Biogas Development

in the world and in Europe

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WIP – Renewable Energies, Munich, Germany

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Content

1. Overview biogas plants worldwide
2. Biogas in Europe
3. Lessons learnt from other countries

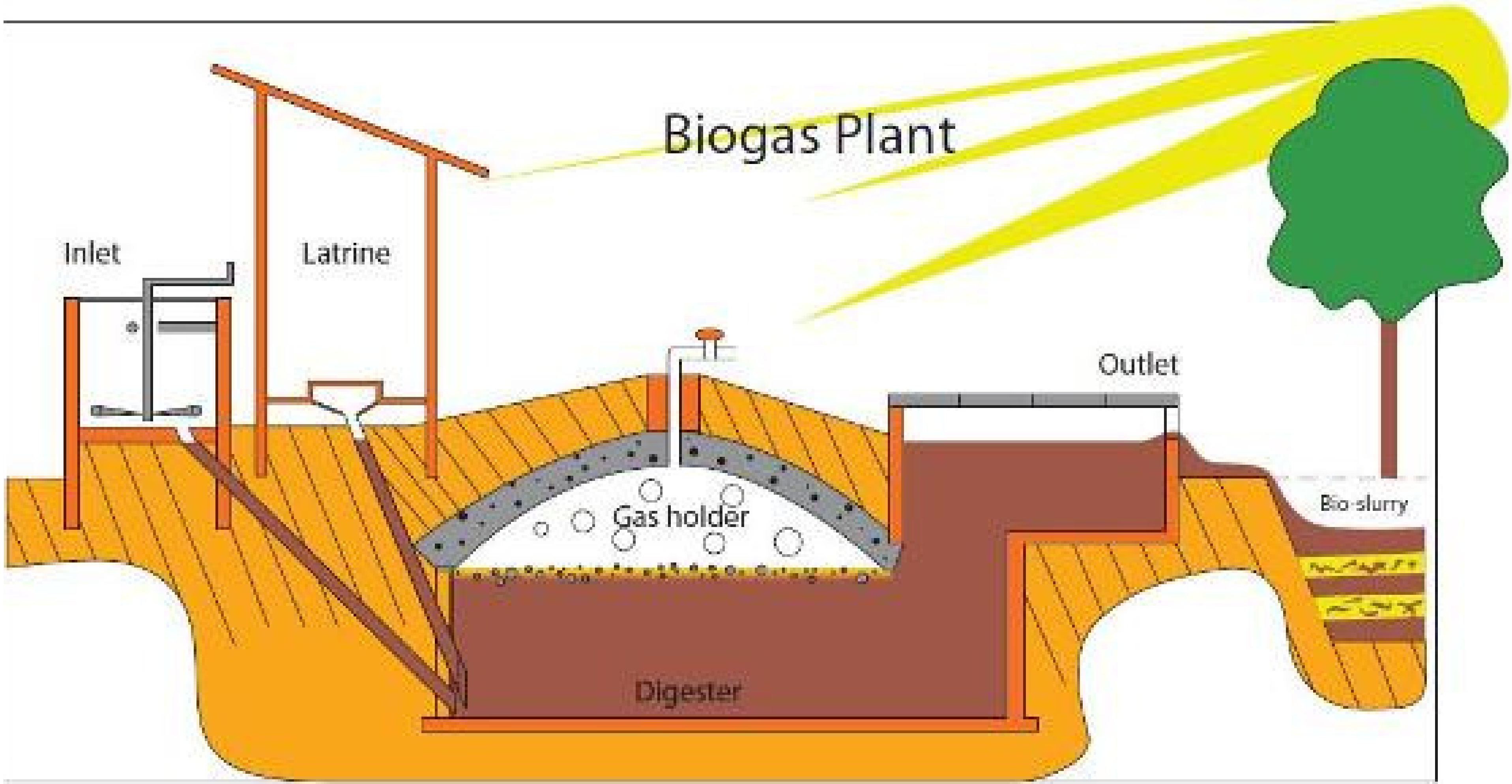
1. Overview Biogas Plants Worldwide

from small/simple scale to large/industrial scale

Mexico

Mali


India
Photo: Jun - Jul 2010, GTZ/WSIP (N. Khawaja), Navin
Well-Field Area, Herat


Biogas Plant
Inlet
Latrine
Outlet
Gas holder
Bio-slurry
Digester

COURTESY: SINTEX

Tanzania

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Primer Planta
Municipal de
BIOGAS
de la Provincia de Entre Rios
Aquí se encuentra el PRIMER BIODIGESTOR
de Cerrito que genera GAS METANO, mediante
la colaboracion y compromiso de los ciudadanos
en la separación de los RESIDUOS ORGÁNICOS
FUNDACIÓN
PROTEGER
Red Argentina de Municipios y Comunidades Saludables
Municipalidad de
Cerrito


Argentina
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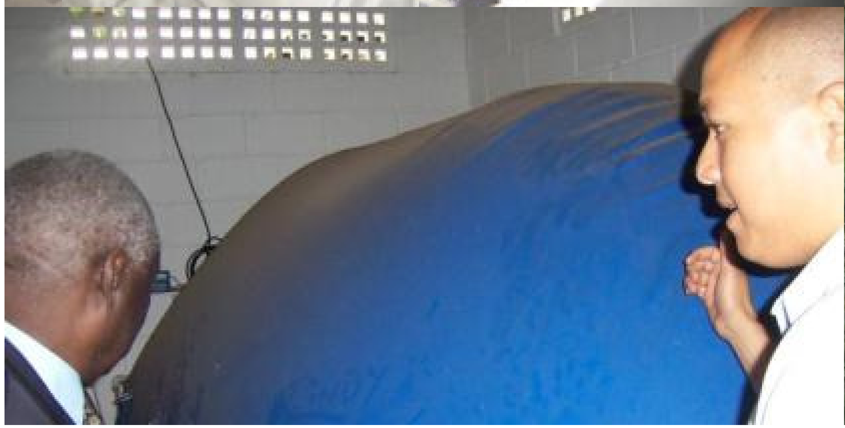
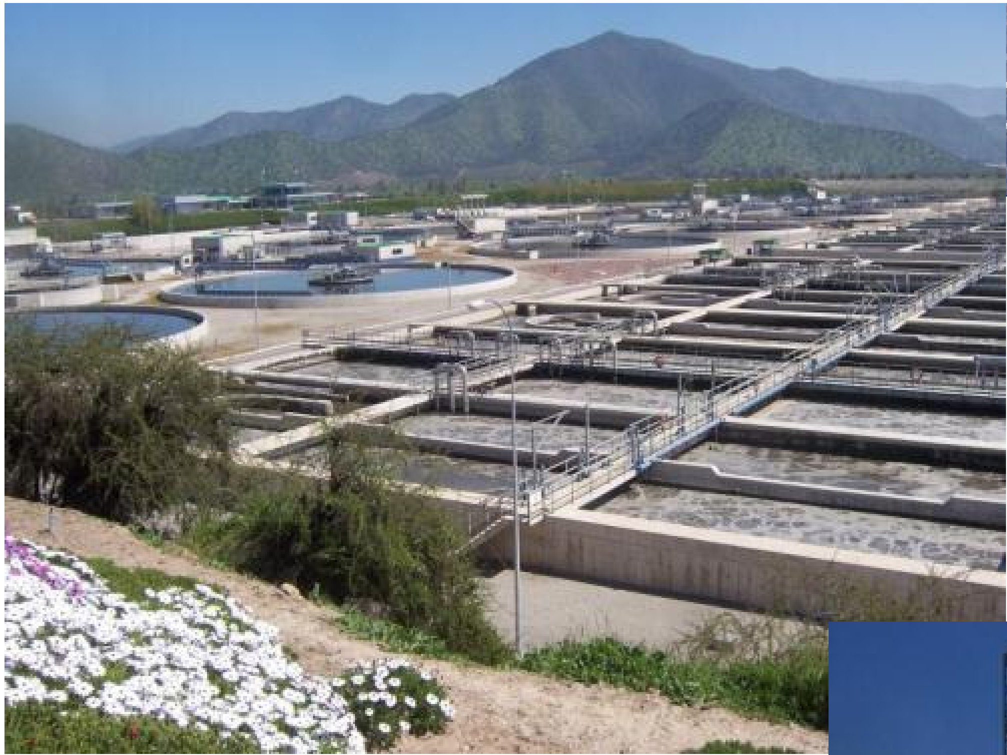
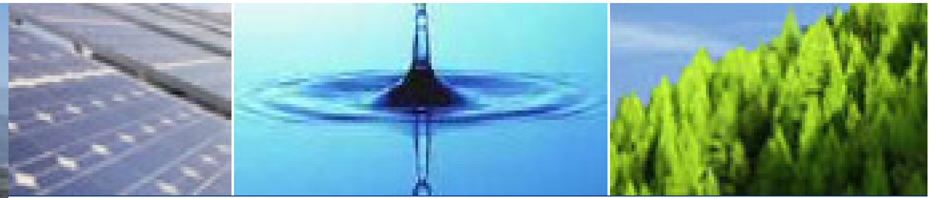
Brazil



