

## FP6 T@W Project



**T@W Facilitation workshop in Malaysia**

# **Two German technology examples for the CDM market**

**Schmack Biogas programmatic VER project and  
LOTECOTEC (low temperature conversion technique) project**

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# Two German technology examples for the CDM market

**Schmack Biogas programmatic VER project and  
LOTECOTEC (low temperature conversion technique) project**

## Content

- Introduction of ZREU
- Schmack Biogas programmatic VER project
- Technology of biogas production
- LOTEKOTEC  
(low temperature conversion technique)

**ZREU**

**Mit Energie** ...begeistern  
...gewinnen  
...überzeugen



Zentrum für rationelle Energieanwendung und Umwelt GmbH

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**ZREU**

**Zentrum für rationelle Energieanwendung und Umwelt GmbH**

**Inspiring CONCEPTS** ▼ **Advanced TECHNOLOGIES** ▼ **Convincing SOLUTIONS**

T@W Facilitation Workshop, Kuala Lumpur

Daniel Caspari, 28 February 2008

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Regensburg/Germany

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## Partner in energy and environmental issues

- **National and international acting consultancy and engineering company**
- **Advisory services for public and private clients for over 20 years**
- **EU-organisation for the promotion of energy technologies and innovation**
- **Special areas of expertise:**
  - Efficient generation and use of energy
  - Renewable energy sources
  - Development and demonstration of innovative energy concepts and technologies



## Our business units ...

**Consulting &  
Concepts**

**Planning &  
Engineering**

**International  
Projects**

## Consulting & Concepts

### Areas

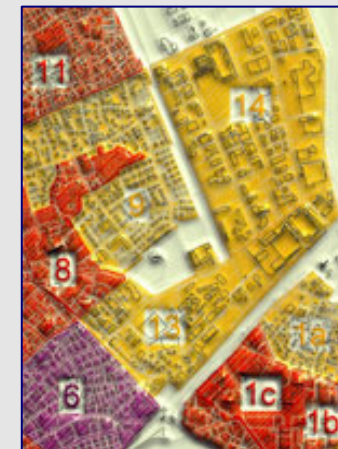
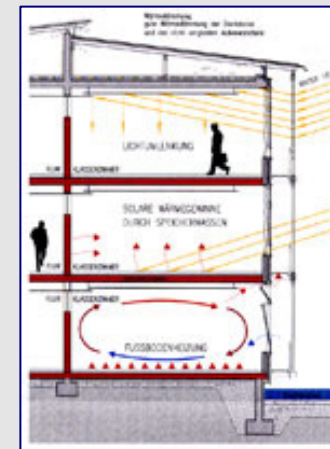
- Building equipment and energy systems - auditing, analysis, assessment and advice
- Efficient energy generation and use - concepts and feasibility studies
- Financing / TPF, tariffs & supply contracts (natural gas, electricity, heat supply, ...)
- CO<sub>2</sub>-emission trading / national allocation plan (inventories and balancing, CDM- / JI-projects, ...)

### Technologies

- Geothermal energy systems (ground-coupled heat pumps, electricity generation and heat networks)
- District heating systems
- Cogeneration, combined heat and power units
- Biomass
- Solar systems (solarthermal and photovoltaics)
- Climatisation, heat recovery
- Heat pumps / refrigeration

### Clients

- Local authorities, cities, public institutions / administrations
- Industry and commerce
- Spas, leisure and recreation centres



## Planning & Engineering

### Services

- Project design and conception
- Implementation planning and engineering
- Tender documents and bid evaluation
- Project management, site supervision

### Technical building equipment

- Heating systems, domestic hot water supply
- Ventilation, air conditioning and cooling
- Natural gas, water supply and waste water
- Measurement, control and monitoring technology

### Energy generation and use

- Heating systems
- Combined heat and power plants
- Heat pump systems
- District heating networks
- Energy management systems

### Buildings

- Schools, gymnasiums
- Spas (indoor, thermal and leisure spas)
- Administrative and municipal buildings, hospitals etc.
- Industrial and commercial buildings

### Renewable energy sources / innov. applications

- Geothermal energy – heating and cooling based on hydrothermal resources
- Biomass – wood chips and pellets, biogas, biofuels
- Solar systems – solarthermal and photovoltaics
- Activation of constructional building elements



## International projects

- RES implementation plans and strategies
- Studies and market-analysis
- Development and implementation of research & demonstration projects
- Co-ordination and management of complex multi-national projects
- Education and training, publication of technical brochures and handbooks
- Technology transfer and marketing
- Organisation of int. conferences, workshops and site visits
- Networking and international co-operation
- Awareness raising and targeted promotional campaigns
- Advice about European programmes and structural funds
- Project screening and proposal development (grant writing, applications in response to EC calls)
- Elaboration of fundraising strategies and plans
- Consultation processes and surveying of members, reporting



## CDM bio energy projects

- represent a major share of „renewable energies“
- are also part of further categories of the 15 CDM scopes, esp. „Waste Handling and Disposal“ e.g.:
  - landfill gas
  - biomass residues from a variety of agriculture processes
  - biogas (manure): e.g. Schmack Biogas programmatic VER project
  - avoided emissions from organic waste through alternative waste treatment processes:  
e.g. LOTEKOTEC (low temperature conversion technique)  
→ esp. Methane (CH<sub>4</sub>) projects are attractive for CDM/JI.
- increasing number of CDM bio fuel projects (including transport sector)

