

# Sustainable Biogas Market Central and Eastern Europe



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2nd High Level Conference in Greece  
Sustainable Development of Biogas Market in Europe





Contract No. IEE/09/848 SI2.558364 | Project duration 01/05/2010 – 31/10/2012

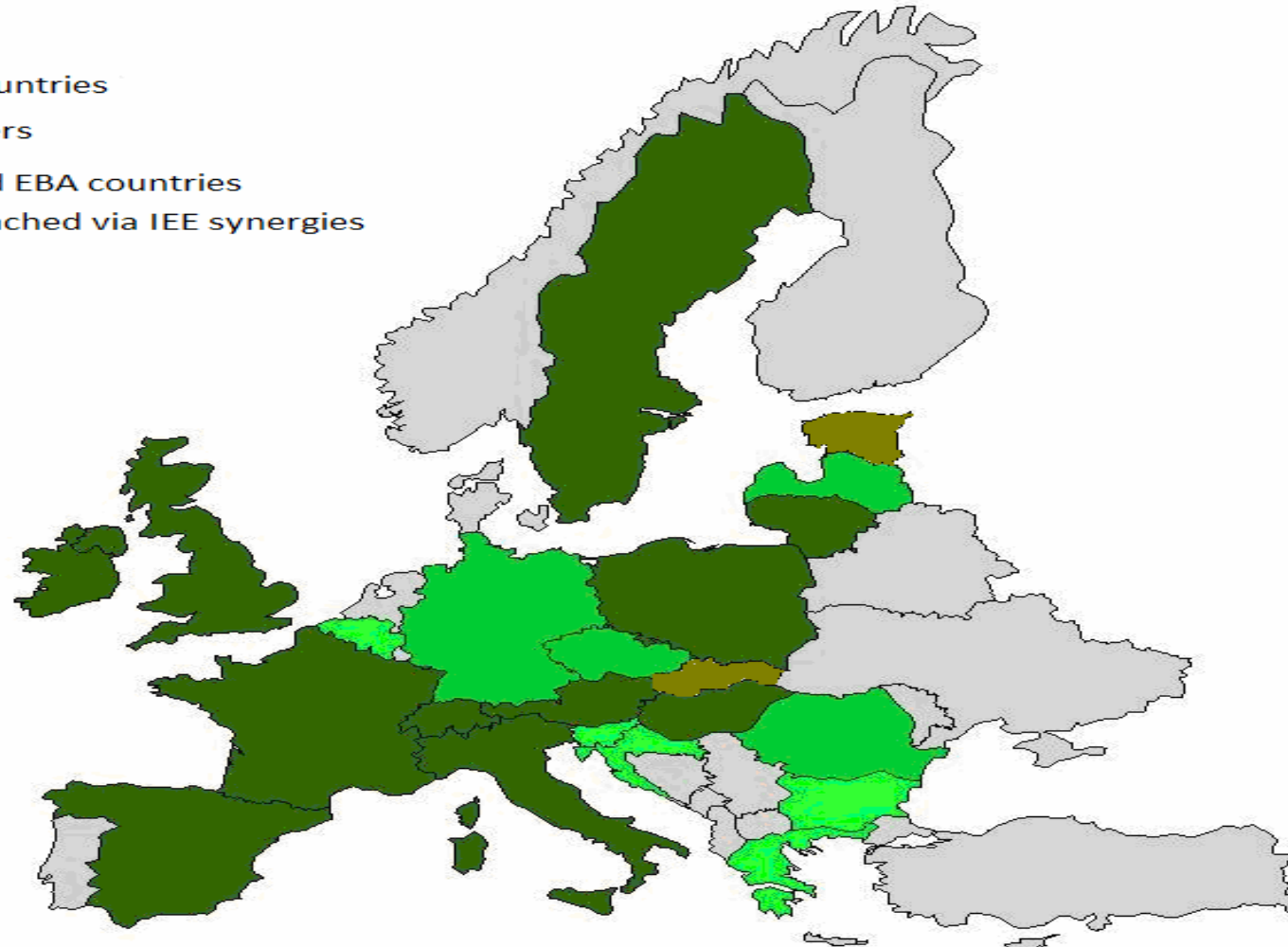
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# Biogas in Europe



-  BiogasIN countries
-  EBA members
-  BiogasIN and EBA countries
-  CEE to be reached via IEE synergies

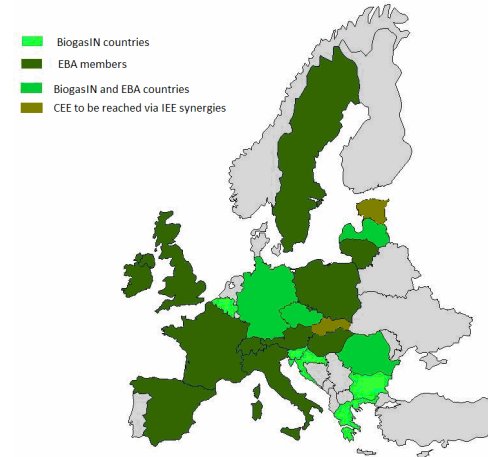
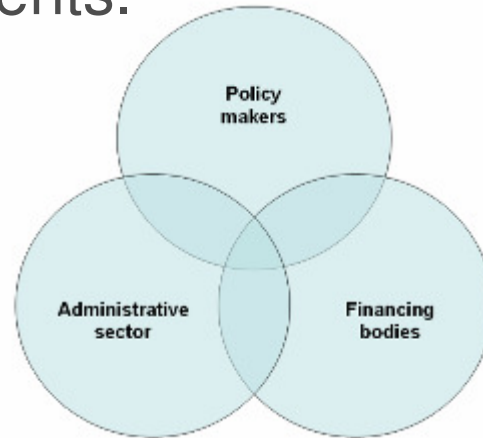




# BiogasIN project



**BiogasIN:** streamlining the permitting and financing procedures of biogas investments.



Knowledge, experience and technology transfer from top 5 EU biogas countries to CE Europe and towards EU biogas policy



# European Directive 2009/28/CE

- In **January 2007** the European Commission put forward an integrated energy/climate change proposal that addressed the issues of energy supply and climate change. Two months later, European Heads of State endorsed the plan and agreed to an Energy Policy for Europe.
- **The European Directive 2009/28/EC of 23 April 2009** on the promotion of renewable energy aims at achieving by 2020 a 20% share of energy from renewable sources in the EU's final consumption of energy and a 10% share of energy from renewable sources in each member state's transport energy consumption.