Costa Rica

Chile





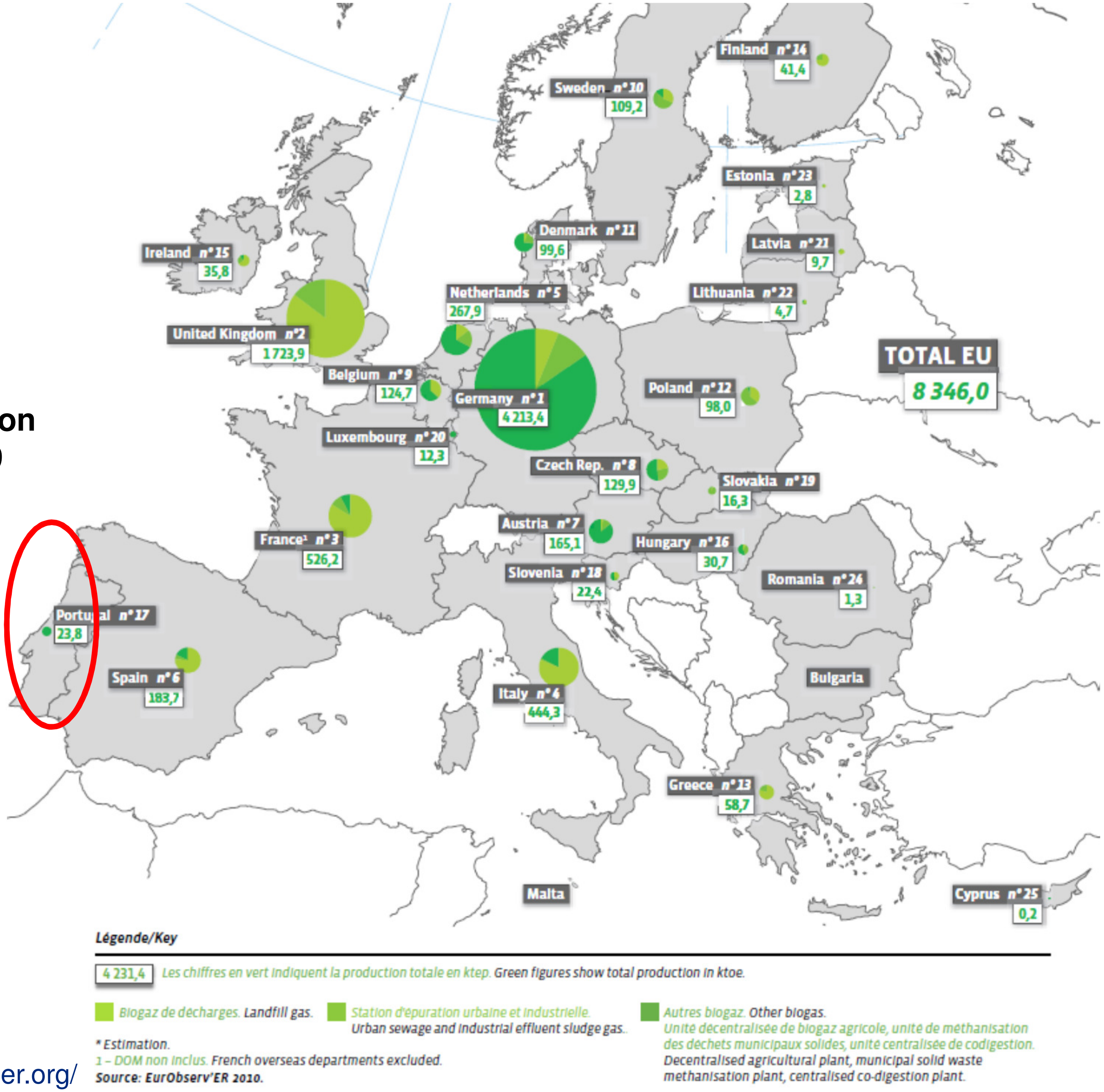
Chile

Biogas Plants worldwide

- Africa: Potential for more than 20 Mio household installations (SNV)
- India: > 2 Mio installations
- Nepal: 150,000 installations
- Pakistan: several hundret thousands
- China: > 6 Mio installations
- N-America, Latin America: increasing numbers