## Schmack Biogas programmatic VER project

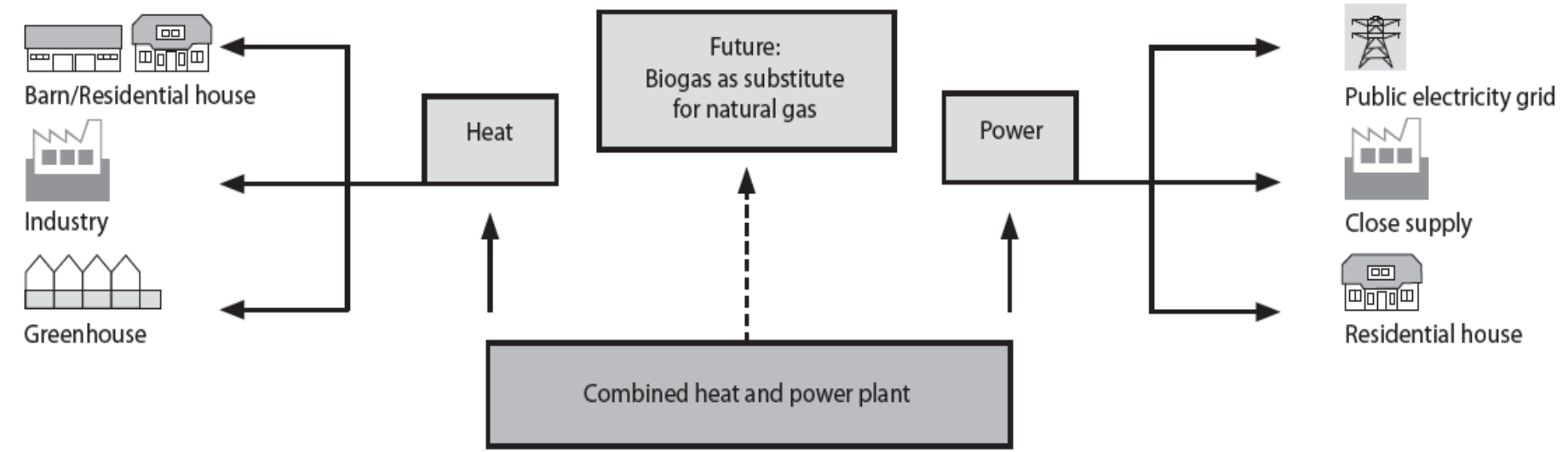
- Fermentation of manure from various stockbreeding farms
  - Avoiding Methane emissions instead of deploying the substrate untreated onto the fields
- Heat and power generation from biogas
  - Replacement of fossil fuels
  - Further indirect emission reductions
  - Not part of the project verification to avoid double-counting with the EU ETS and the German Feed-in Law (EEG)
- Pilot project
  - Development of a baseline and monitoring methodology
  - “Bundling” of decentral biogas plants in a “Programme of Activities (PoA)”



