Grid feeding plants	Note
KOPF SynGas GmbH & Co. KG	Fluidized bed process	Sewage sludge (10 % moist. cont.)	2	• Since 2000
Wood Gasifier System Werner	Fixed-bed process in co-current flow	Unadulterated wood, wood chips	1	
Meva Energy (S)	Entrained flow in co-current flow	Unadulterated wood, wood chips, pellets, saw dust, husks, straw	1	
URBAS Maschinenfabrik GmbH (A)	Fixed-bed process in co-current flow	Unadulterated wood, wood chips	19	• Since 2008

Source: https://fee-ev.de/images/FEE__Holzgas_Branchenguide_2020.pdf

Cumulative number of CHP plants in Germany

The growth curve has flattened considerably since the EEG compensation was reduced.

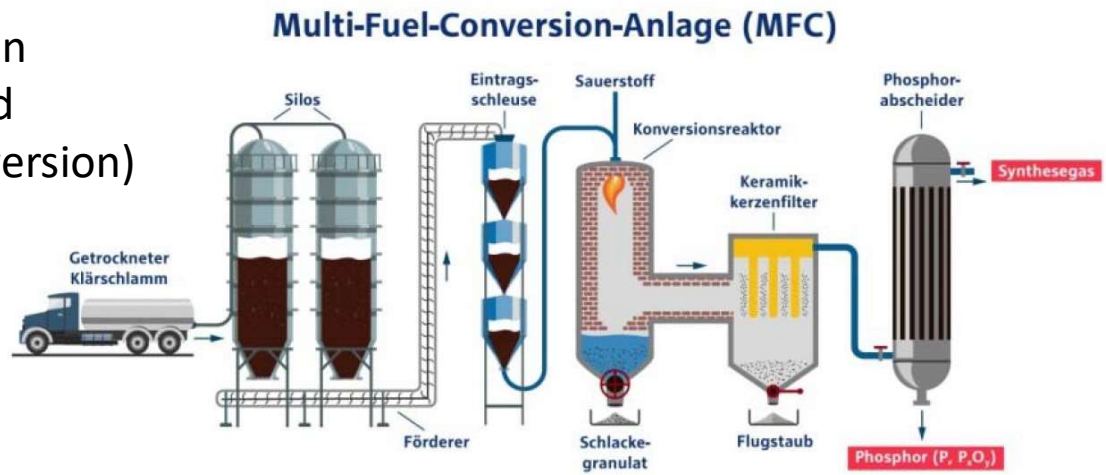
Operators are increasingly focusing on their own supply of electricity and heat.



Source: https://fee-ev.de/themen/holzgas/zahlen-und-daten#deutschland-kumulierte-anzahl-von-in-betrieb-genommenen-holzgas-kwk-anlagen

RWE Sewage Sludge to Phosphorus

MFC (Multi Fuel Conversion) within ITZ-CC (Virtuelles **I**nnovations- und **T**echnologie**z**entrum **C**arbon **C**onversion)



- Pilot plant in Niederaußem
- Entrained flow gasifier
- Atmospheric, refractory lined, dip quench, liquid ash discharge
- Production of Phosphorus (Phosphoric acid)
- From Sewage Sludge, Sewage Sludge Ash, Lignite 130 kg/h
- Temperature ~1500°C
- Erection in 2020, Start-Up April 2021
- Funding provided by State of North Rhine Westphalia (Ministry of Economics);
  Total project budget (incl. cost for plant operation): 6.7 Mio. €
- Partners: Fraunhofer UMSICHT, Ruhr Universität Bochum

Source: RWE; https://www.group.rwe/presse/rwe-power/2019-08-01-neue-versuchsanlage-gewinnt-lebenswichtigen-rohstoff-phosphor-aus-klaerschlamm-zuruck

Industry Activities

Blue Energy CHP

Up date 2020

Blue Energy Europe Holzgas-Heizkraftwerk Senden

Wood gas cogeneration plant to be converted into an advanced bio-energy park

Future Products:

- Heat and Power
- Bio-oil
- Hydrogen

Source: BlueEnergy: https://blue-energy-group.de/bioenergiepark-senden/

Industry activities:

BioTfueL-Projekt

BioTfueL - Venette Torrefaction Demo Plant

The demonstration plant for biomass preparation in Venette has been built to convert the raw biomass into a suitable feed for the selected entrained-flow gasification process and includes biomass torrefaction as well as optional pelletization and all relevant storage and feeding sites.

Venette Demo Plant

- Avril industrial site
- Size 5 t/h feed
- Different kind of biomasses to be prepared

Update June 2020:
Plant in Operation
Transport of torrefied wood coke to Gasifier in Dunkirch via ship

23.05.2019 / N. Ullrich

Source: ThyssenKrupp; N. Ullrich; DGMK 2019 Leipzig

Industry activities:

BioTfueL-Projekt

BioTfueL-Dunkirk / Demoplant for Milling, Gasification, Gas Cleaning and FT

The demonstration plant in Dunkirk has been built to demonstrate the grinding and gasification of torrefied biomass and fossil feedstock in an entrained-flow reactor as well as the syngas conversion and cleaning for Fischer-Tropsch application.

Dunkirk Demo Plant

- Total industrial site
- Multi scale for a safe scale up
- Gasification 15 MWth (3 t/h torrefied wood)
- Gasifier in operation since 2019

Update June 2020:

Plant in Operation

Grinding of coke from Venette

Gasification experiments 100% biomass

23.06.2019 / N. Ullrich

Source: ThyssenKrupp; N. Ullrich; DGMK 2019 Leipzig

Thanks for your attention

Mark Eberhard

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www.ieabioenergy.com