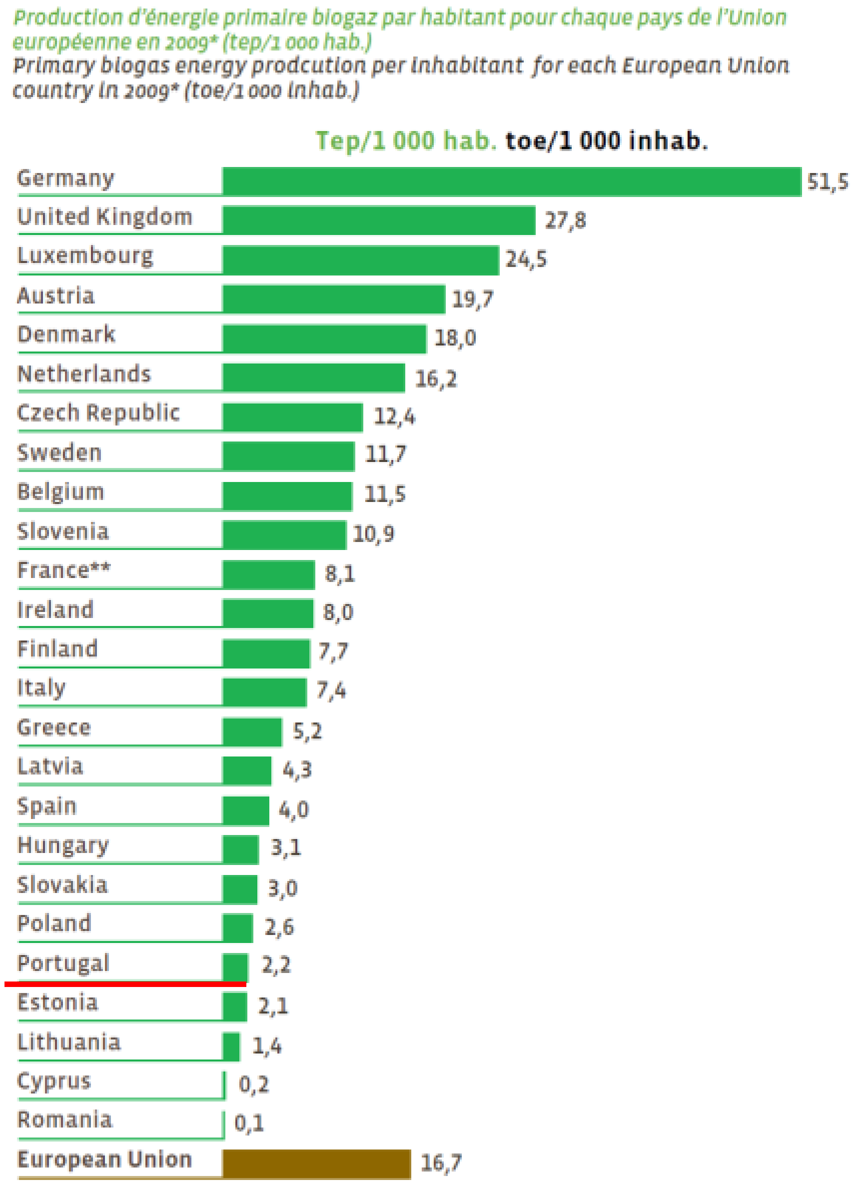
2. Biogas in Europe

Primary Energy Production of Biogas in Europe 2009



Source: http://www.eurobserv-er.org/

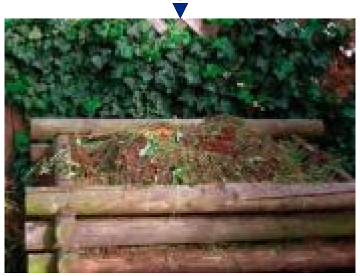
Primary Energy Production of Biogas per 1000 habitants in Europe 2009



* Estimation. ** DOM non inclus. French overseas departments excluded.
Les décimales sont séparées par une virgule. Decimals are written with a comma.
Source: EurObserv'ER 2010.