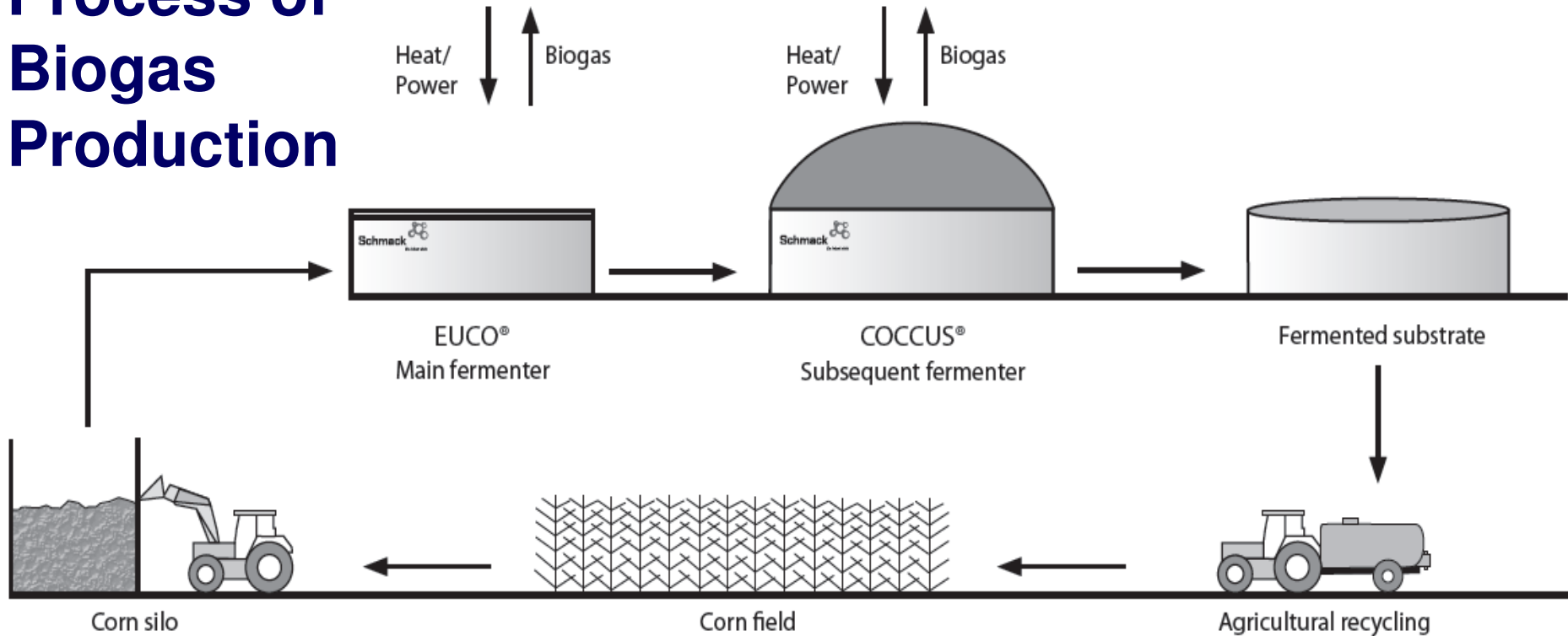
© Schmack Biogas AG

# Schmack Biogas programmatic VER project

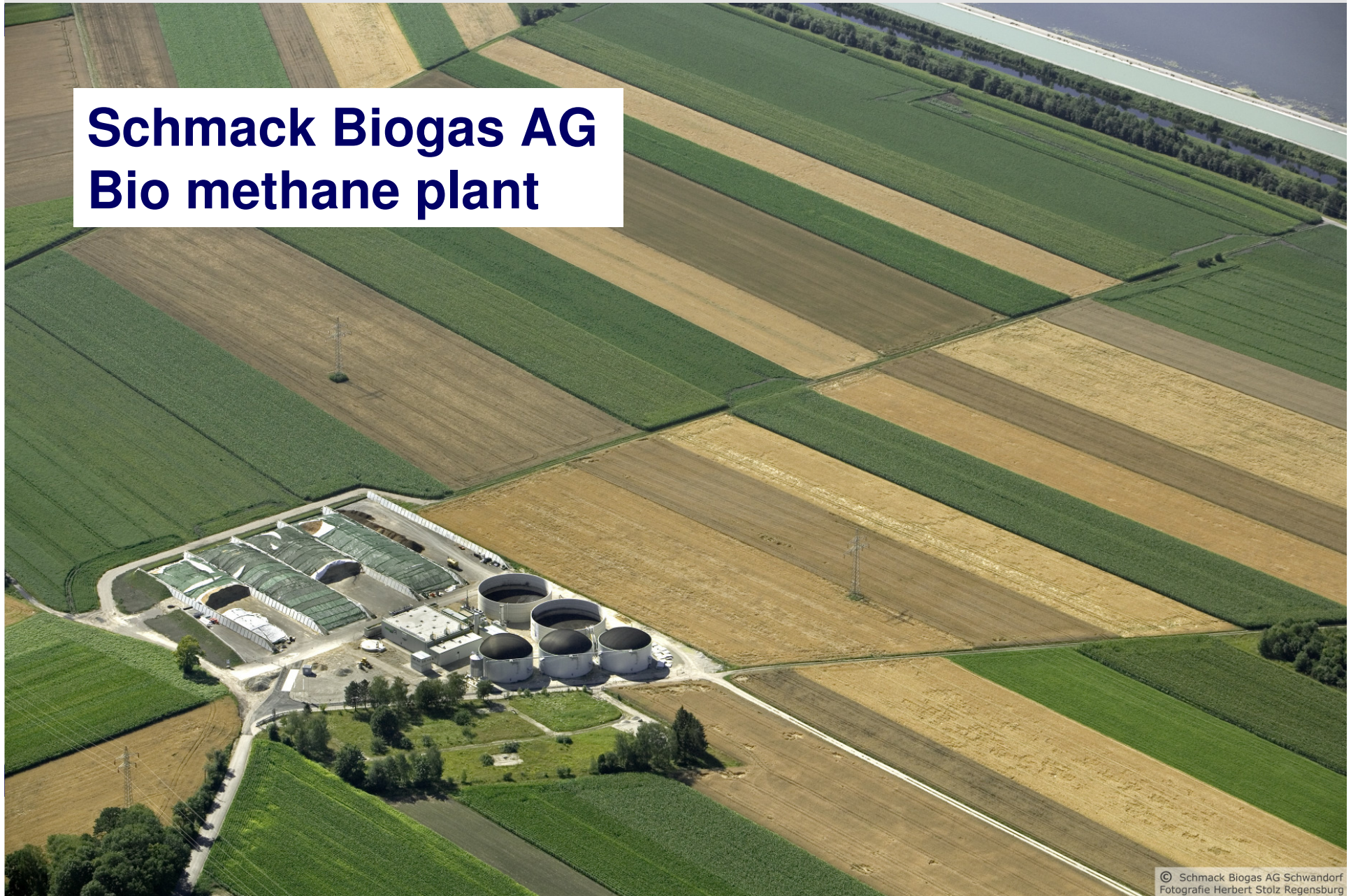
<b>Project Data:</b>	
Project title	Reduction of methane emissions by implementing and optimising the operation of biogas installations
Host Country	Germany
Type of certificate	Verified Emission Reduction (VER)
Crediting period	2001 - 2007
Installed capacity	40 – 1,250 kW
Emission reductions	20,000 – 25,000 t CO <sub>2</sub> e/a, depending on the number of participating farmers, installed capacities and types of substrate
Project participants	Schmack Biogas AG and a varying number of biogas plant operators / support by FutureCamp