## The Directive called for a:



- **20%** increase in energy efficiency
- **20%** reduction in greenhouse gas (GHG) emissions
- **20%** share of renewables in overall EU energy consumption by 2020
- **10%** biofuel component in vehicle fuel by 2020

- The greenhouse gas emission saving from the use of biofuels shall be at least 35%
- Biofuels shall not be made from raw material obtained from land with high biodiversity value (i.e. primary forest and other wooded land where there is no clearly visible indication of human activity, areas designated for nature protection purposes or for the protection of rare, threatened or endangered ecosystems or species, or highly biodiverse grassland).
- Biofuels shall not be made from raw material obtained from land with high carbon stock (i.e. wetlands, continuously forested areas).
- Biofuels shall not be made from raw material obtained from peatland



# Mandatory national targets set out in the Directive (2005 and 2020)



	Share of energy from renewable sources in final consumption of energy, 2005	Target for share of energy from renewable sources in final consumption of energy, 2020
Bulgaria	9.4%	16%
The Czech Republic	6.1%	13%
Germany	5.8%	18%
Greece	6.9%	18%
Spain	8.7%	20%
France	10.3%	23%
Italy	5.2%	17%
Latvia	34.9%	42%
Austria	23.3%	34%
Poland	7.2%	15%
Romania	17.8%	24%
Slovenia	16.0%	25%
The Slovak Republic	6.7%	14%
Finland	28.5%	38%
Sweden	39.8%	49%
United Kingdom	1.3%	15%



Table 16 Share of RES production in demand (primary (based on Eurostat convention), electricity, I transport fuels) for EU-25 in the 20%-RES-by-2020 main case

Country breakdown	% RES-primary		% RES-E		% RES-H		% RES-T	
	2010	2020	2010	2020	2010	2020	2010	2020
Austria	28%	35%	65%	70%	25%	34%	5%	11%
Belgium	4%	9%	6%	13%	4%	9%	2%	8%
Denmark	23%	45%	48%	86%	22%	33%	5%	27%
Finland	29%	44%	34%	48%	37%	49%	4%	36%
France	10%	19%	19%	37%	18%	30%	5%	11%
Germany	8%	16%	16%	30%	7%	15%	4%	10%
Greece	10%	20%	18%	29%	16%	28%	4%	10%
Ireland	7%	22%	18%	44%	6%	14%	3%	13%
Italy	12%	18%	24%	27%	11%	19%	3%	8%
Luxembourg	2%	6%	5%	7%	2%	6%	1%	5%
Netherlands	4%	9%	10%	21%	2%	6%	2%	7%
Portugal	21%	32%	43%	56%	27%	37%	3%	10%
Spain	13%	21%	31%	40%	12%	18%	3%	12%
Sweden	34%	49%	61%	75%	51%	65%	4%	20%
United Kingdom	5%	13%	10%	29%	4%	8%	2%	8%
Cyprus	4%	11%	8%	22%	9%	18%	2%	6%
Czech Republic	8%	14%	10%	19%	8%	15%	7%	13%
Estonia	21%	41%	15%	32%	37%	67%	4%	29%
Hungary	9%	22%	8%	15%	10%	23%	8%	29%
Latvia	32%	52%	47%	54%	34%	52%	9%	63%
Lithuania	18%	43%	10%	29%	32%	40%	9%	67%
Malta	3%	8%	7%	15%	7%	28%	2%	6%
Poland	12%	22%	11%	21%	14%	22%	9%	27%
Slovakia	9%	15%	20%	21%	8%	15%	5%	18%
Slovenia	19%	30%	37%	51%	24%	36%	1%	4%
<b>EU 25</b>	<b>10.9%</b>	<b>19.6%</b>	<b>21.8%</b>	<b>34.2%</b>	<b>12.3%</b>	<b>20.7%</b>	<b>3.9%</b>	<b>11.9%</b>



