

GHANA – NORTH RHINE WESPHALIA CONFERENCE

Options for energetic and material use of biomass

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LAB FOR MECHANICAL PROCESS ENGINEERING



Take responsibility for the future and find solutions for tomorrow



Mission

Take responsibility for the future

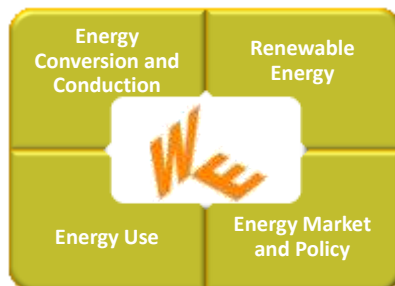
and



find solutions for tomorrow

Research & Development

WE Westfälisches
Energieinstitut



Organization

Institute of the Westphalien University

Mission

Realization of applied Research and Development projects around Energy Solutions, based on **Economical, Ecological and Security** of Energy Supply

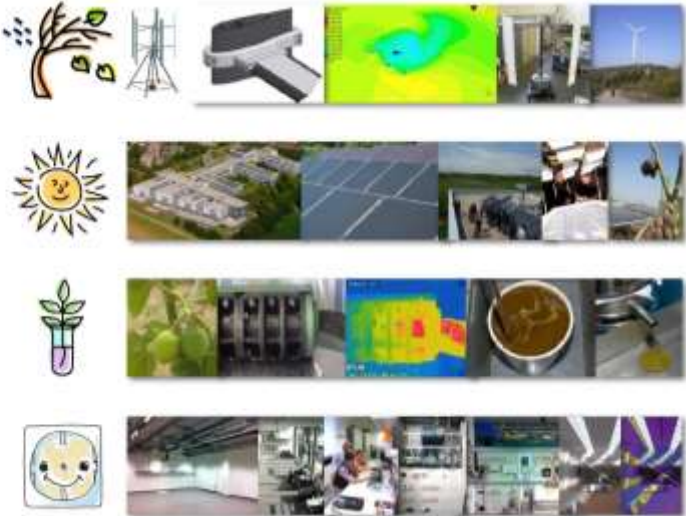
Member

21 Professors from different faculties


Equipment

10 Labs all around energy

Research & Development




The collage includes icons for a tree, a wind turbine, a solar panel, a heat map, and a wind turbine. It also features photos of solar panels, a laboratory setting, and a wind turbine.



Energy Conversion and Conduction
Renewable Energy
Energy Use
Energy Market and Policy


Take responsibility for the future and find solutions for tomorrow




WACEE

Westfälische Hochschule
Prof. Dr.-Ing. Ralf Weinbauer

Impressions Biomass




The collage includes photos of biomass processing equipment, a heat map, a laboratory, and various biomass products like pellets and briquettes.



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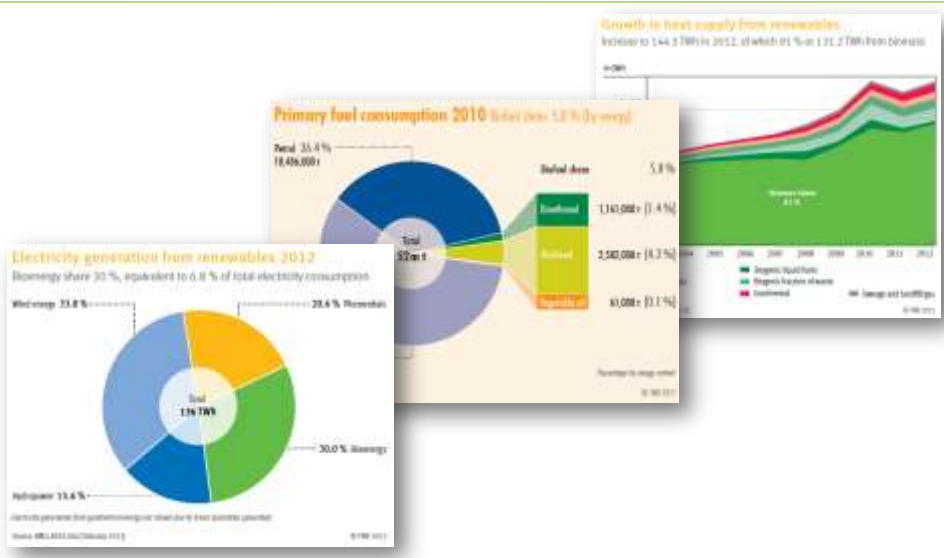