# Process of Biogas Production



# Schmack Biogas AG Bio methane plant



# Animation of the typical, standardised construction of a Schmack biogas Plant

Insight into the technical and biological process within a biogas plant – from charging to feeding electricity into the network.

Download Animation: <http://www.schmack-biogas.com/wEnglisch/anlagen/animation.php?navid=32>

## Theoretical Biogaspotential of different Energy plants at an area of 200 hectare (in Germany)

Energy Plant	Crop yield	Biogas output	CHP Plant size
Corn silage	9,000 t/solid cubic metre	1,600,000 m <sup>3</sup>	360 kW <sub>el</sub>
Sudan grass	11,000 t/solid cubic metre	1,240,000 m <sup>3</sup>	300 kW <sub>el</sub>
Grass silage	7,200 t/solid cubic metre	1,090,000 m <sup>3</sup>	260 kW <sub>el</sub>
Rye silage	5,200 t/solid cubic metre	746,000 m <sup>3</sup>	170 kW <sub>el</sub>

**Assumptions: one annual crop, storage losses of the silage: 12%, CHP electrical efficiency: 35%, operating hours: 8,000**

Source: Handreichung Biogasgewinnung und –nutzung (FNR, 2006);  
Datensammlung Energiepflanzen (KTBL, 2006)

## Key data for Biogas

1 m <sup>3</sup> Biogas	5.0 – 7.5 kWh <sub>total</sub>
1 m <sup>3</sup> Biogas	1.5 – 3 kWh <sub>el</sub>
CHP electrical efficiency	30 – 40 %
CHP thermal efficiency	40 – 60 %
CHP total efficiency	~ 85 %
CHP operating hours	7,500 – 8,000 /a
<b>Specific investment</b>	
- CHP gas engine 150 kW <sub>el</sub>	900 €/kW <sub>el</sub> ≈ 430 MYR
- CHP gas engine 500 kW <sub>el</sub>	560 €/kW <sub>el</sub> ≈ 2,700 MYR
- Biogasplant < 100 kW <sub>el</sub>	5,000 – 3,000 €/kW <sub>el</sub>
- Biogasplant 100 - 350 kW <sub>el</sub>	3,000 – 2,000 €/kW <sub>el</sub>
- Biogasplant > 350 kW <sub>el</sub>	< 2,000 €/kW <sub>el</sub> ≈ 9,500 MYR

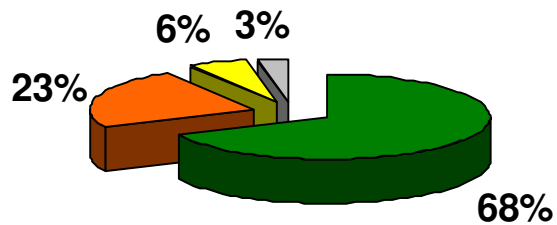
Source: Handreichung Biogasgewinnung und –nutzung (FNR, 2006), FAL

**Sewage sludge in Germany:  
9 Mio. t/a (containing 25% DM)**

=

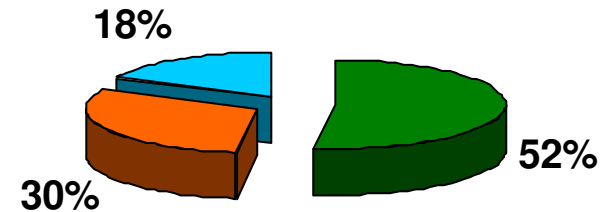
**3.5 times the Volume of the Cheops Pyramid  
(Height: 146.5 m, Length: 230 m)**