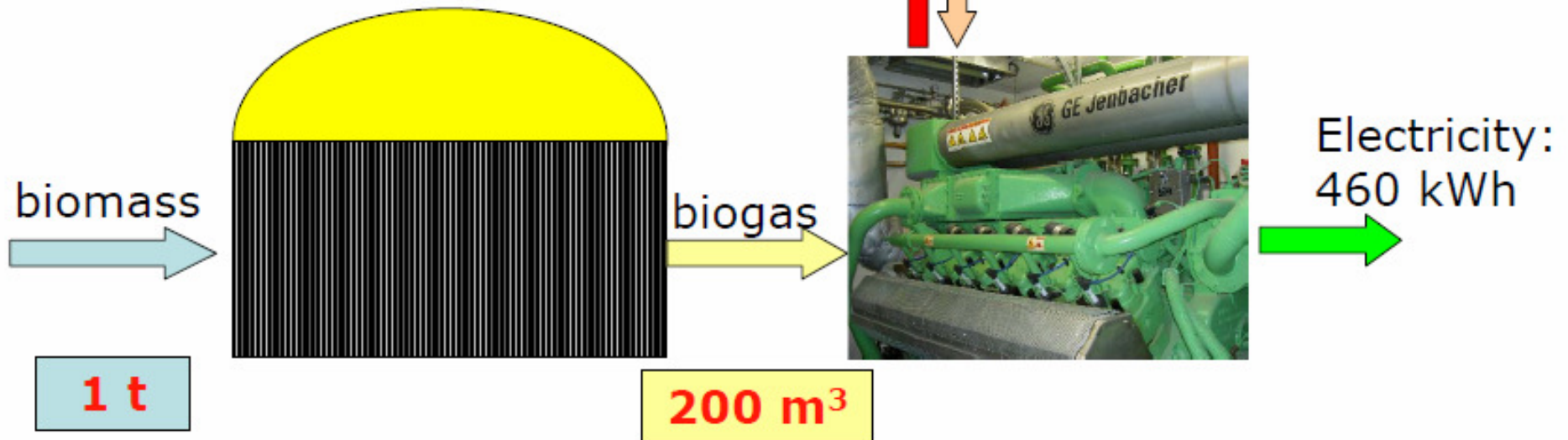
# Basic number about BIOGAS



**1 tone of biomass**  
**=**  
**4 tones of water**  
**20 °C to 100 °C**

**There is a lot of heat available!!!**

**1.44 GJ**



# Basic number about BIOGAS



Substrate	Biogas yield m3/t
Fat (clean, 100% dry)	1300
Molasses - treacle	633
Grain, meal, bread	538
Technical glycerine	500
Slaughterhouse waste(only blood, paunch manure, soft tissues)	300
Fat from grease trap (fat pulp)	250
Fresh grass	200
Maize silage	180
Sugar beet pulp (22% dry)	119
Fruit vegetable press cake ( 20% dry)	108
Bird's dung cellular (25% dry)	103
Rhizocarpous vegetables	100
Brewery spent grains (18% dry)	99
Bird's dung litter (40% dry)	90
Maize pulp (20% dry)	85
Pig manure natural (15% dry)	62
Cattle manure natural (12-15% dry)	54
Milk whey	50
Distillery grains from molasses ( 10% dry)	50
Distillery grains from grain ( 7% dry)	40

# Few examples of BIOGAS PLANTS from Europe



# Biogas plant – Wielopole - Poland



## key data

Start of Operation .....	<b>2007</b>
Type of corporation.....	<b>Ltd. Company</b>
Amount of gas produced .....	<b>1300 m<sup>3</sup> per day</b>
Investment costs .....	<b>2 500 000 €</b>

# Biogas plant – Wielopole - Poland

- **feedstock**

- Sewage sludge ..... 9000 tons per year

- **production data**

- Thermal power rating of the gas engine ..... 540 kW
- Electric power rating of the gas engine ..... 345 kW
- Generated electric energy ..... 1 800 MWh per year

- **technical plant description**

- Digester ..... 3000 m<sup>3</sup>
- Gas storage tank ..... 800 m<sup>3</sup>
- Residence time in the digester ..... ~ 28 days
- Temperature of the anaerobic digestion (operational) ..... 38,5 ° C
- Average expenditure of human labour ..... 8 hours per day

# Biogas plant “PORGAPORCS, S.L” - Spain



- **key data**
- Start of Operation ..... 2006
- Type of corporation..... limited liability company
- Operator..... Ramón Porta
- Amount of gas produced .....aprox 765 000 m<sup>3</sup> per year
- Cost .....998 000 €



# Biogas plant “PORGAPORCS, S.L.” -



## Spain

- **feedstock**

- Pig manure .....11 500 m<sup>3</sup> per year
- Sludge from Waste treatment plant ..... 2,500 Tn per year
- Productos alimentarios en mal estado ..... 1,350 Tn per year
- Vegetal used oil ..... 400 L per year

- **production data**

- Available area for the output of the biogas fertilizer .....324 ha
- Thermal power of the gas engine .....215 kW
- Electric power of the engine.....191 kW
- Generated electric energy .....1,528 MWh/a

- **technical plant description**

- Digester 1 .....1,360 m<sup>3</sup>
- Digested sludge storage ....3,700 m<sup>3</sup>
- Residence time in the digester ..... 30 days
- Temperature of the anaerobic digestion (operational) ..... 36 ° C
- Average expenditure of human labour .....3 hours per day

# Biogas plant – Lowbrook - GB



- **key data**

- Start of Operation ..... mid July 2008
- Type of corporation ..... Limited company
- Amount of gas produced ..... 1.357M m3 per year
- Investment costs ..... € 980,000

# Biogas plant – Lowbrook - GB



- **feedstock**

- Liquid manure (cattle) ..... 8,000 tons per year
- Grass/maize silage ..... 3,000 tons per year
- Poultry litter.....1,000 tons per year

- **production data**

- Available area for the output of the biogas fertilizer ..... 700 ha
- Thermal power rating of the gas engine ..... 424 kW
- Generated thermal energy ..... 3,230 MWh per year
- Electric power rating of the gas engine ..... 370 kW
- Generated electric energy ..... 2,800 MWh per year

- **technical plant description**

- Digester ..... 2,880 m<sup>3</sup>
- Residence time in the digesters ..... 62 days
- Temperature of the anaerobic digestion (operational) ..... 39-40° C
- Average expenditure of human labour ..... 2.5 hours per day



# Biogas plant „Formigara“- Italy



- **key data**
- Start of Operation ..... 2006
- Type of corporation..... farm company
- Amount of gas produced ..... 15.000 m3 per day
- Investment costs ..... 3.500.000 €

# Biogas plant „Formigara“- Italy



- **feedstock**

- Liquid manure..... 20-30 tons per day
- Silage (mais and other cereals )..... 50 tons per day
- Triticale .....20 tons per day
- Milk serum .....5 m3 per day