Source: http://www.eurobserv-er.org/

Options for Organic Waste Treatment



Landfill

- Reduction necessary to comply with Directive 2006/12/EC

- Landfill gas could be energetically used, but energy output is low

- No use of nutrients is possible

Incineration Plant

+ Energetic use

- "waste heat" is often un-used

- No use of nutrients is possible

- High investment costs and other barriers for new plants

- Long transport ways due to centralised plants

Household Composting

+ Common practice in many cases

+ High-value end-product: closed nutrient cycle

+ No sophisticated logistics needed

- No energetic output

- Not all waste is suitable for private composts

- Not possible in urban areas

Industrial Composting

+ Common practice in many cases

+ High-value end-product: closed nutrient cycle

- No energetic output

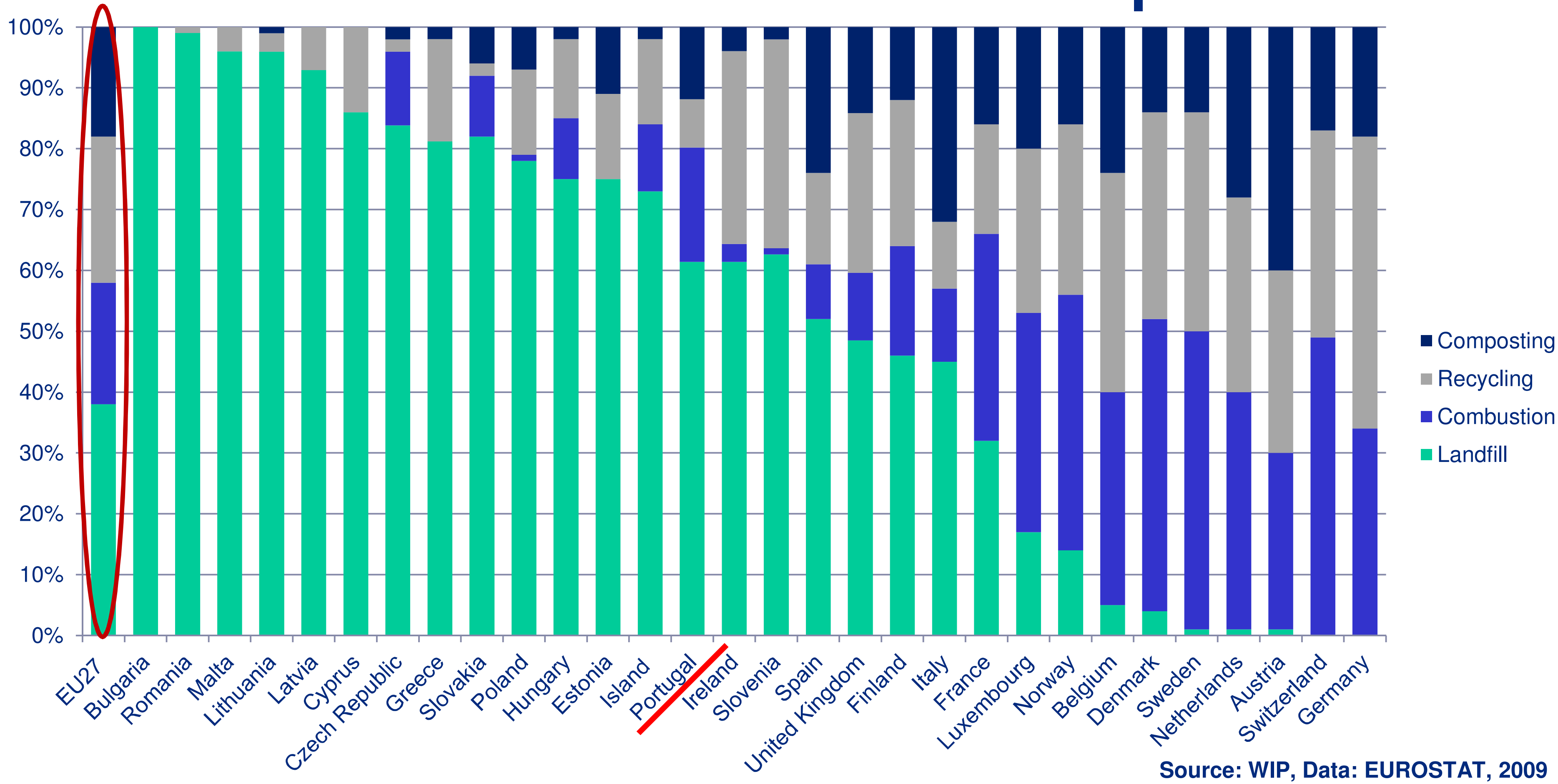
Anaerobic Digestion

+ High energetic output

+ High-value end-product: closed nutrient cycle

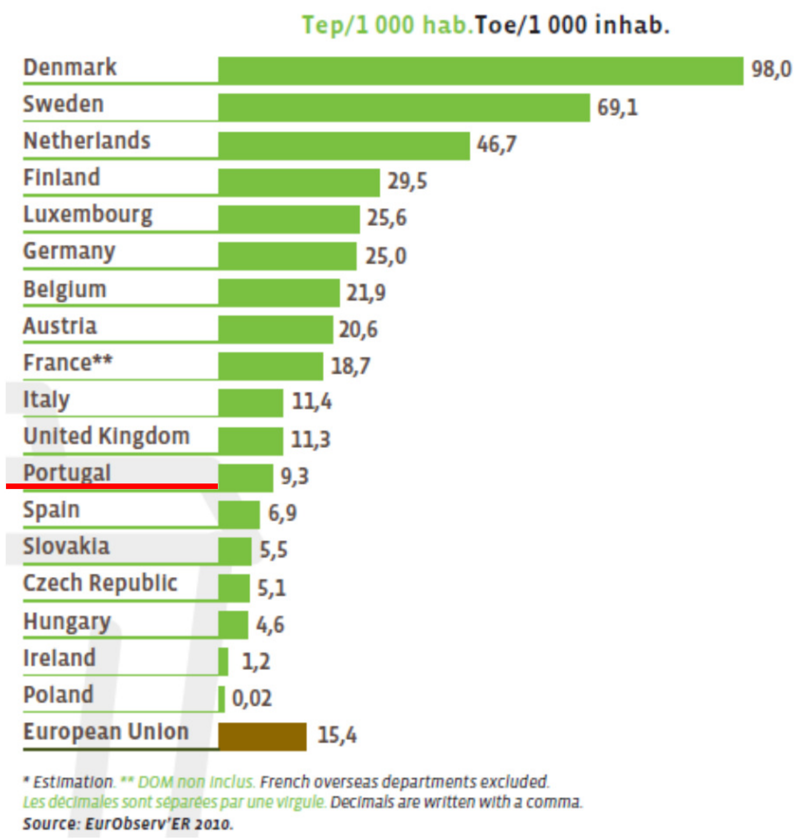
→ Still needs non-technical support

Treatment of MSW in Europe

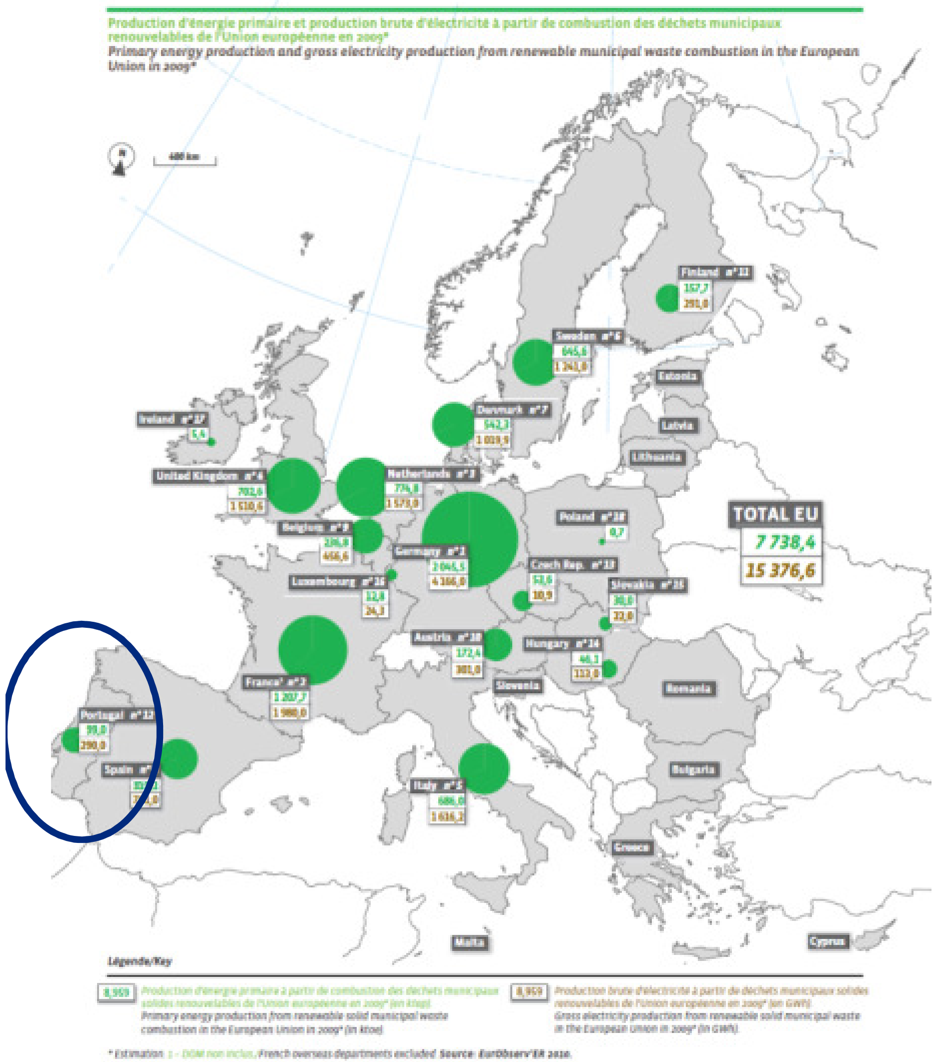


Source: WIP, Data: EUROSTAT, 2009
MSW = Municipal Solid Waste
includes also non-organic waste!

