



Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
**GLOBAL**  
EXPORTINITIATIVE ENERGIE

# New Technologies and Project Examples from Germany

Dr. Jan Adolph  
20.11.2017  
Bangkok, Thailand



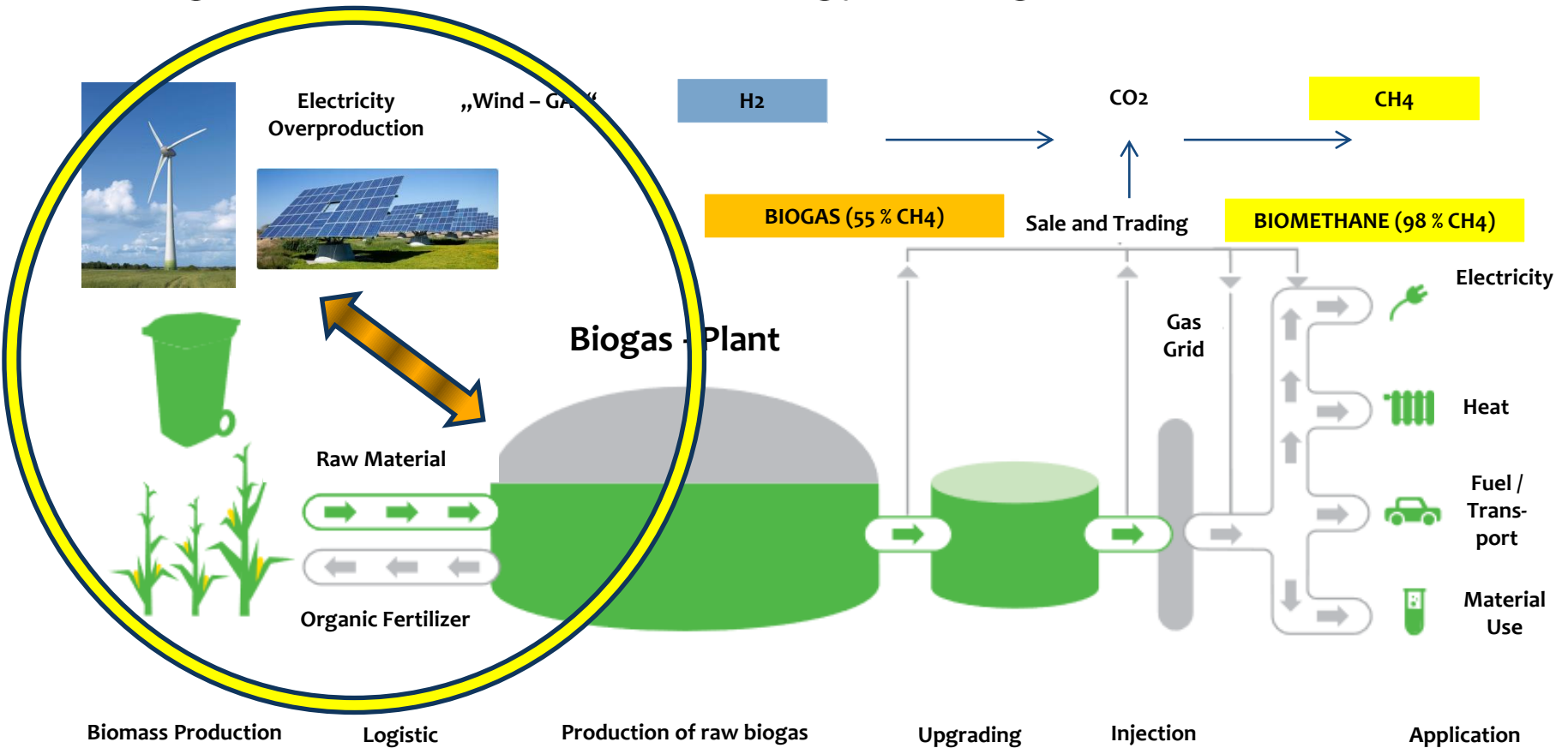
# INDEX

- 1. Introduction**
- 2. The need of flexible backup for Renewables**
- 3. The advantages of Biogasplants in comparison to other Renewables**
- 4. Examples of Innovative Biogas Plants and „Good Practice“**
- 5. Waste Potential**
- 6. Summary**

# 1. Introduction

# Introduction

Biogas – a multitalent in energy storage and production.