- **production data**

- Available area for the output of the biogas fertilizer ..... 300 ha
- Electrical power rating of the gas engine ..... 1,490 MWt
- Annual delivery of electricity to the (regional) electric grid company.....
- .....9.100 MWh per year

- **technical plant description**

- 2 Digesters..... 1700 m<sup>3</sup> each
- Mixing tank ..... 300 m<sup>3</sup>
- Digested manure storage tank .....12 000 m<sup>3</sup>
- Residence time in the digester..... 40 days
- Temperature of the anaerobic digestion..... 45° C

# Biogas plant „Ljubljana – KOTO” - Slovenia



- **key data**
- Start of Operation ..... 2007
- Type of corporation..... Stock company
- Amount of gas produced ..... 4500 m<sup>3</sup> per day
- Investment costs ..... 2 760 000 €



# Biogas plant „Ljubljana – KOTO” - Slovenia

- **feedstock**

- Liquid manure (cattle)..... 1000 tons per year
- Biowaste (source sorted biological waste)..... 1000 tons per year
- Biowaste (organic kitchen waste)..... 5000 tons per year
- Wastes from slaughterhouse industry..... 500 tons per year

- **production data**

- Available area for the output of the biogas fertilizer ..... 0 ha
- Thermal power rating of the gas engine ..... 584 kW
- Electric power rating of the gas engine ..... 526 kW
- Power consumption (electricity) of the plant itself ..... 260 000 kWh per year

- **technical plant description**

- Digester ..... 2 x 500 m<sup>3</sup>
- Residence time in the digester ..... 18 days
- Temperature of the anaerobic digestion (operational) ..... 53 - 55° C

# Biogas plant „Gehrung“ - Germany



- **key data**
- Start of Operation ..... 2006
- Type of corporation..... Ltd. Company & Co KG
- Investment costs ..... 500.000 €

# Biogas plant „Gehrung“ - Germany



- **feedstock**

- Food leftovers ..... 1.100 tons per year
- Maize..... 740 tons per year
- Grass silage..... 640 tons per year
- Liquid manure and dung..... 700 tons per year
- Offcuts of farming..... 500 tons per year

- **production data**

- Available area for the output of the biogas fertilizer ..... 75 ha own land,
- Generated thermal energy.....788.400 kWh/a
- Annual delivery of electricity to the (regional) electric grid company.....
- .....609.000 kWh per year

- **technical plant description**

- Digester .....800 m<sup>3</sup>
- Fermenter.....950 m<sup>3</sup>
- Operating temperature.....40° C
- Residence time in the digester ..... 68 days
- Average expenditure of human labour ..... 1,5 hour



# Biogas plant „ Biowerk Hamburg” - Germany



- **key data**

- Official Opening.....24.04.2006
- Digestion Residue .....17.350 tons per year
- Biogas .....3.350 tons per year
- Packaging and Metals.....2.250 tons per year
- Investment costs .....5 000 000 €



# Biogas plant „ Biowerk Hamburg” - Germany

- **feedstock**

- Expired foodstuff ..... 15.000 tons per year
- Water ..... 3.450 tons per year
- Mixed Waste..... 2.000 tons per year
- Oil and Fat ..... 2.850 tons per year

- **production data**

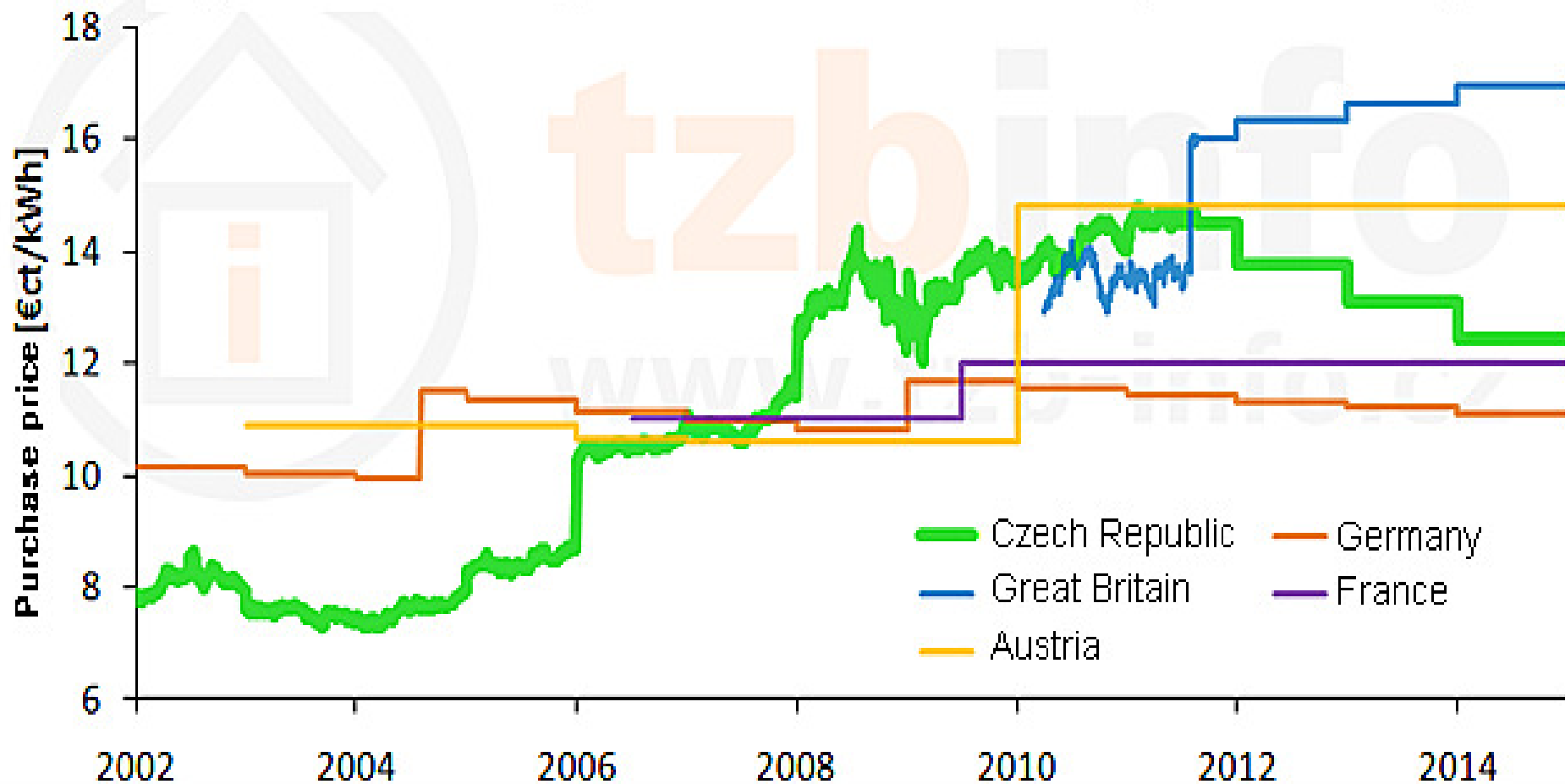
- Electrical power ..... 1.021 kW
- Thermal power ..... 1.070 kW
- Electrical energy.....6,7 Mio kWh per year
- Thermal energy.....7,0 Mio kWh per year