3.5 times



■ material recycling    ■ thermal recycling  
■ landfill    ■ storage

source: Statistisches Bundesamt, 2001



■ material recycling    ■ thermal recycling  
■ new technologies

source: Kolb, Quo Vadis 2005

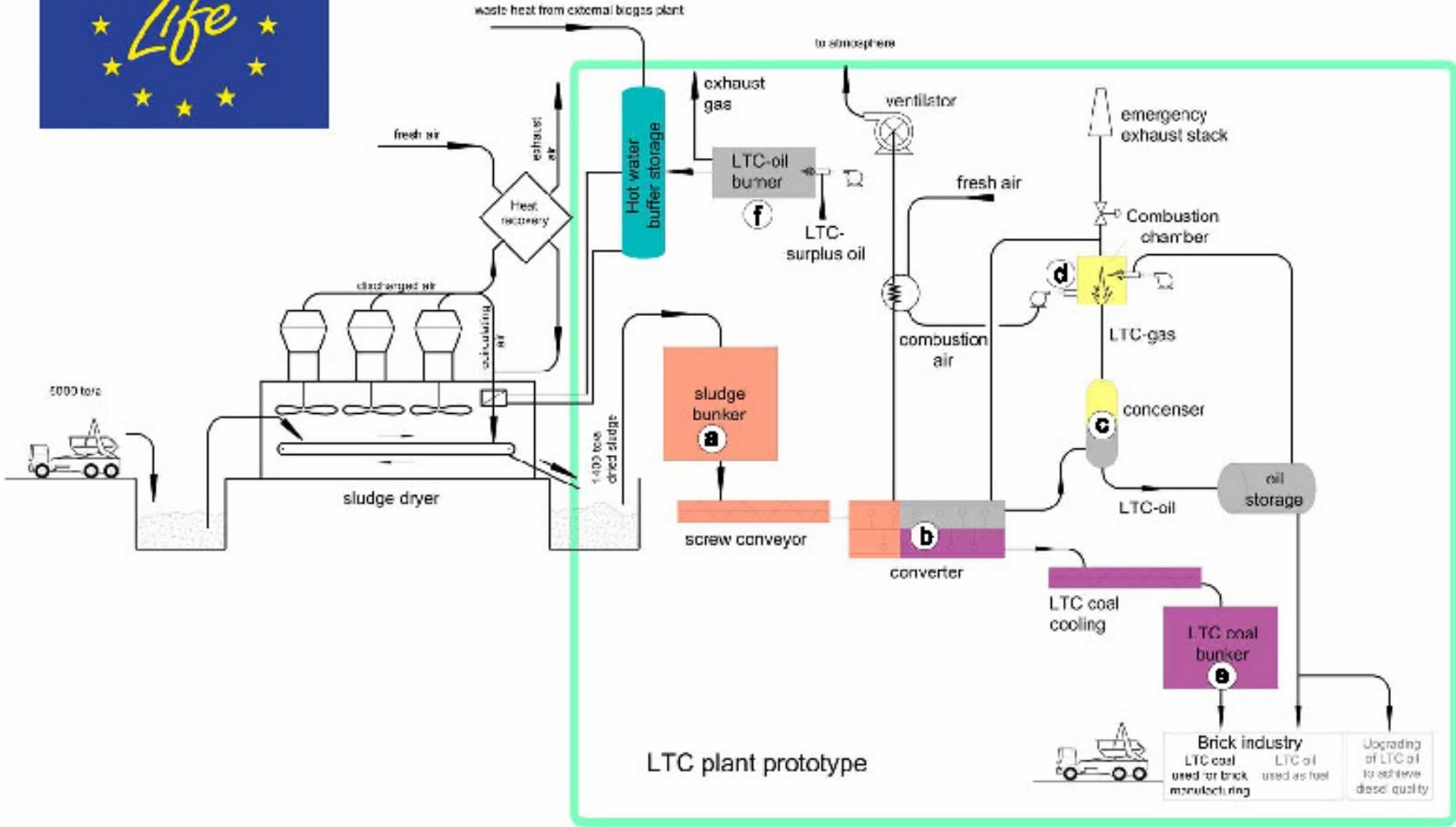
**A possible solution is demonstrated in the project:**

**LOTECOTEC  
(low temperature conversion technique)**

# LIFE Demonstration-Project : Efficient disposal and recycling of sewage sludge by low temperature conversion (LOTECOTEC)



**lotecotec**



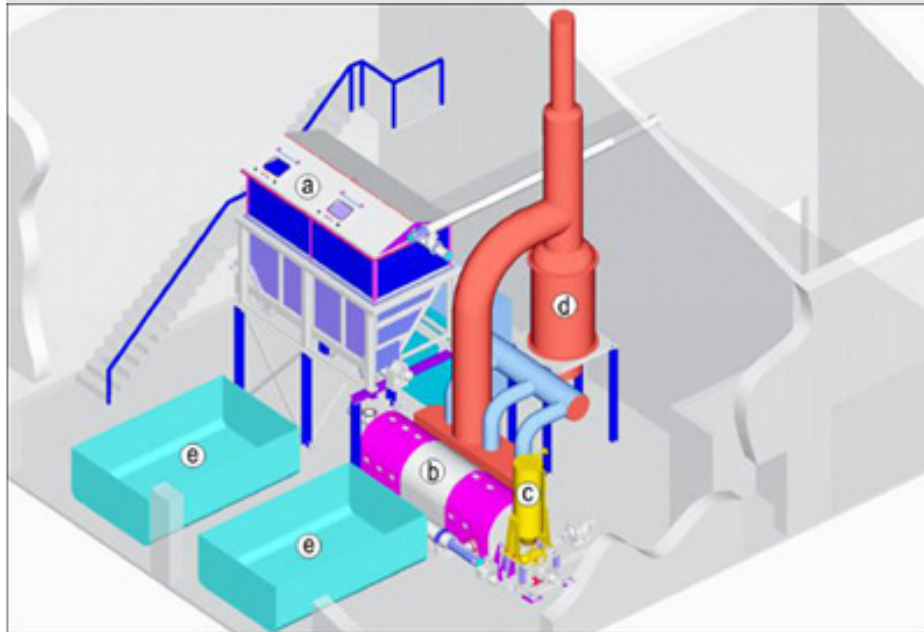
Delivery of dewatered sewage sludge (25% DM)