Source: [www.dabec.de](http://www.dabec.de)

# Introduction

„Biogas is stored sun energy“ – Not fluctuating – continuous or flexible power supply

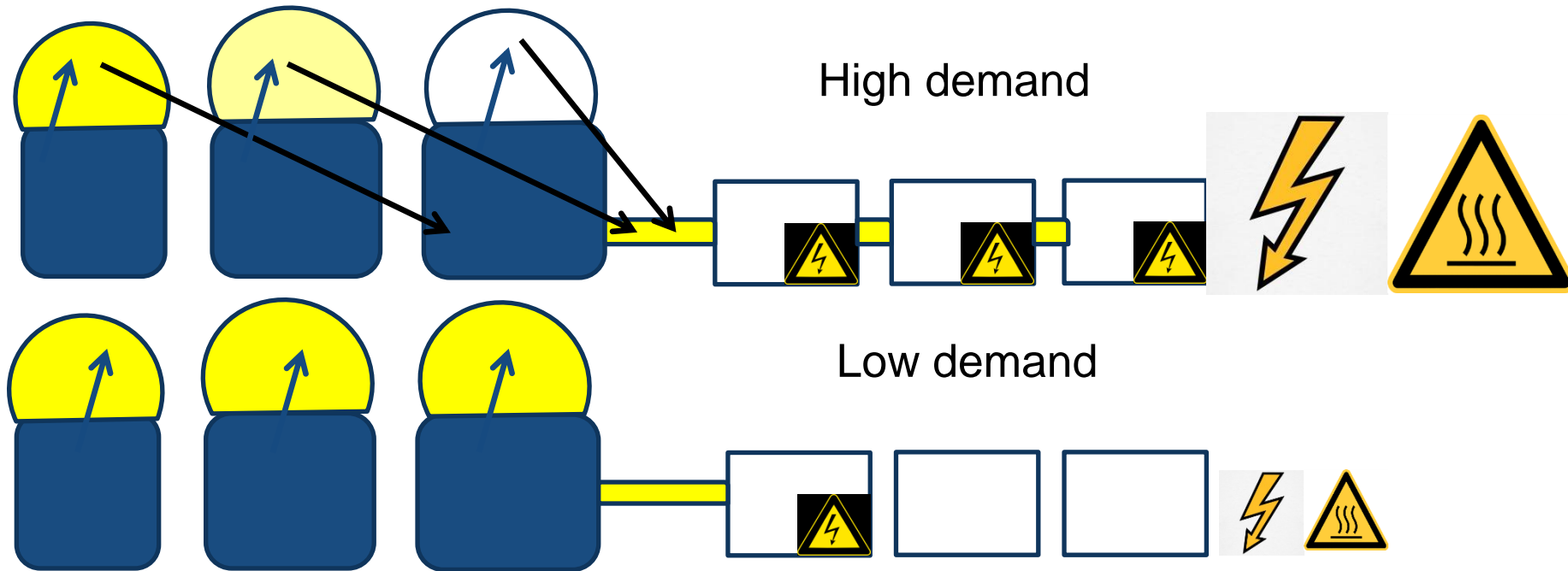


Source: [www.dabec.de](http://www.dabec.de)

# Introduction

„Biogas is stored sun energy“ – Not fluctuating – continuous or flexible power supply