- **technical plant description**

- Gas Production rate.....330 m<sup>3</sup> per hour
- Energy content Biogas.....approx 6,5 kWh/m<sup>3</sup>
- Residence time in the digester ..... ~ 40 days
- Temperature of the anaerobic digestion (operational) ..... 37° - 41° C

# Situation and Feeding-Tariff in Europe

## Biogas: Purchase prices for instalations up to 150 kW<sub>el</sub>



# Success in Biogas: Key Factors

## Taking advantage of biogas versatility

- CHP and vehicle fuel applications
- • using existing NG infrastructure for biomethane
- • highlighting biogas advantages over the other bioenergies and biofuels (environmental and socio-economic advantages)

## Sustainable agriculture

- “combined food-and-energy production” from one land
- digestate - valuable fertiliser and soil conditioner

## Socio-economic issues

- bringing money and new developments to rural areas
- saving current jobs together with creating new jobs

# Biogas Production Potential



- **Big potential for the EU**
  - Biogas = versatile renewable energy source
- **Energy utilization**
  - space heating, cooking
  - local power production
  - automotive fuel
  - natural gas substitute
- **Rural area development**
  - sustainable agriculture
  - nutrient recovery and soil improvement
  - securing current jobs, new 'green' jobs creation

…this is the potential of biogas



# Biogas Potential



- Main potential of biogas is in the transport and injecting biogas into the gas grid across the Europe,
- In EU are 21 states involved in EBA – European Biogas Association,
- But only 10 countries are actually injecting biomethane into the natural gas grid.