Thermal drying of the sludge (90% DM)

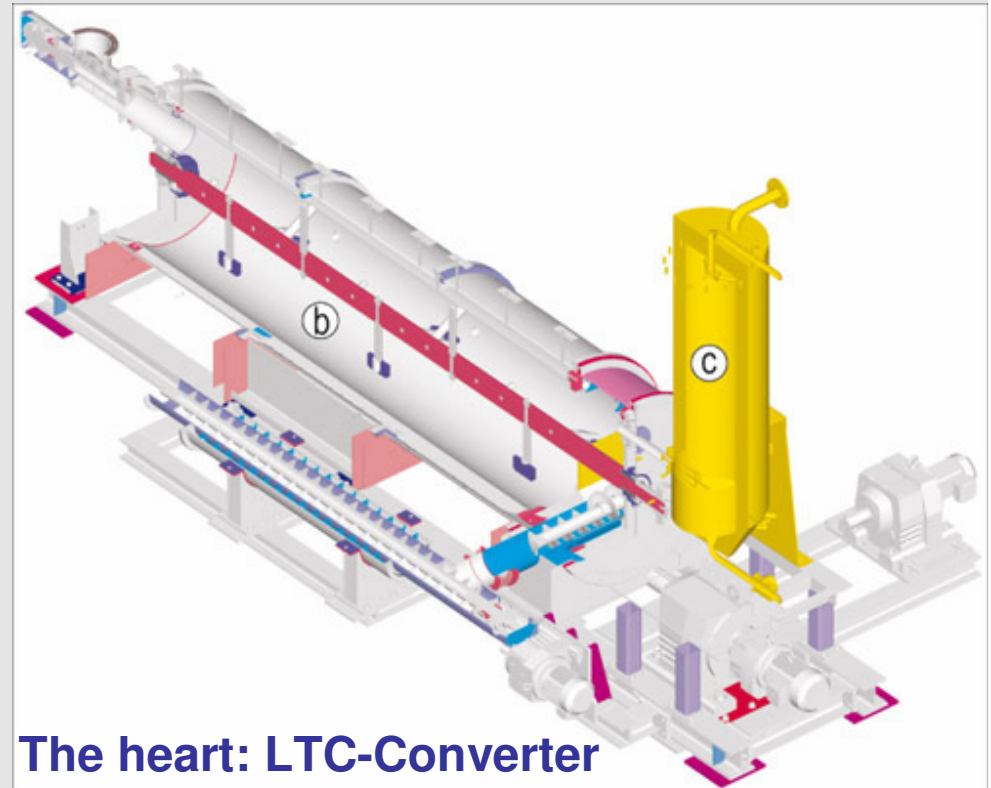
Low temperature conversion process (sludge conversion to LTC coal, oil and gas)