Energy Production from Municipal Solid Waste per 1000 habitants 2009

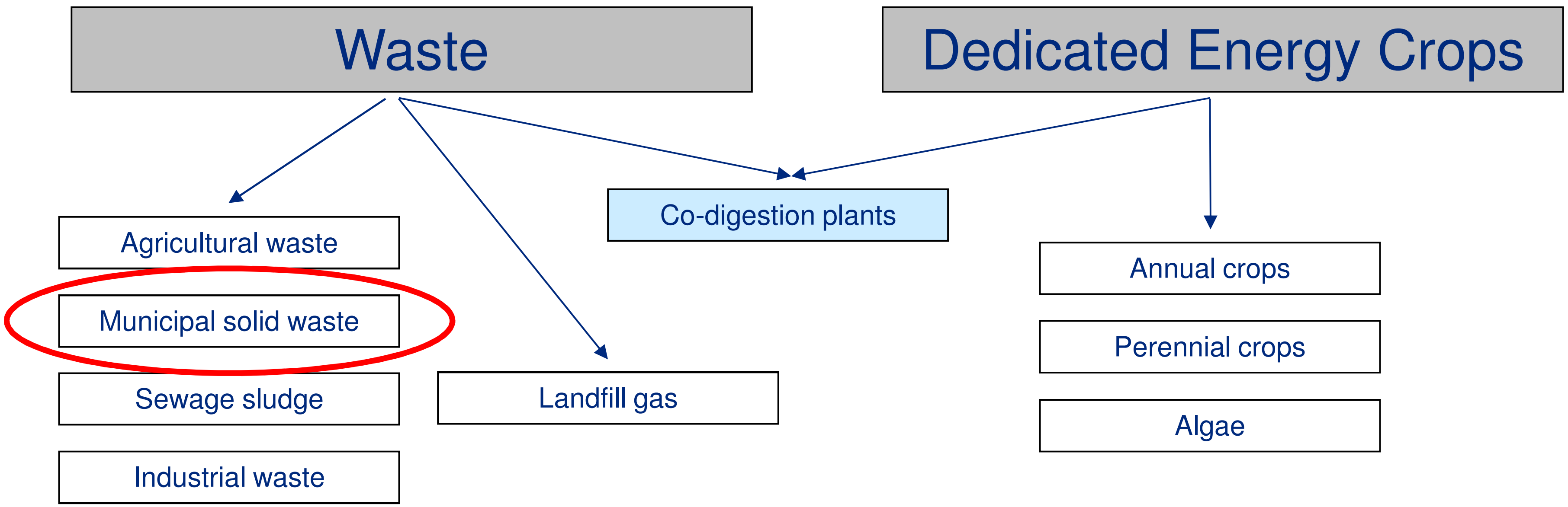


Energy Production from Municipal Solid Waste 2009

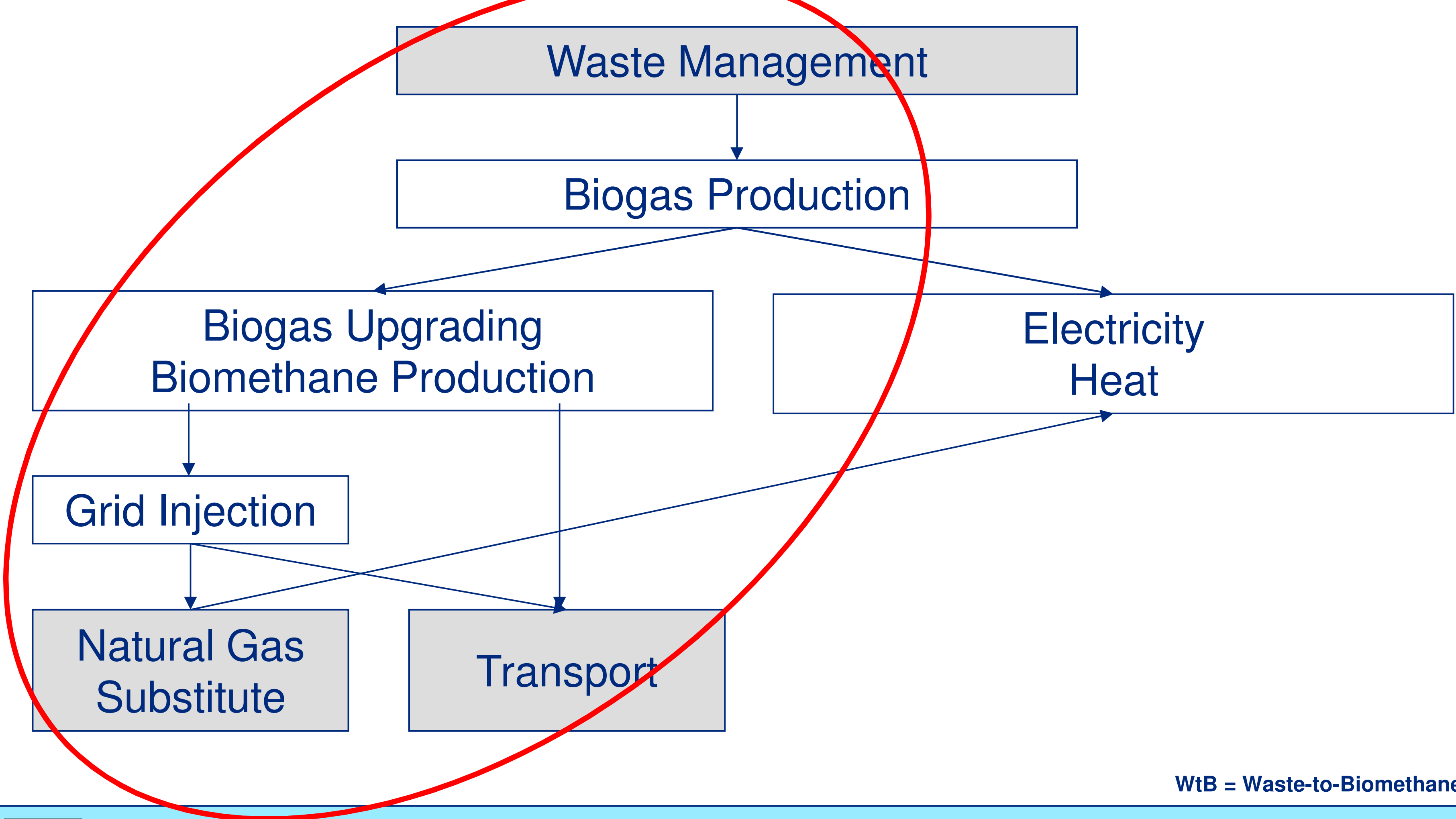


Source: http://www.eurobserv-er.org/

Biogas Feedstock Classification



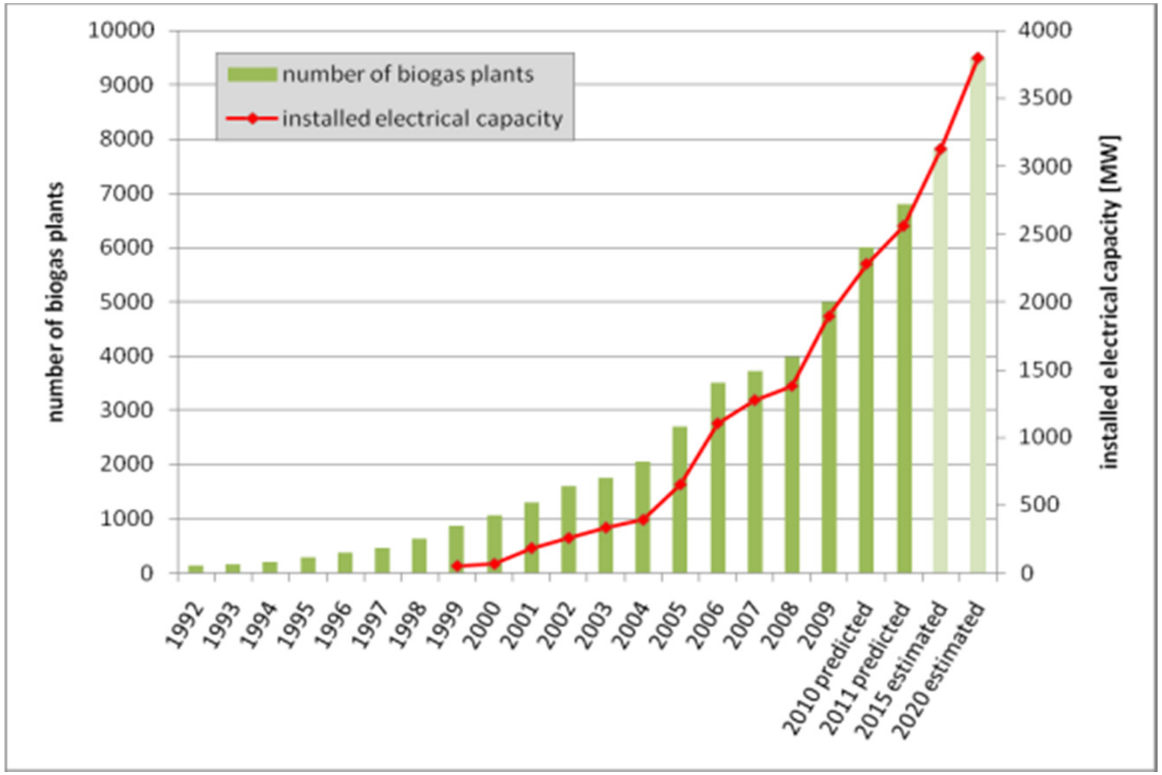
WtB Supply Chain



WtB = Waste-to-Biomethane

Biogas in the German nREAP

Estimated development of biogas plant installations according to the National Renewable Energy Action Plan (nREAP)



Source: Fraunhofer IWES after FNR, FVB 2010 and on basis of estimation of the nREAP

Typical biogas plant in Germany

- Size: 300-500 kWel
- Biogas use: electricity
- Feedstock: mainly corn silage, but also manure, waste, etc.

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Typical biogas plant in Germany


Feedstock: MSW
© Dominik Rutz

Feedstock: MSW

© Dominik Rutz

Feedstock: Catering/Food Waste

Feedstock: Expired Food


Abgelaufen?