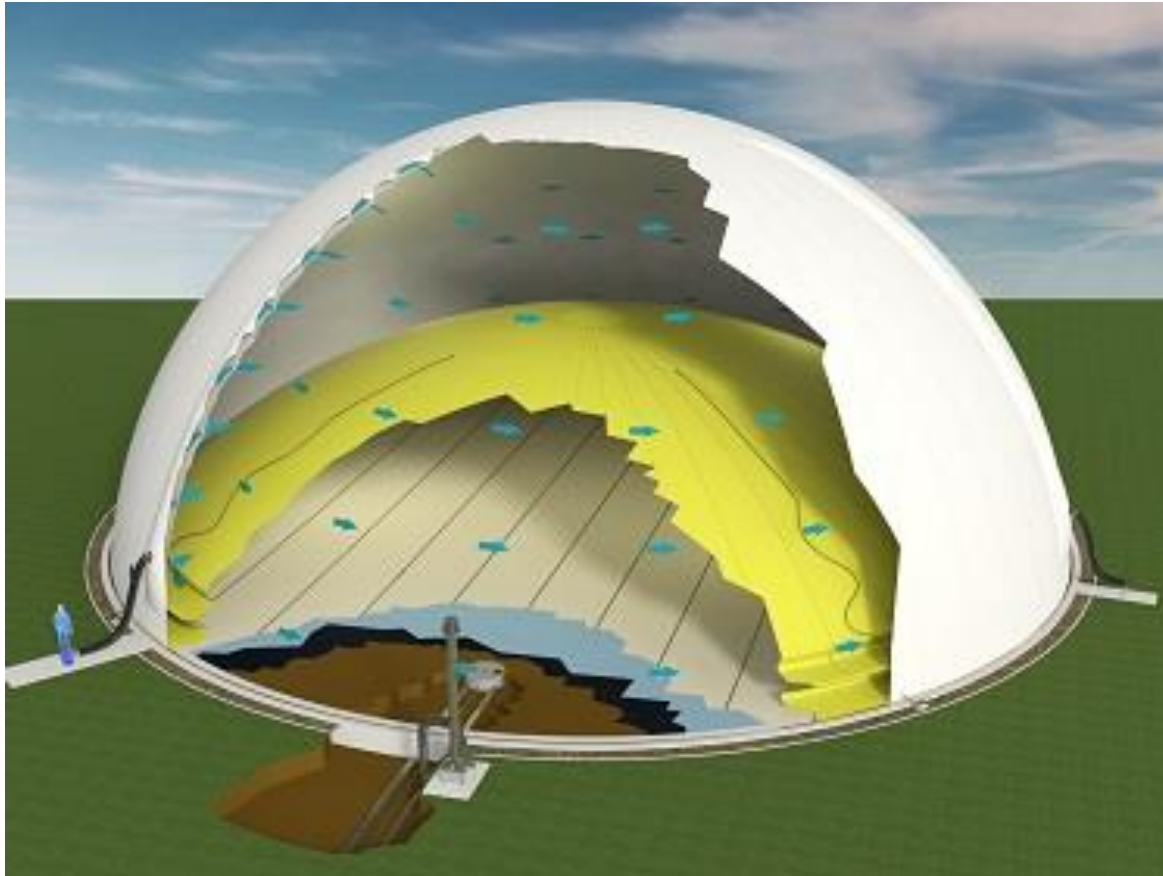
Need – based production with continuous or flexible supply





## Introduction

„Biogas is stored sun energy“ – Not fluctuating – continuous or flexible power supply