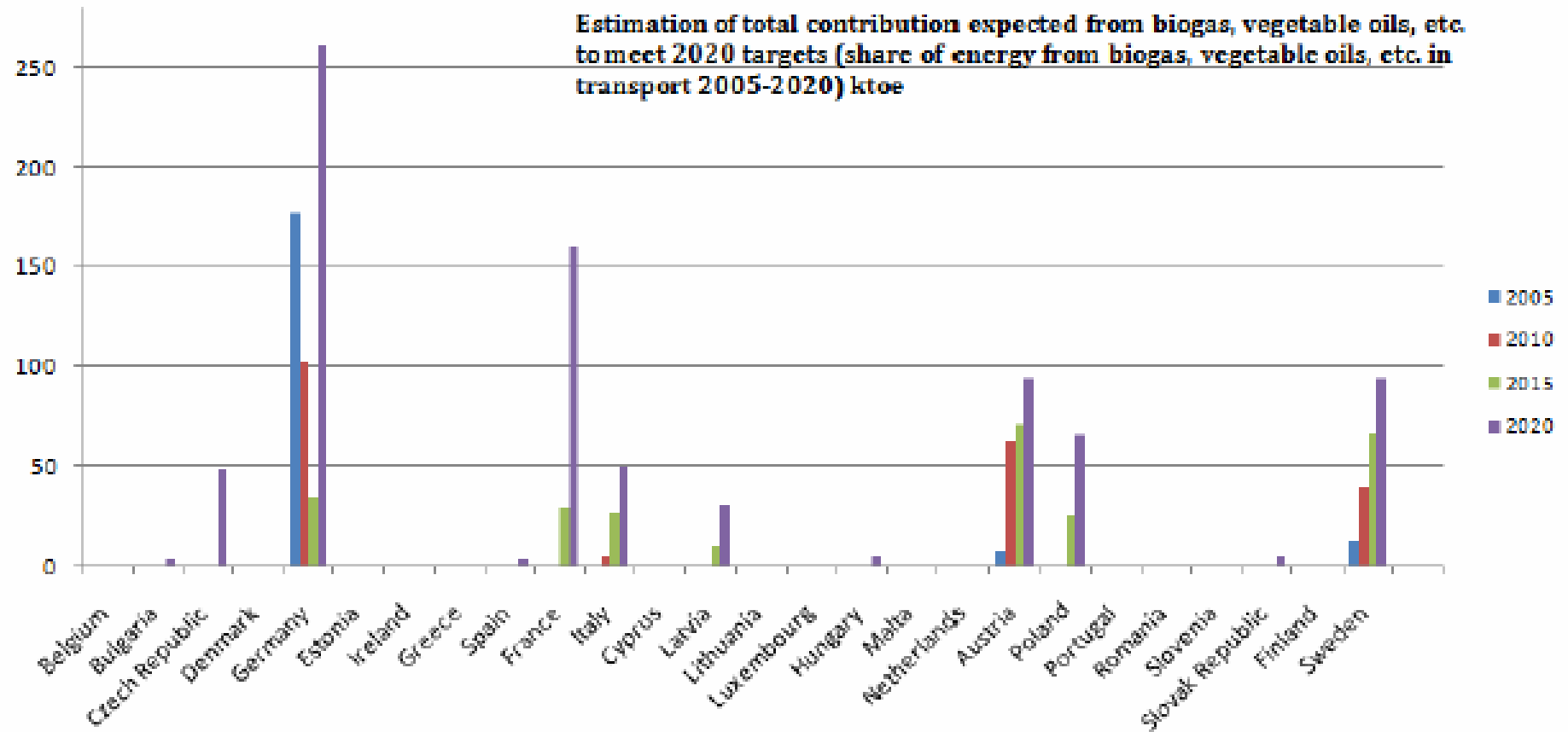
# Biogas in transport



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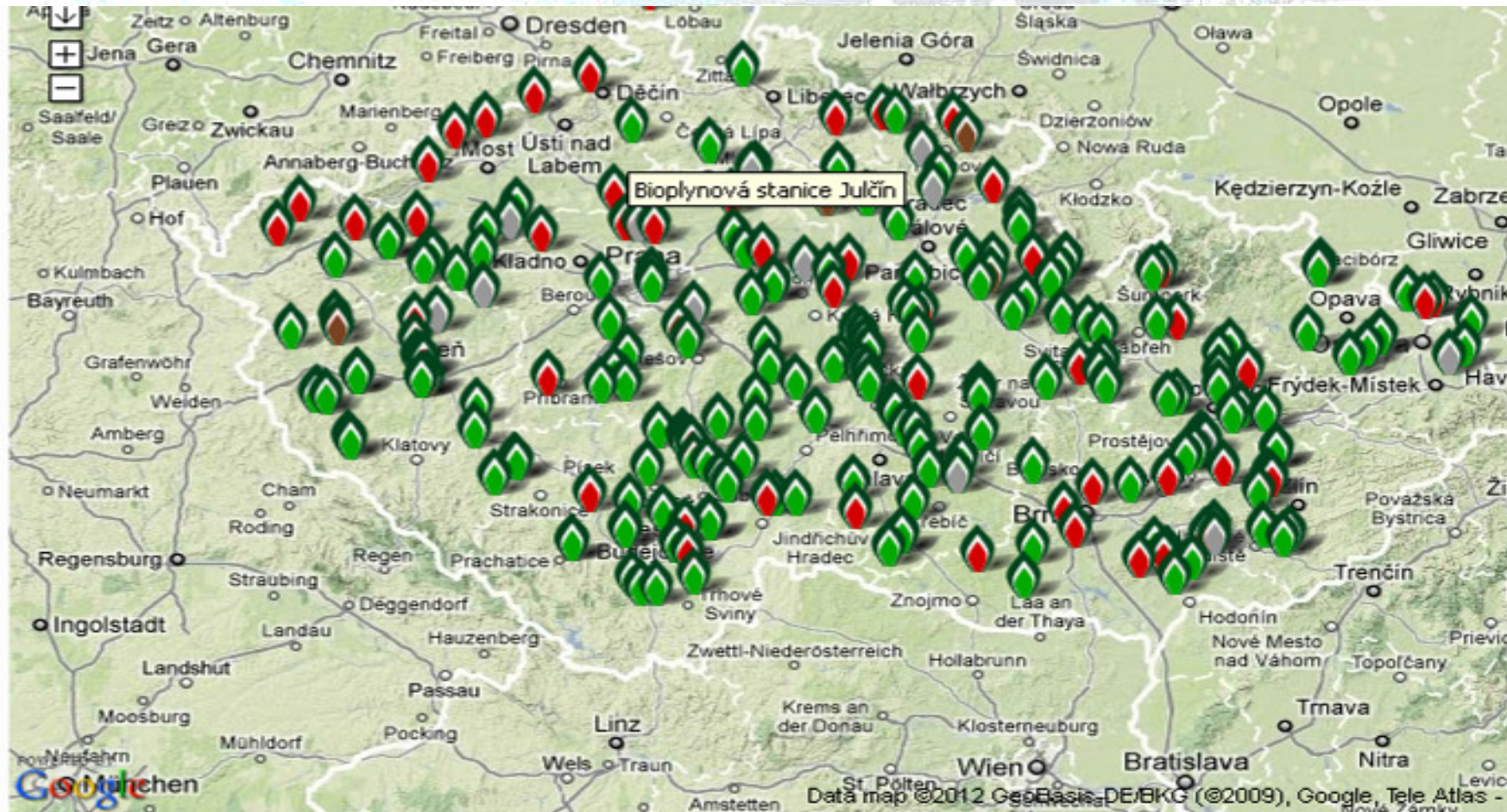
# RES- biofuels in transport by 2020



Only 10 countries in Europe - Austria, France, Germany, Hungary, Italy, Norway, The Netherlands, Sweden, Switzerland, and the UK are actually injecting biomethane into the natural gas grid!