Refinement and further utilisation of LTC sub-products

## Low temperature conversion technique: 3D-schematic diagram of the entire plant

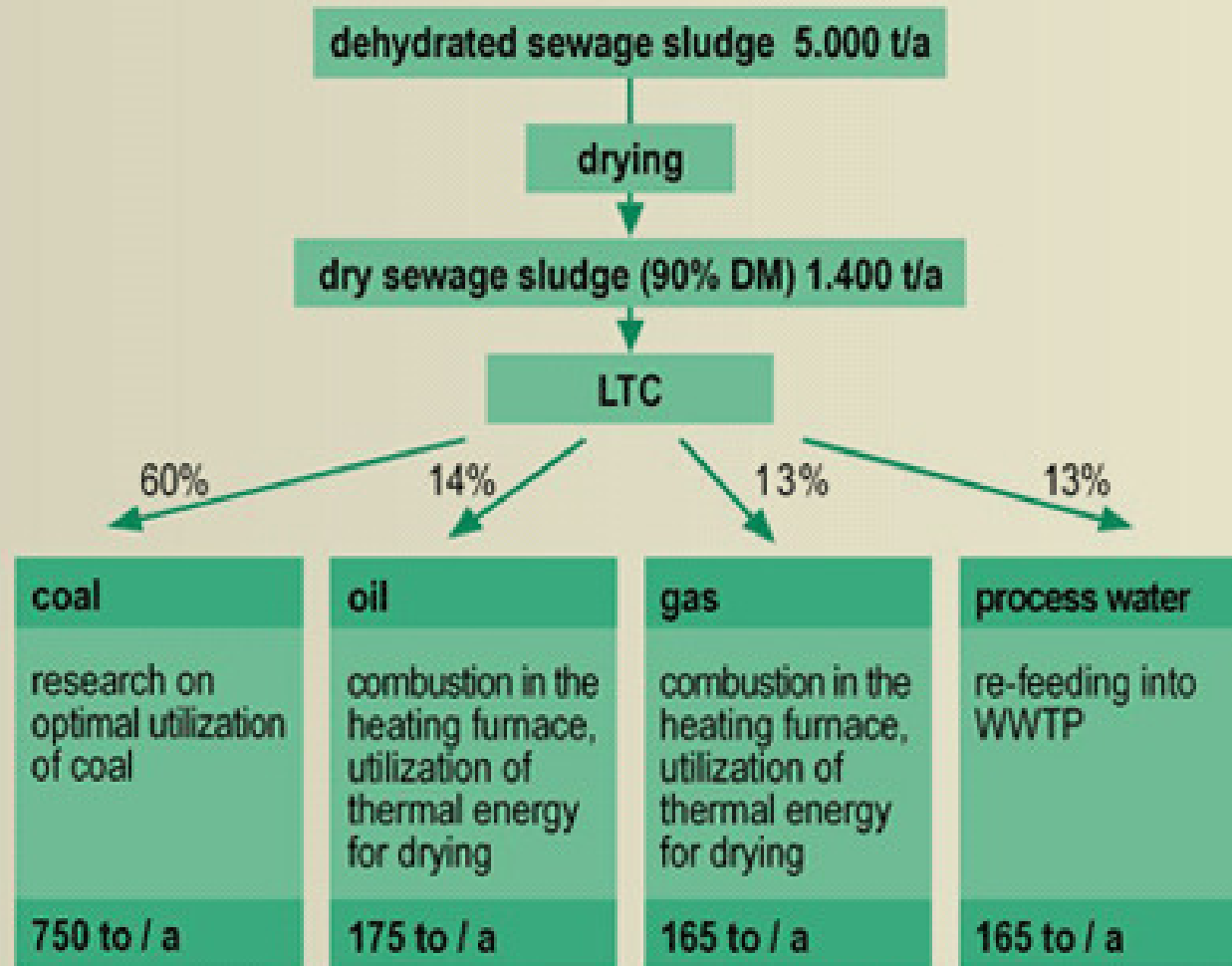


- Ⓐ sludge bin      Ⓑ LTC-converter      Ⓒ condenser
- Ⓓ combustion chamber      Ⓔ coal stockyard      Ⓕ LTC-oil-burner

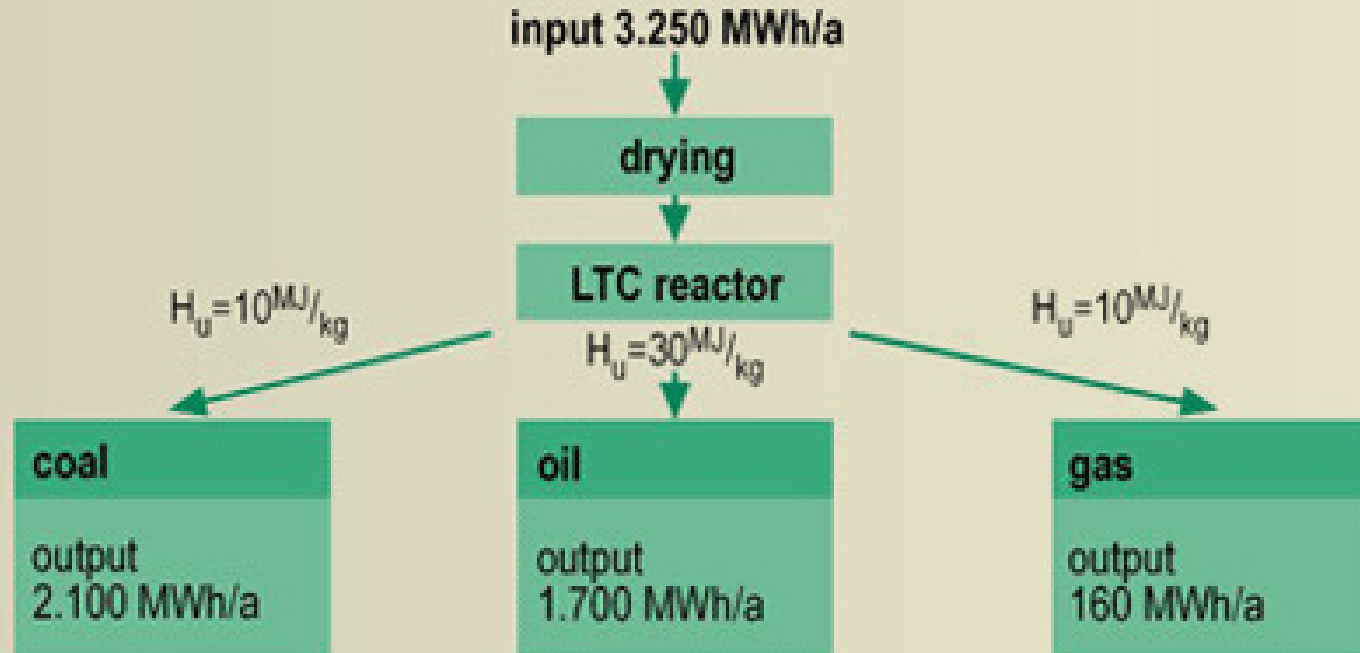


**The heart: LTC-Converter**

material balance



# energy balance



The sewage sludge produced by local and other waste water treatment plants is dried to 90% DM and in the LTC converter subsequently transformed into energy carriers/sources. As the resulting sub-products contain more energy than is needed for drying, the sewage sludge treatment plant could work self-sufficiently.