Source: Sattler Cenotec

18.000 m<sup>3</sup> Volume / 32 MWh Storage of Electricity



Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE

 **renac**  
renewables academy

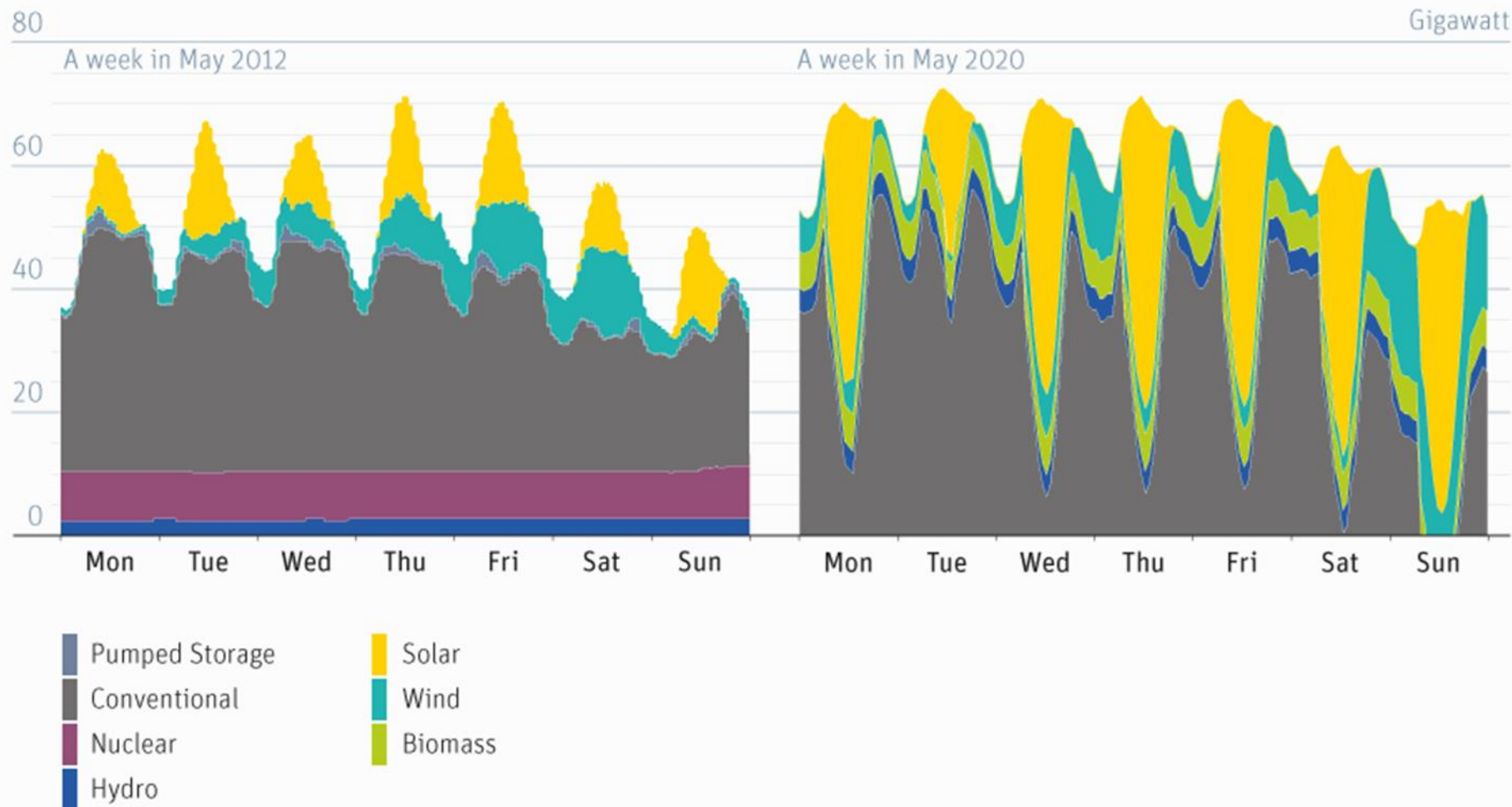
## 2. The need of flexible backup for Renewables