WACEE

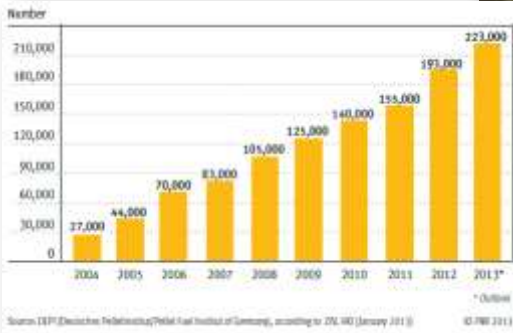
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BIOMASS IN GERMANY

Some facts about Energy in Germany

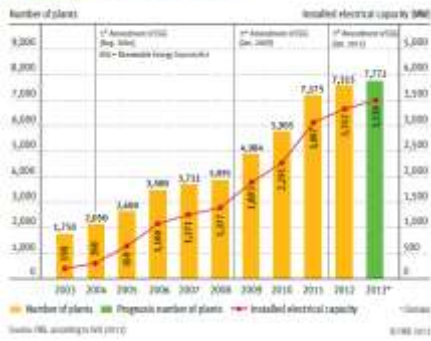


Wood Pellets



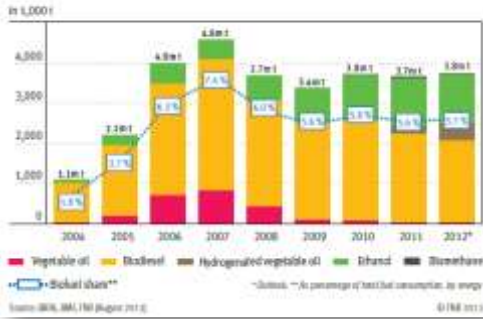
Biogas

Development of biogas plants



Biofuel

Development of biofuels

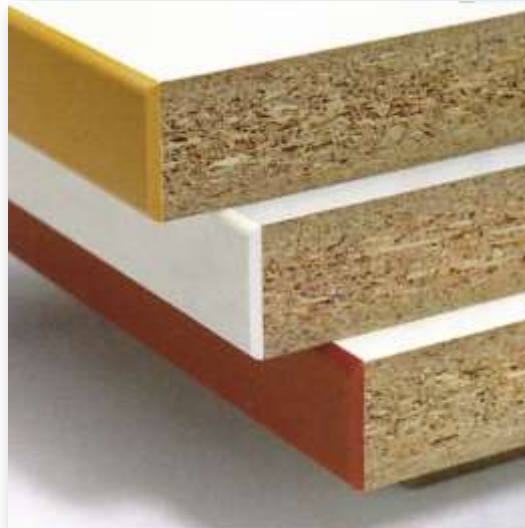


Biomass - Products

Chipboard or Particleboard:

- Cheaper
- Denser
- more uniform

than conventional wood



Biomass - Products



Plant bottle 30 % bio

<http://kunststoffreport.de/wp-content/uploads/2011/02/Neue-umweltschonende-Verpackungen-%C3%84Chren-Coca-Cola-und-Heinz-Ketchup-ein-Die-neue-Verpackung-her%3%9F1-PlantBottle.jpg>

Biomass - Products

Bioplastics



Bioplastics are made of renewable raw materials and replace the previously used plastics made from fossil raw materials. Scientists and technologists don't only adjust them to conventional production machinery, but develop new applications for them. Therefore packaging, disposable tableware, or mats from bioplastics are already available.

Depending on the requirement, some bioplastics are guaranteed a long life, while others are easily biologically degradable and disintegrate naturally into non-toxic raw materials. Whether bioplastics are put to use in biogas plants after their material use, thermally recycled or composted, the portion of the plant-based materials (many plastics are compounds from fossil and vegetable components) only releases the CO₂, which was bound by the plants during their growth phase. In order to calculate the proper CO₂ balance however, the carbon dioxide which was released during the production process of the bioplastics, needs to be taken into account.

Bioplastics can be produced from many biogenic raw materials. The starch occupies a pivotal role. Likewise cellulose and sugar currently gain increasingly importance.