Abgelaufen?
Kunden-Service


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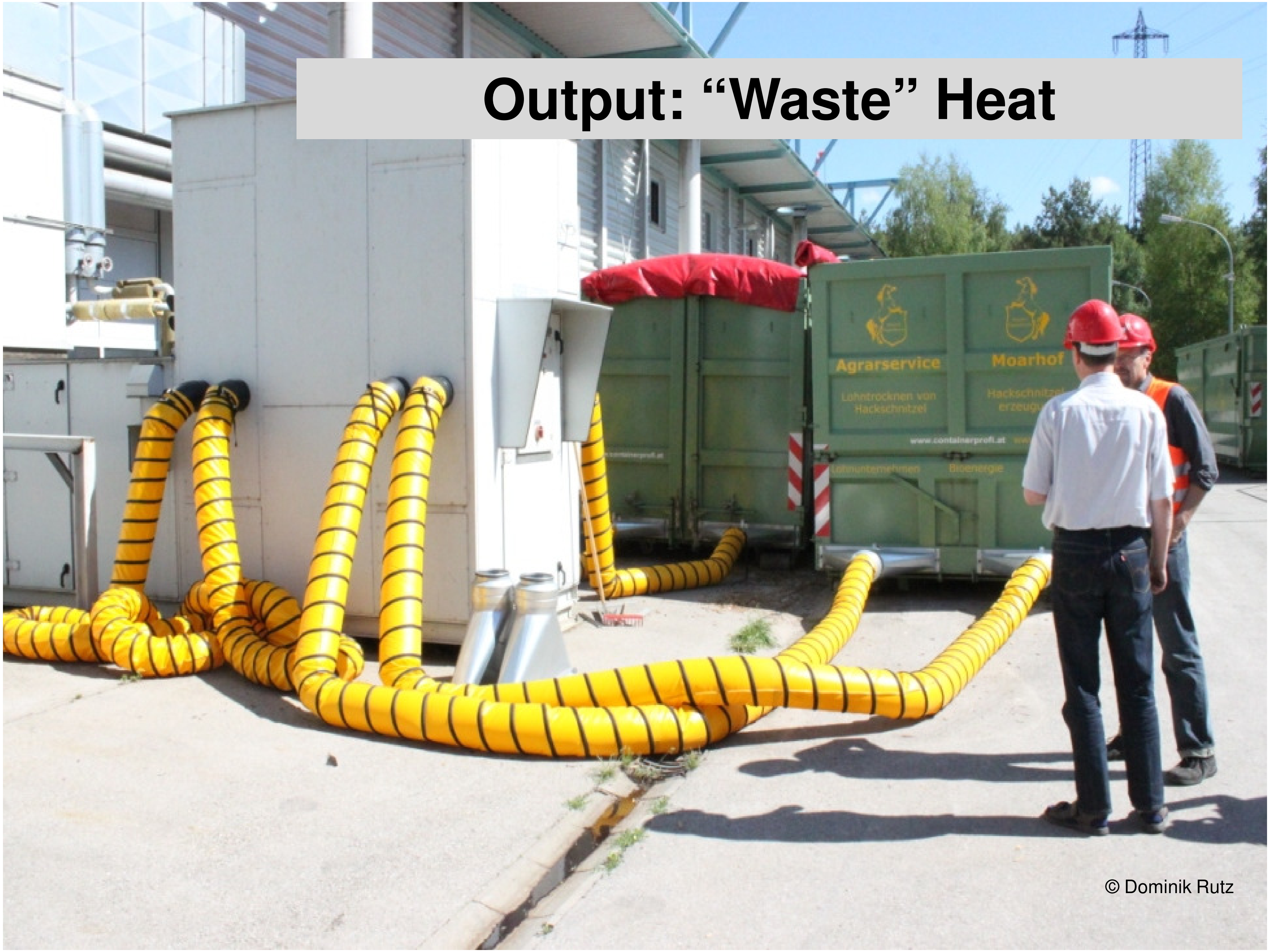
Residue: Digestate as Fertilizer

Output: Electricity from CHP

Output: “Waste” Heat



Output: Heat

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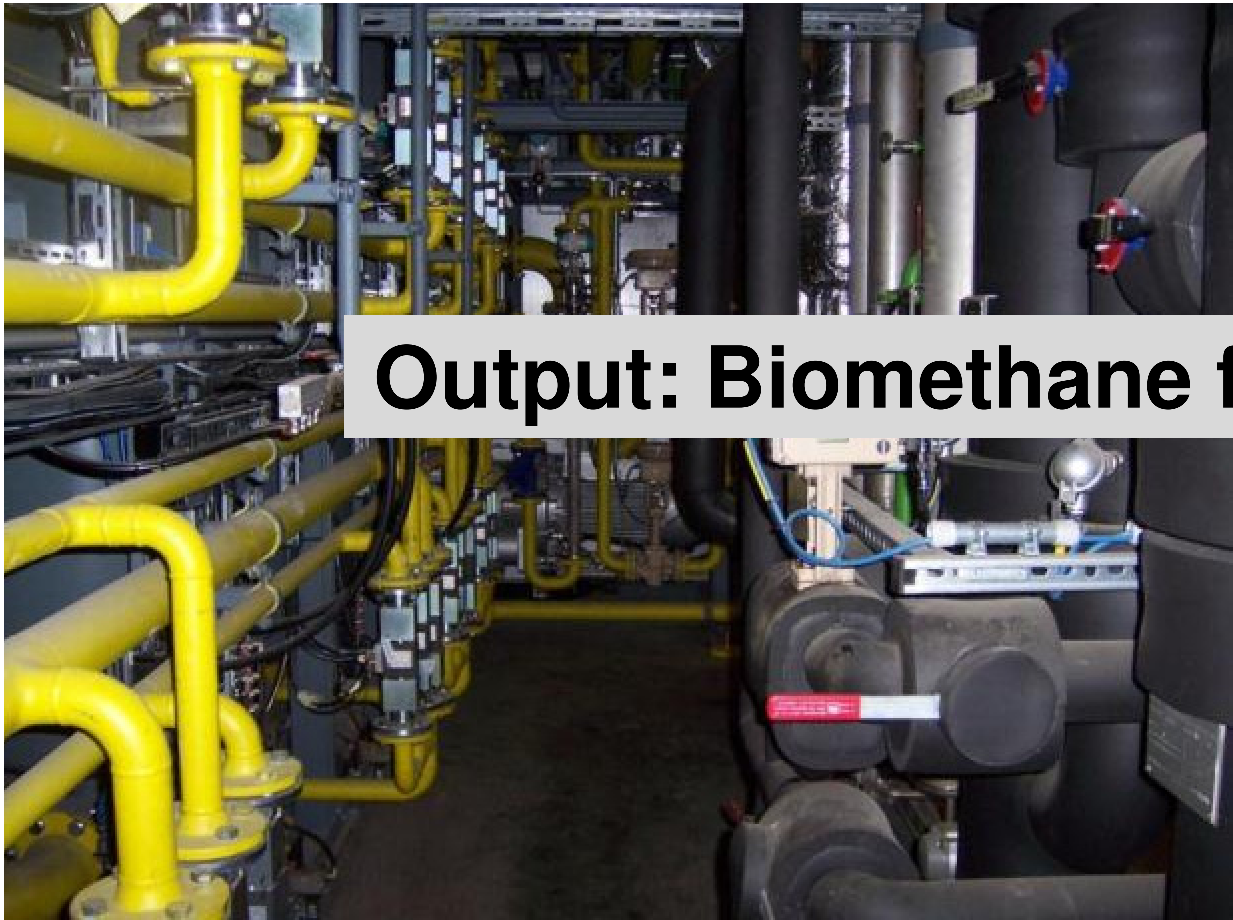
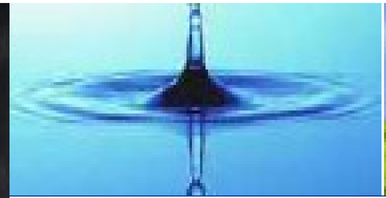
Output: Biomethane for grid injection