# Biogas in Czech Republic



- BPS komunální
- BPS zemědělské
- BPS průmyslové
- Skládkový bioplyn
- ČOV



# Number of installed stations and their capacity

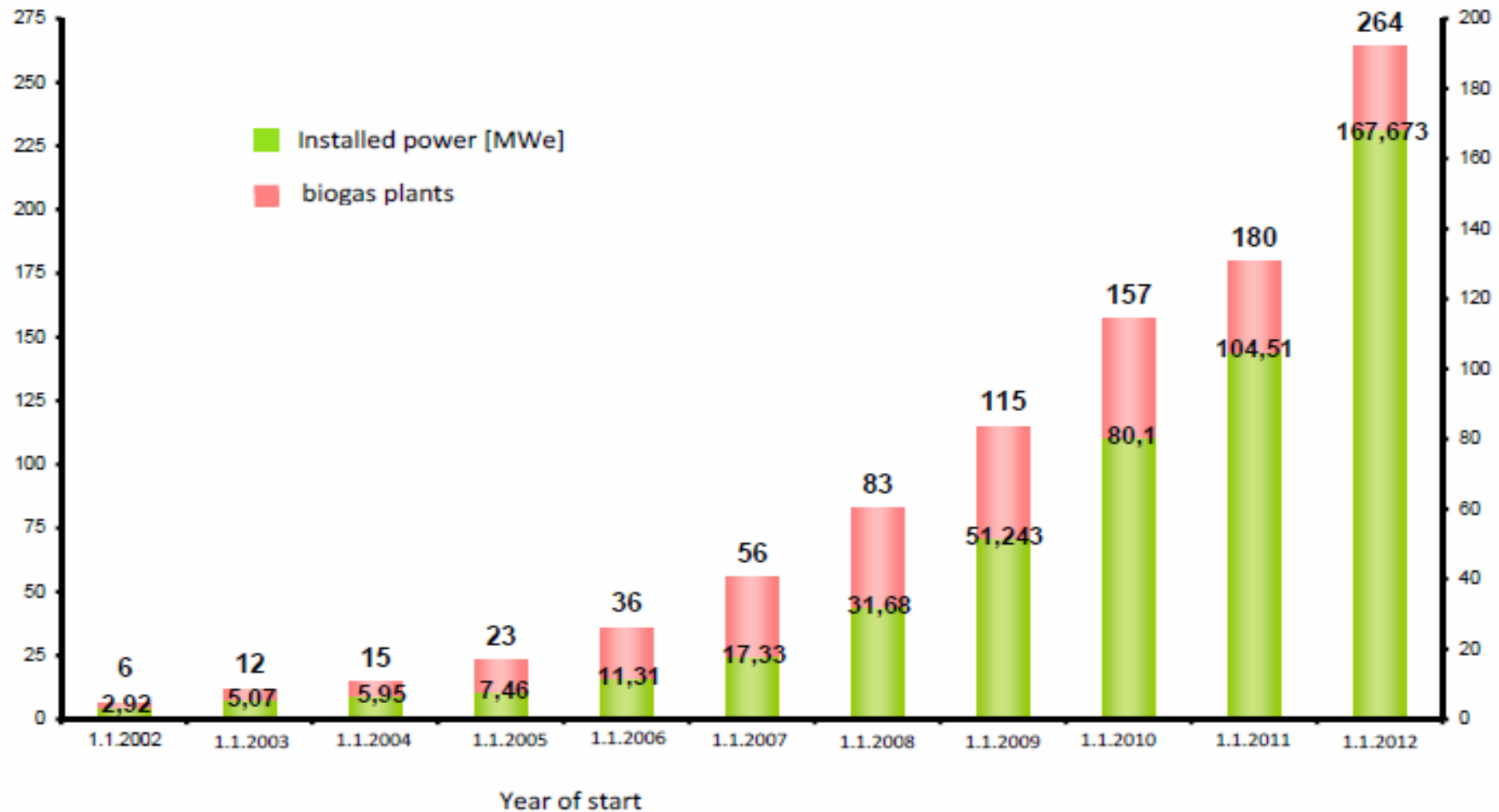


- 31/12/2008
  - total 136 BGS, 52.44 MW,
    - agro-only 59 BGS, 34.99 MW
- 31/12/2009
  - total 173 BGS, 73.18 MW,
    - agro-only 91 BGS, 61.64 MW
- 31/12/2010
  - total 242 BGS, 103.28 MW,
    - agro-only 124 BGS, 89.00 MW
- 01/07/2011
  - total 259 BGS, 150.94 MW,
    - agro-only 168 BGS, 110.49 MW