# Renewables need flexible backup, not baseload

Estimated power demand over a week in 2012 and 2020, Germany

Source: Volker Quaschnig, HTW Berlin



# 3.

## The advantages of Biogasplants in comparison to other Renewables

# The advantages of Biogasplants in comparison to other Renewables

- Biogas can provide electricity, heating, cooling and fuel



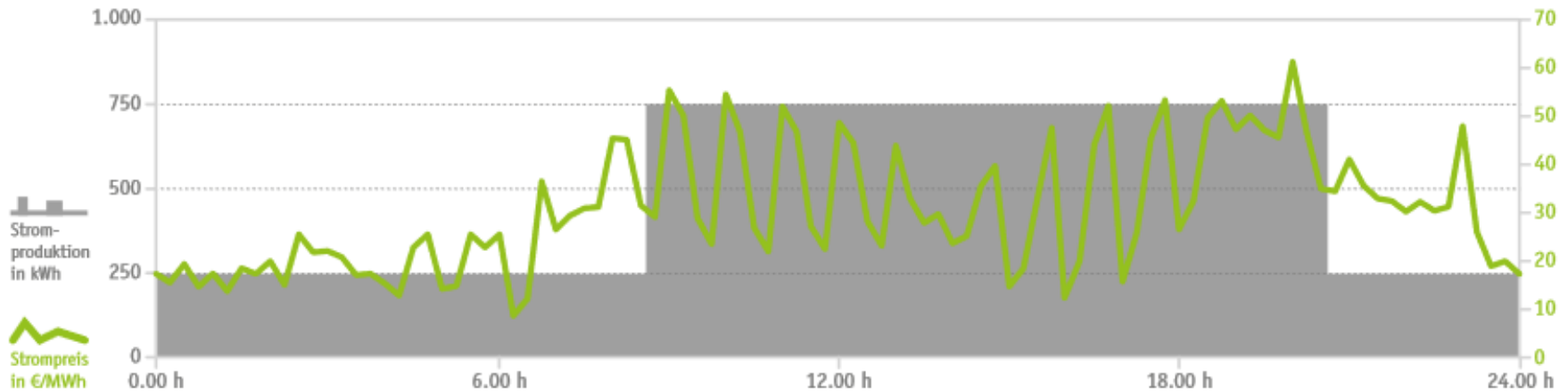
- Biogas can be stored easily (Cheap - Batterie for Energy Systems)



- Biogas Plants can provide system service regulation

# The advantages of Biogasplants in comparison to other Renewables

Flexibility in practical implementation:



STAGE I



Federal Ministry  
for Economic Affairs  
and Energy



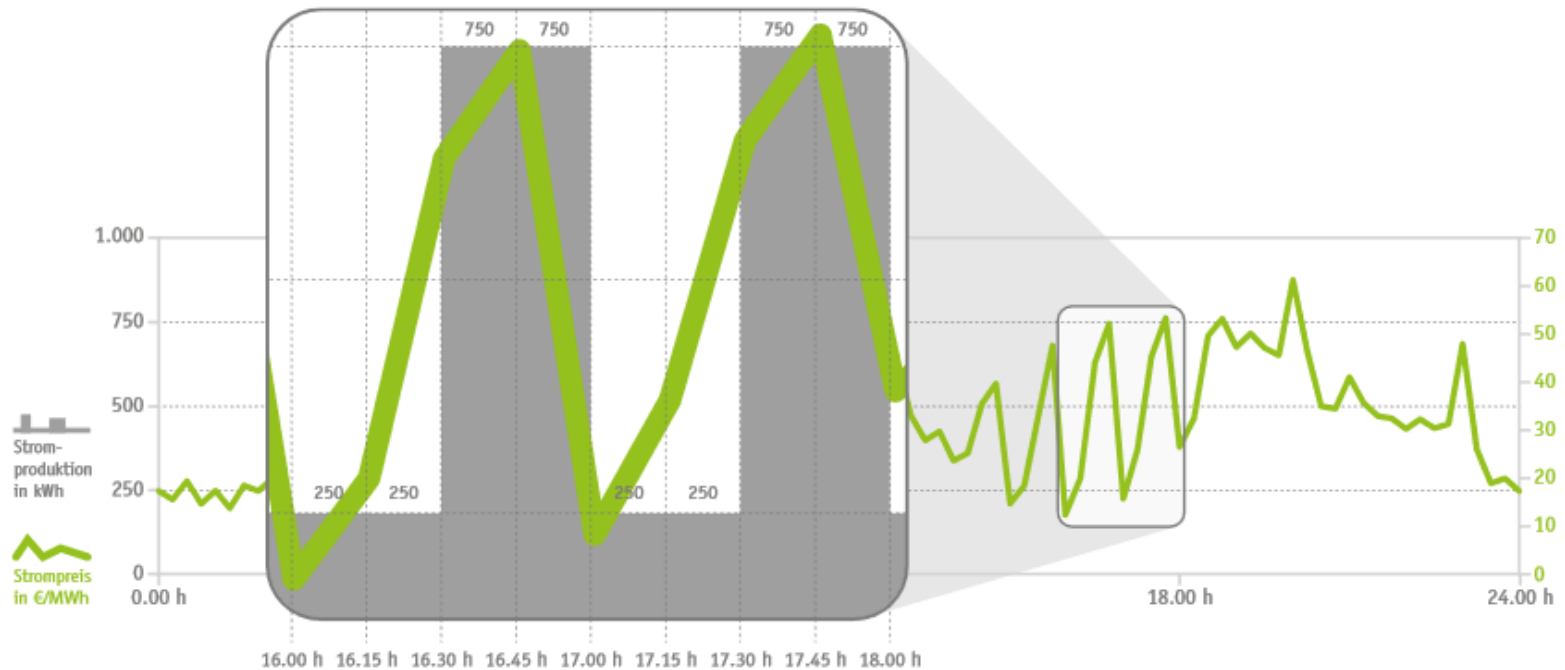
MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE