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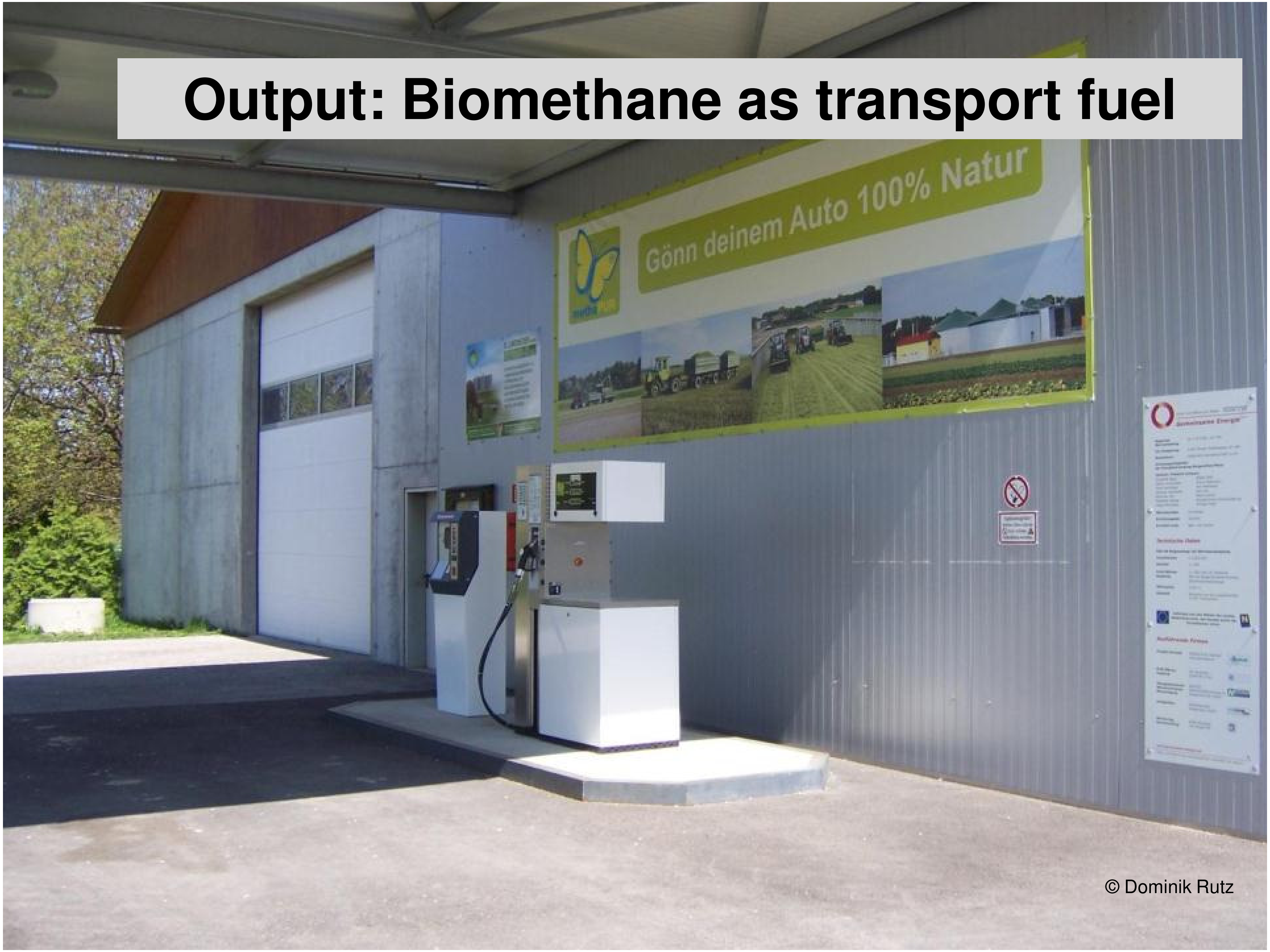
Output: Biomethane as transport fuel



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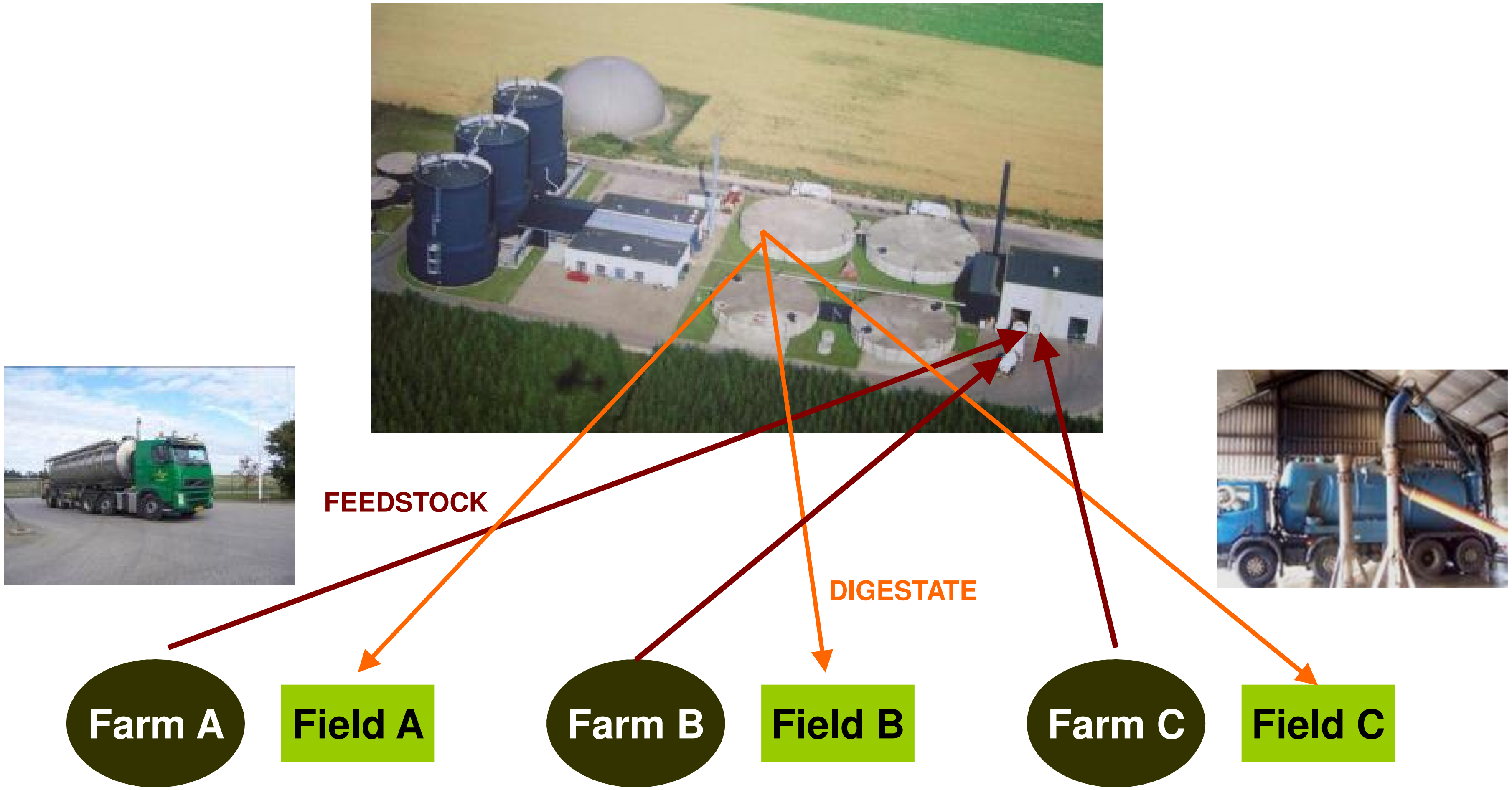
Output: Electricity from Fuel Cell

Biogas in Denmark

- 60 **farm-scale** biogas plants

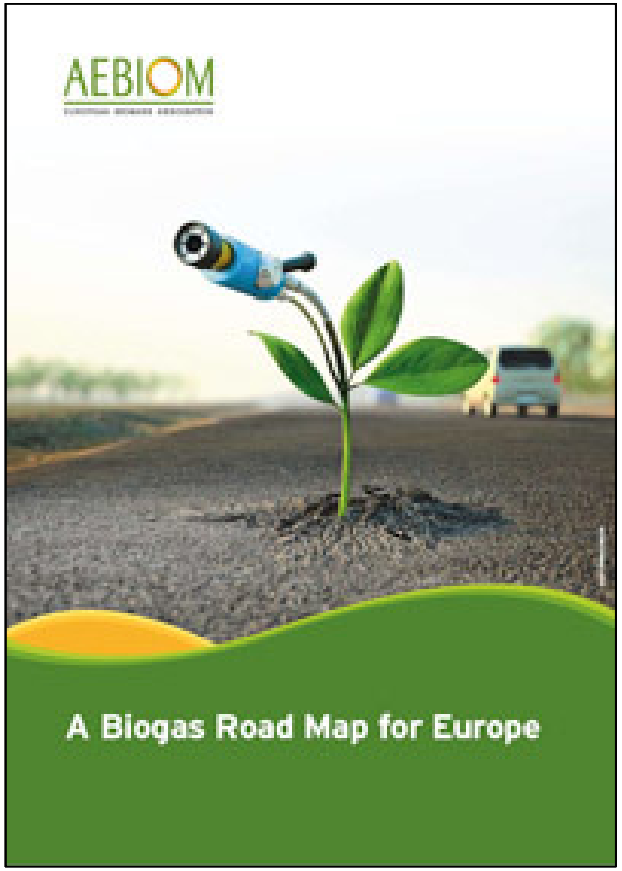
- 21 **centralised** co-digestion biogas plants
  - usually non-profit farmer cooperatives
  - owned by 10-80 farmers
  - feedstock is a combination of manure and waste
  - feedstock is collected from different farmers to the centralised biogas plant
  - digestate is brought back to storage tanks on the fields