## Advantages of Low temperature conversion:

- ✓ Increased independence for communities due to decentralized self-sufficient waste disposal
- ✓ No land application of sewage sludge, keeping bacteria, residual drugs etc. from the food chain
- ✓ Reduction of CO<sub>2</sub> emissions by working on a regional scale
- ✓ Recovery of phosphate from coal is possible, as the natural deposits of phosphate are declining

## Demonstration-Project LOTECCOTEC project partners

### ↳ Beneficiary:

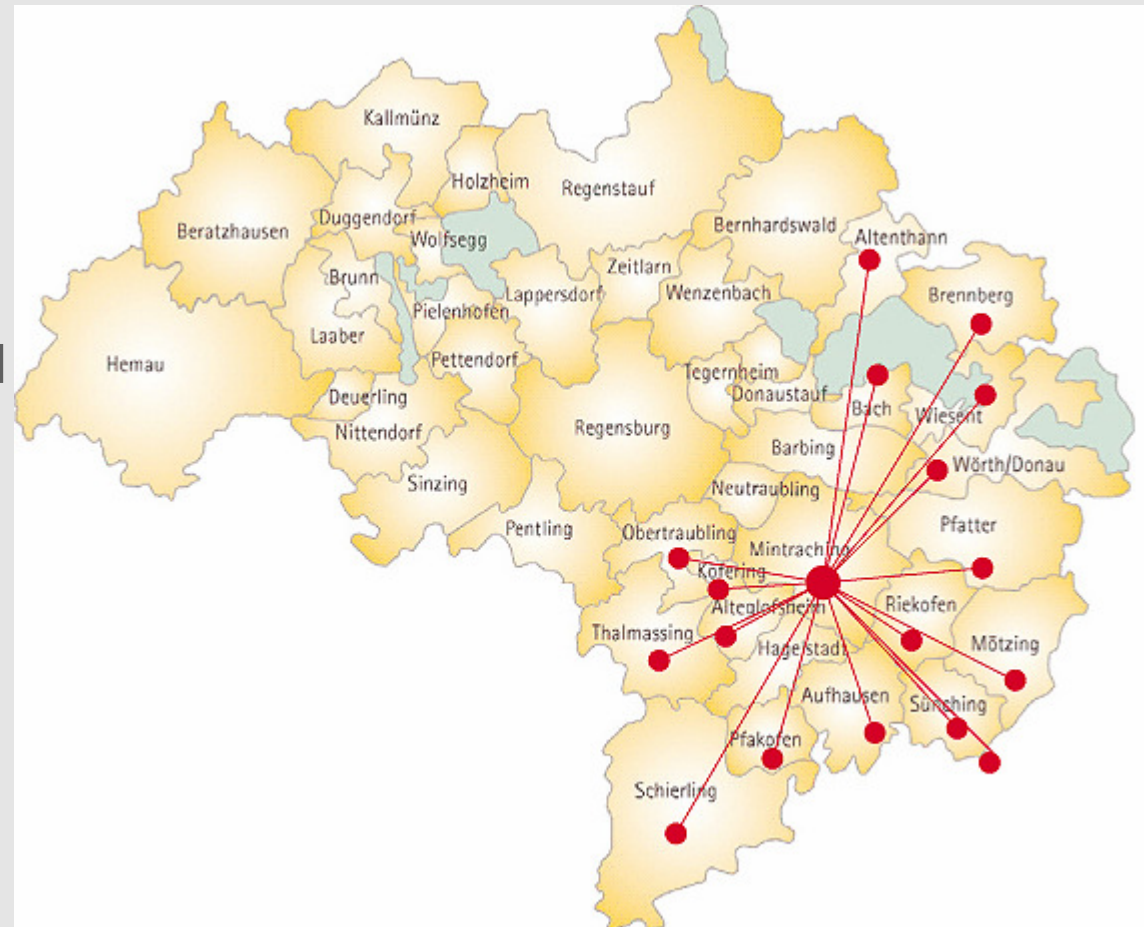
VBA Pfattertal (sewage disposal association of Pfattertal)

### ↳ Project partners:

- University of applied sciences Gießen-Friedberg,
- Tonwerk Venus GmbH (brick industry)
- ZWT Wasser und Abwassertechnik GmbH, Bayreuth  
(water and wastewater technologies)

**11 waste water treatment plants representing 16 communities in the south-eastern part of Regensburg County joined forces**

**Annual delivery of up to 5,000 tonnes of dewatered sewage sludge (25,000 tonnes of wet sludge) dried to 90% DM**



## Demonstration-Projekt LOTECCOTEC project costs

- ↖ **Project duration:** 01. Nov. 2006 bis 31. Okt. 2009
  
- ↖ **Total project costs (incl. investment):** 4.25 Mio. Euro  $\approx$  20.23 Mio. MYR
  
- ↖ **EU Grant:** 1.16 Mio. Euro  $\approx$  5.53 Mio. MYR

# Thank you very much for your attention

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