<http://international.fnr.de/renewable-resources/biomaterial/bioplastics/>

Biomass - Products

Natural fibre reinforced plastics

Natural fibre reinforced plastic (NFK) are materials that consist of a plastic that increases its stability through integrated natural fibres. The plastic itself is usually of fossil origin but can also be made of bioplastic. Glass or carbon fibre reinforced plastics are the conventional counterpart to NFK. NFK components don't only show high stiffness and strength, but also have a low density. They are mechanically highly resistant and at the same time light (up to 30% lighter than conventional fibre composites) and thus ideally suited for modern vehicle construction. Furthermore they don't split easily and break without sharp edges, they have good acoustic characteristics and are already economically competitive today. In the automotive industry, they are used in the serial-production of several models.



<http://international.fnr.de/renewable-resources/biomaterial/bioplastics/>

Biomass Products

Design for recycling, use of eco plastics; Toyota



Spare tire cover
made of eco plastic



Seat cushion made of eco
plastic (driver seat)



Door trim base material
that uses kenaf



Kenaf fibers

http://www.toyota-global.com/sustainability/emironmental_responsibility/automobile_recycling/design_for_recycling/overview_of_eco_plastics.html

Biomass - Products

WoodPlasticComposites



WoodPlasticComposites (WPC) consist of a share of saw dust and conventional plastics. They combine the advantages of wood (inexpensive, higher stiffness, reduced expansion under the influence of heat, natural look) and plastic (malleable, resistant to humidity).

<http://international.fnr.de/renewable-resources/biomaterial/bioplastics/>

Tractors and harvesting



Biomass Power Station

In Germany RWE Innogy operates biomass power plants with 45 MW power output and 81 MW thermal output in total.

Built – Own - Operate

Neukölln, Bergkamen, Wittgenstein

Plants sold in 2013

Kehl 1, Kehl 2, Goch

At present 2 new biomass power plants are under construction:

- 53 MW_{el} CHP plant in Markinch / Scotland
- 18,7 MW_{el} power plant in Enna / Sicily



Single-Family Home, Heating with wood pellets, Test-Lab



Biomass from eatables



http://www.dresden.de/de/08/035/kinder/c_02.php

Compost for fertilization



Biomass from eatables

Biomass from:
restaurants, canteens and catering
companies, bakeries, care home
and hospital kitchens, meat
markets and butchers' shops, food
production operations and food
retailers.



<http://www.refood.de/en/rf/products-and-services/the-refood-approach/>

Biomass from eatables

All a question of technology.



ReFood steps on the gas.

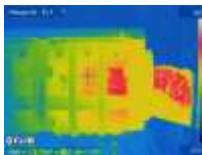


State-of-the-art

Our technicians continually strive to improve the technology deployed by ReFood. Generating biogas typically produces small quantities of hydrogen sulphide. ReFood filters off this harmful substance and feeds only clean biogas into the combined heat and power (CHP) plant. This not only ensures our employees are safe but also means that the emissions from electricity generation are significantly below prescribed limits. Our technicians are also working to produce biogas of the same quality as natural gas. This will open up other fields of application in future, such as biogas filling stations.

RESEARCH TOPICS

Production of oil, pellets, electricity – Container



Expeller
Temperatures



Expeller 3



Filtration 1



Jatropha Engine



Storage Crude Oil



Contribution by International Activities

Set up Cooperation **Renewable Energy**

KOUAME NKRUMAH
University of Science and Technology



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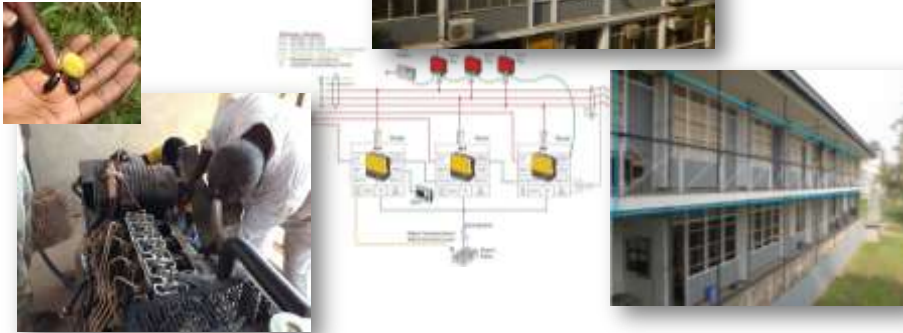
Pilot Project, uninterrupted power supply



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System Configuration; 3 Phase OFF-Grid System



Energy Efficiency

- Know where
- **Sensitize**
- Optimize
- Realize



Quelle: Kückelhaus K. (2014): Fachkooperation Klima- und Ressourcenschutz mit der Universität KNUST, Endbericht GIZ

KNUST



Thank you for your attention!

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