Centralised Co-digestion Plant in Denmark

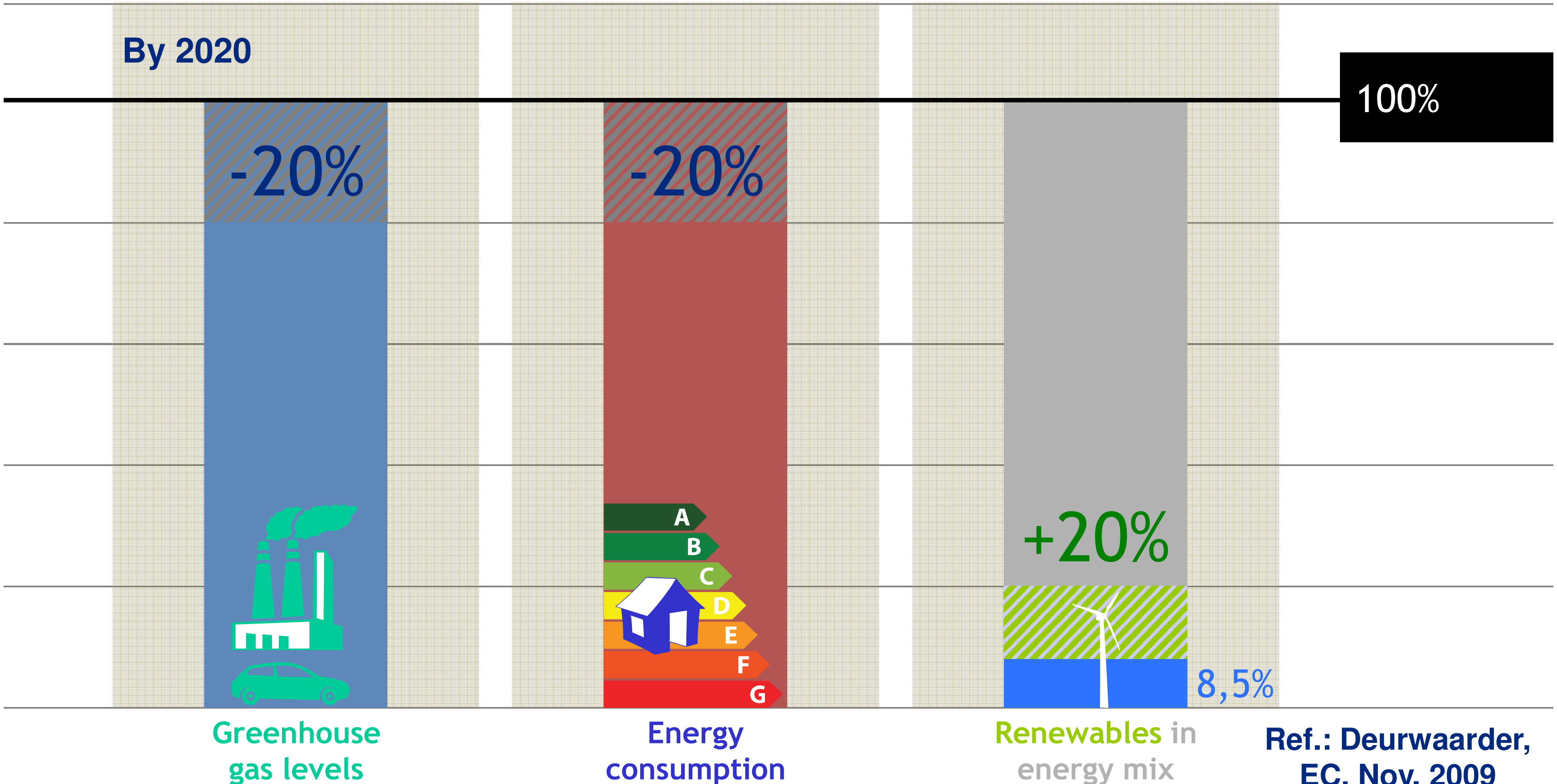


European Framework

- Renewable Energy Directive
  - Use of Biomethane (in transport)
  - nREAPs
- Waste Directive
- Nitrate Directive
- Aebiom Roadmap
- European Biogas Association



The “20-20-20” EU policy



Ref.: Deurwaarder, EC, Nov. 2009

3. Lessons learnt from other countries

Lessons from other countries (examples)

Germany:

→ too much reliance on corn silage as feedstock: price fluctuations
→ only limited use of heat from CHP plants
→ insufficient legislation on the use of digestate from waste materials
→ open (not covered) digestate storage tanks

Czech Republic:

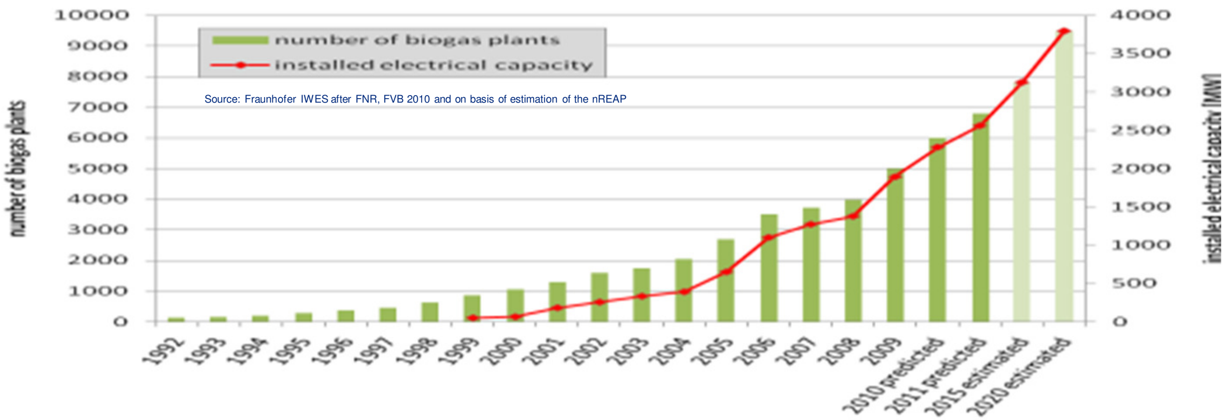
→ too high initial feed-in prices

UK:

→ former application of inefficient quota system instead of feed-in systems

Latvia:

→ wrong use /estimations of feedstock (corn yields are low)
→ high heat / insulation need due to cold winters



1940 — 1992 — 1999 — 2011

- 1940: Organic/ green farmers
- 1992: Electricity Supply Law (StrEG)
- 1999: Renewable Energy Source Act (EEG)

- Germany needed more than 70 years to develop biogas…

- Portugal could do it much faster! In 7 years?

Thank You

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Renewable Energy Directive (RED)

- Combat climate change
- Security of energy supply
- Green jobs and innovation

- Directive 2009/28/EC
- Publication in Official Journal on 5 June 2009.

Renewable Energy Directive (RED)

1. Sets **mandatory national targets** for renewable energy shares, including 10% renewables in transport (incl. biofuels) in 2020
   - Biofuels from wastes, residues, non-food cellulosic material, ligno-cellulosic material count double towards targets (Article 21)

2. Requires **national renewable energy action plans (NREAPs)**

3. Requires **reduction of administrative and regulatory barriers**, improvements in provision of information and training and improves renewables' access to the electricity grid

4. Creates a **sustainability regime** for biofuels (Articles 17 - 19) (criteria for economic operators, monitoring for the Commission)