renac  
renewables academy

# The advantages of Biogasplants in comparison to other Renewables

Flexibility in practical implementation:



STAGE II

## 4. Examples:

# Innovative Biogas Plants and „Good Practice“ with flexible storage and production possibilities



# Examples



## Example 1:

BGP Ulm - Herrieden

Owner: Private

Substrates: Kitchen waste,  
Residues, Green Wastes

Storage Capacity: 8 hours  
3 Gasmotors

Power Capacity: 1.500 kW<sub>el.</sub>  
Heating of public school and  
private Homes



Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE

 **renac**  
renewables academy



# Examples

Example 2:

BGP Türkheim - Schönbrunn

Owner: Private

Substrates: Kitchen waste

Storage Capacity: 6 hours

3 Gasmotors

Power Capacity: 960 kW<sub>el.</sub>

Heating of Stables and  
private Homes

[www.maps.google.de](http://www.maps.google.de)



Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE

 **renac**  
renewables academy



# Examples

Credits: [www.drewag.de](http://www.drewag.de)



## Example 3:

BGP Dresden – Klotzsche

Owner: Public Municipality

Substrates: Manure, Silage

Storage Capacity: 8 hours  
1 Gasmotor

Power Capacity: 834 kW<sub>el.</sub>  
Heating of Dresden Airport



Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE

 **renac**  
renewables academy



# Examples

Credits: [www.drewag.de](http://www.drewag.de)