# Actual number of BGP



Biogas plants, condition to 1st January 2012



# Example from CZ



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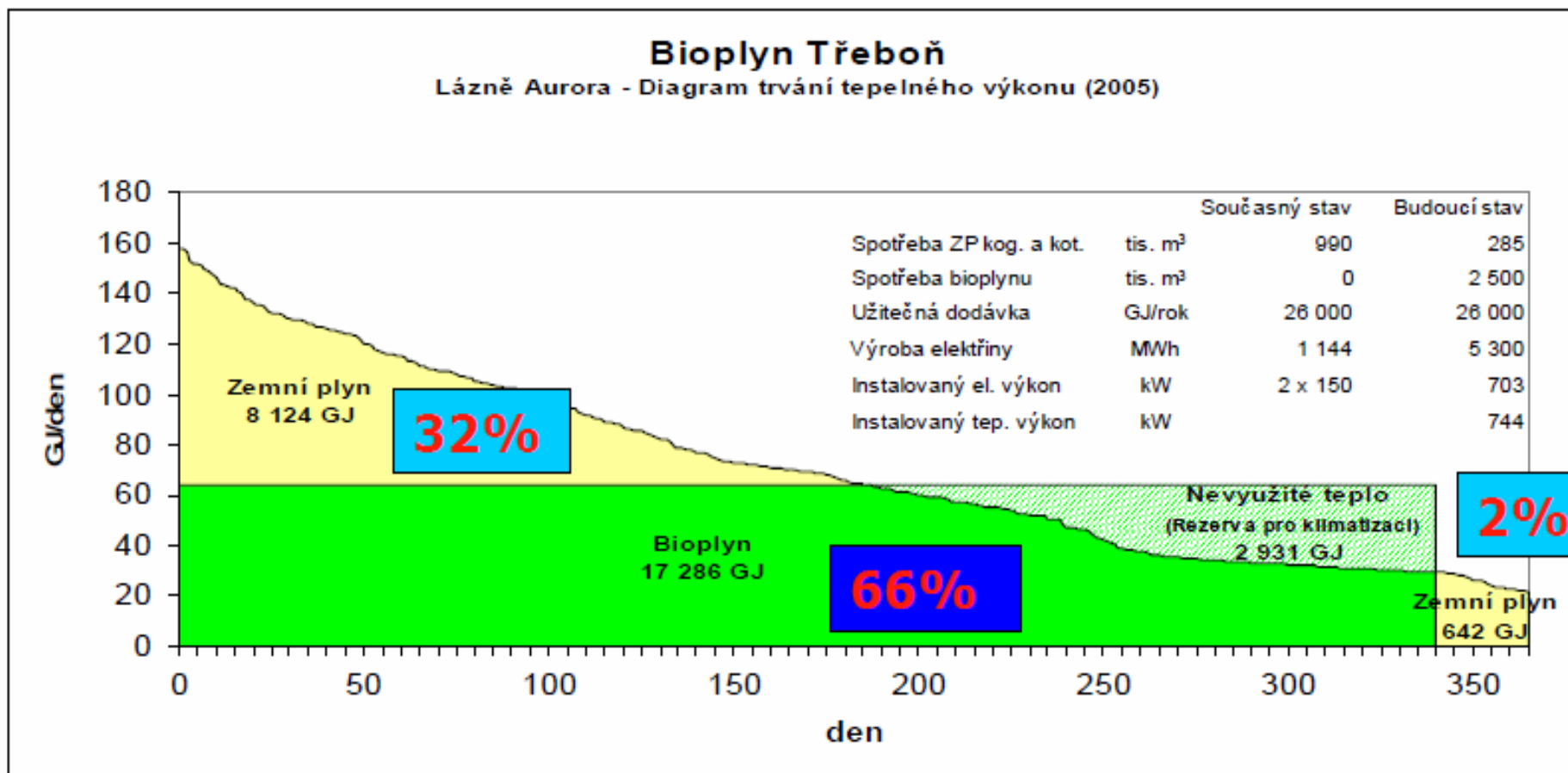
# Example from CZ





# Utilisation of biogas in the spa

Aurora spa saves 500 000 m<sup>3</sup>/a of natural gas



# Partners & Contact



## Co-ordinator:



Energy Institute Hrvoje Pozar  
Savska cesta 163  
Zagreb, Croatia  
[www.eihp.hr](http://www.eihp.hr)

## Contact:

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## Project web-site:

[www.biogasin.org](http://www.biogasin.org)

## Project partners:



WIP Renewable Energies (WIP), Germany



European Biogas Association (EBA), Belgium



Fraunhofer (IWES), Germany



Centre for Renewable Energy Sources  
and Savings (CRES), Greece



**Czech Biogas Association (CzBA),  
Czech Republic**



EKODOMA, Latvia



Energoproekt, JSC (ENPRO), Bulgaria

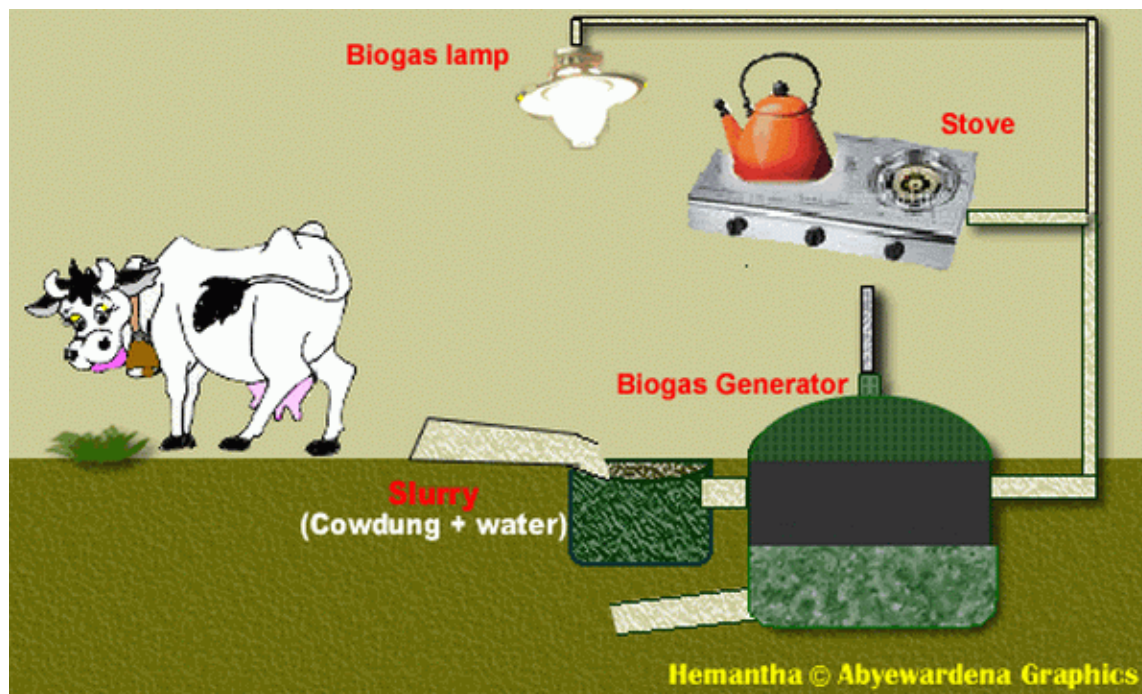


Razvojna agencija Sinergija, Slovenia



Trinergi Grup (TG), Romania

# Thank you for your attention



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