## Example 4:

BGP Dresden – Haßlau

Owner: Public Municipality

Substrates: Manure, Silage

Storage Capacity: 8 hours

Biomethan production  
Power Supply of Dresden



Federal Ministry  
for Economic Affairs  
and Energy



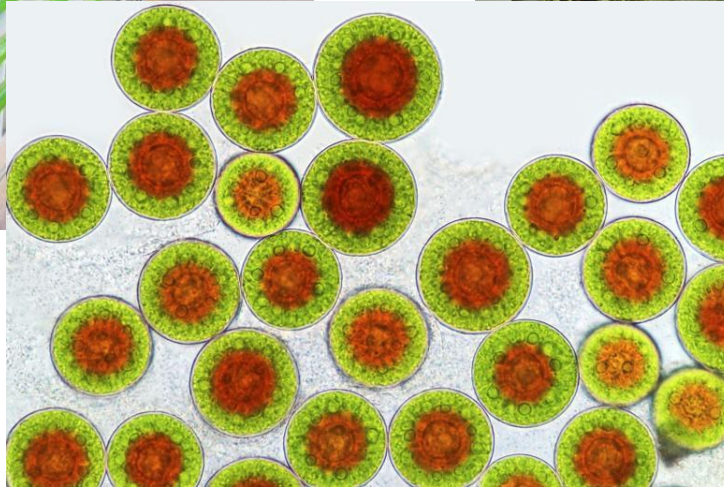
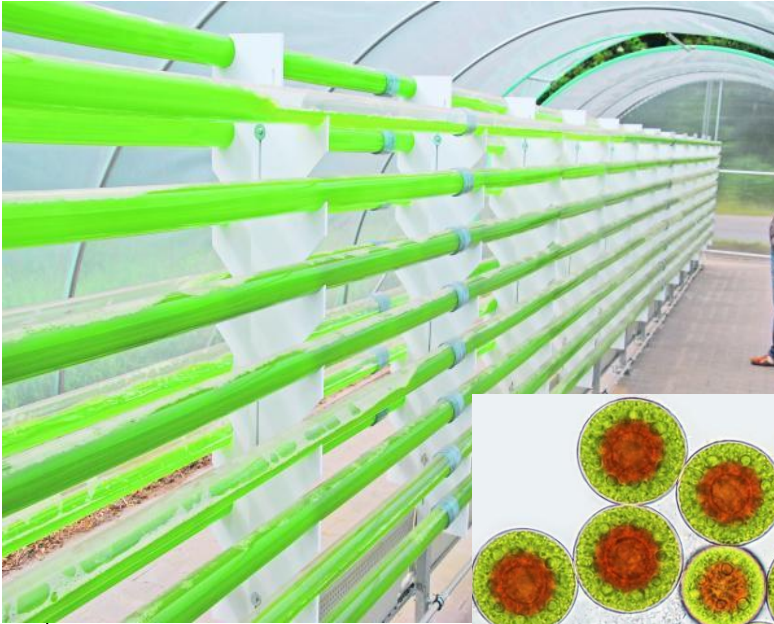
MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE

 **renac**  
renewables academy



# Examples

## Biogasproduction from Algae Production



TU Munich

„Algenflugkraft“

Substrates: Algae

Biogas from Algae



Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE

 **renac**  
renewables academy

# Examples

## Biogasproduction from Algae Production



**Algae - Oil**



**Biokerosene**



**Biogas**

# 5. Waste Potential



# Waste Potential

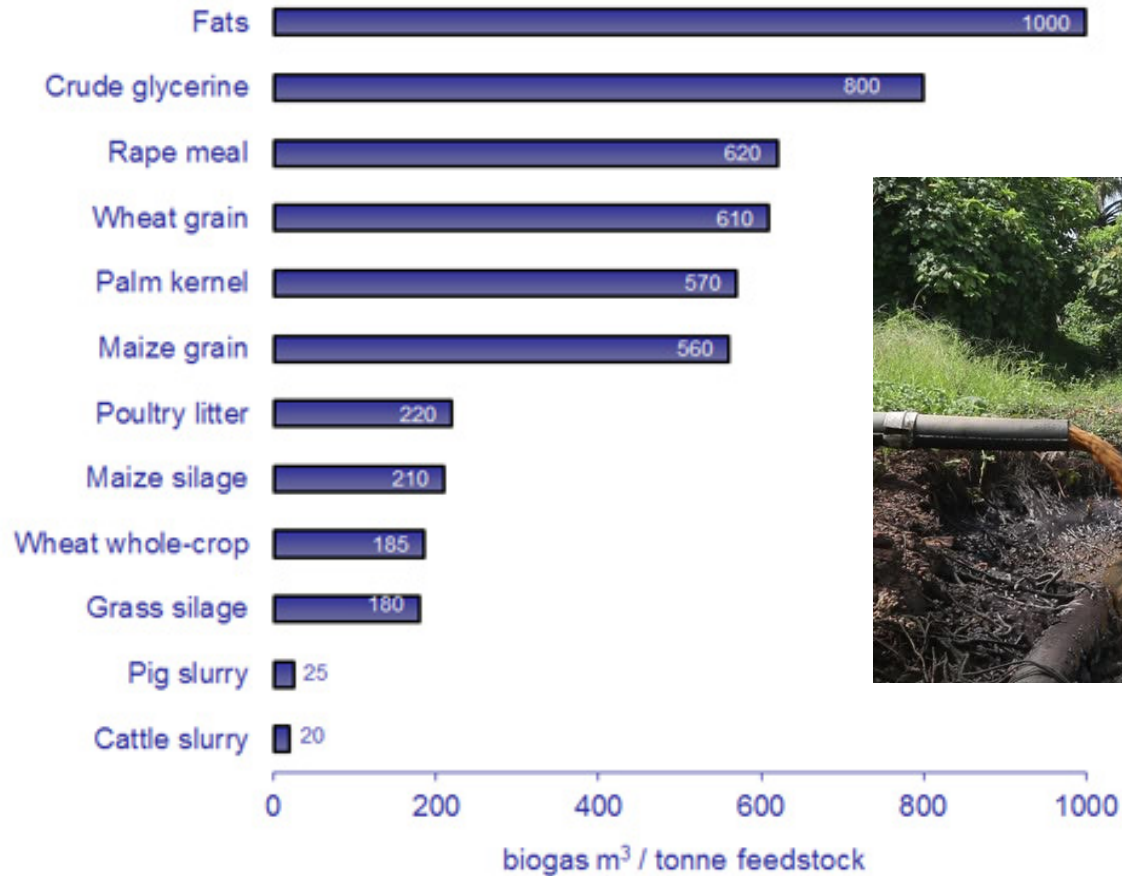




# Waste Potential of palm oil mill effluent

## Typical Biogas Yields Of Various Feedstocks

...be sure of what are you trying to achieve from your digester



Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE

 **renac**  
renewables academy

# Biogas composition of palm oil mill effluent

<b>Methane (CH<sub>4</sub>)</b>	<b>: 60-73%</b>
<b>Carbon dioxide (CO<sub>2</sub>)</b>	<b>: 26-30%</b>
<b>Nitrogen (N<sub>2</sub>)</b>	<b>: 0-1 %</b>
<b>Hydrogen Sulphide (H<sub>2</sub>S)</b>	<b>: 0-0.3 %</b>
<b>Hydrogen (H<sub>2</sub>)</b>	<b>: 0-1 %</b>
<b>Oxygen (O<sub>2</sub>)</b>	<b>: 0-2 %</b>

~ 30 – 35 Nm<sup>3</sup> Biogas / m<sup>3</sup> POME Effluent!

## 6. Summary

# Summary

- In future : Higher demands for flexibility in energy production and storage
- Biogas technology is the key – system for growing share of RES
- Various biogas utilization purposes (heat, elec., steam, fuel, ....)
- Careful process – control systems with online measurements optimize the process and flexible the biogas production
- Professional and safe operation is essential
- Last decade gives significant economies of scale and techn. progress
- Competition between food production vs. Biogas Plants not conducive

# Summary

- Future Energy Systems with high share of renewables only possible together with Water, Wind, Photovoltaic, Geothermal Power and Biogas
- Use of waste for biogas – future is essential
- Energy Storage very important
- !! Power Supply must remain affordable!!

# Thank you for your attention!



Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
GLOBAL  
EXPORTINITIATIVE ENERGIE

 **renac**  
renewables academy





Federal Ministry  
for Economic Affairs  
and Energy



MITTELSTAND  
**GLOBAL**  
EXPORTINITIATIVE ENERGIE

# Thank you for your attention!

DABEC Bioenergy Consulting  
Dr. Jan Adolph  
Mobile: +49 – 151 424 12 678  
Mail: [jan.adolph@dabec.de](mailto:jan.adolph@dabec.de)  
[www.dabec.de](http://www.dabec.de)

