Biogas Benefits in terms of green energy and beyond

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

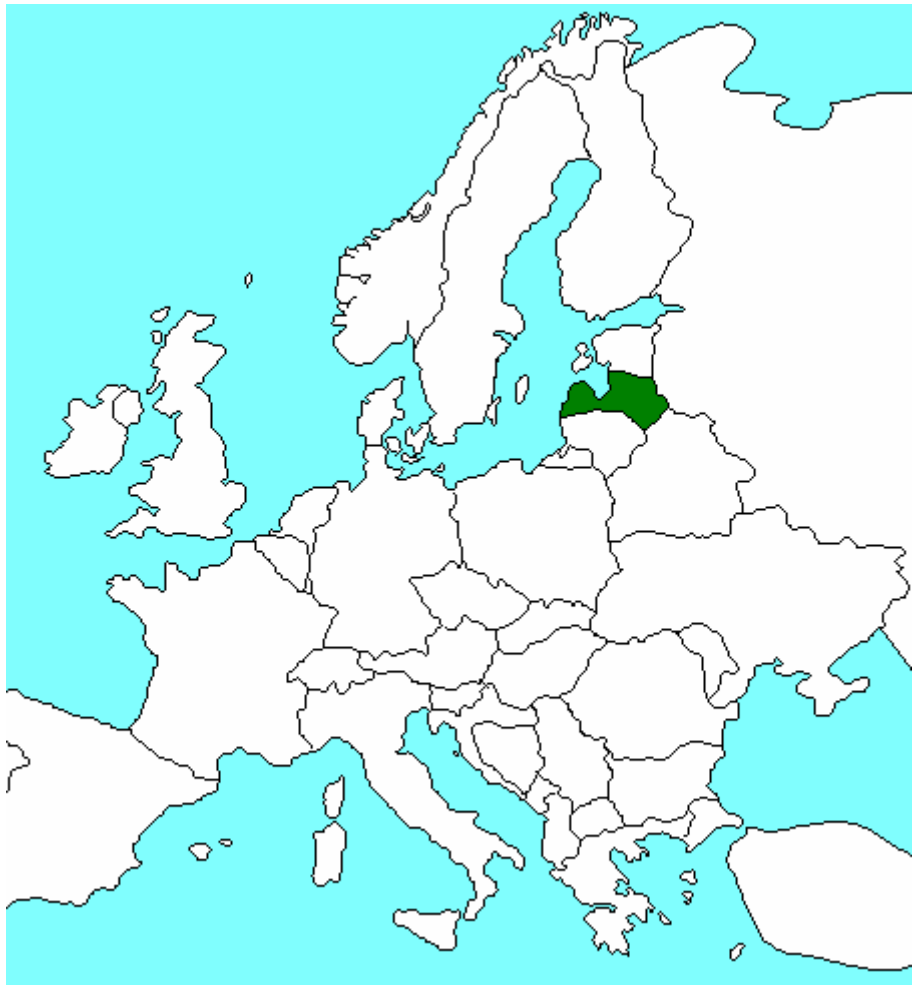
Sustainable Biogas Market Development in Central and Eastern Europe

Supported by INTELLIGENT ENERGY EUROPE

Thessaloniki, 2/02/2012

Latvia

- Basic facts:
  - Located in the Northern Europe
  - Area 64 559 km^2
  - Population ~2.2 million
  - Capital – Riga with ~700 000 inhabitants



Ekodoma

- Private, independent engineer-consulting company
- More than 20 years of experience in renewable energy and energy efficiency consultation
- Office in Riga, ~15 employees
- Experience in biogas related European projects:
  - BiG>East
  - BiogasIN
  - UrbanBiogas
  - BiogasHeat

Biogas in Latvia - history

- 1980s: First experimental biogas plants
- 1990s: WWTP with AD installed in Riga (2MWe)
- 1994: Foundation of Latvian Biogas Association
- 2001-2008: Landfill gas plants "Getliņi" (5 MWe) and "Liepaja RAS" (1 MWe)
- 2008: First agricultural biogas plant (0,27 MWe)
- 2009: Landfill gas plant "Daibe" (0,17 MWe)
- 2009: Introduction of the feed-in tariff
- 2009-2011: Rapid biogas market development
- 2011: Total installed biogas capacity 29,9MWe

Feed-in Tariff in Latvia

- Based on mandatory purchase quota system (limited capacity):
  - 54.6 MWe (2009)
  - 65.6 MWe (2010)
  - In 2011 due to economical crisis new quotas are not assigned (until 01/01/2013)
- Depending on the installed electrical capacity feed-in tariff for first 10 years:
  - 15,04 €c – 23,31 €c/kWh (for plants over 1 MWe)
  - 19,83 €c/kWh (for plants less than 1 MWe)
- For the next 10 years tariff is multiplied by 0,8

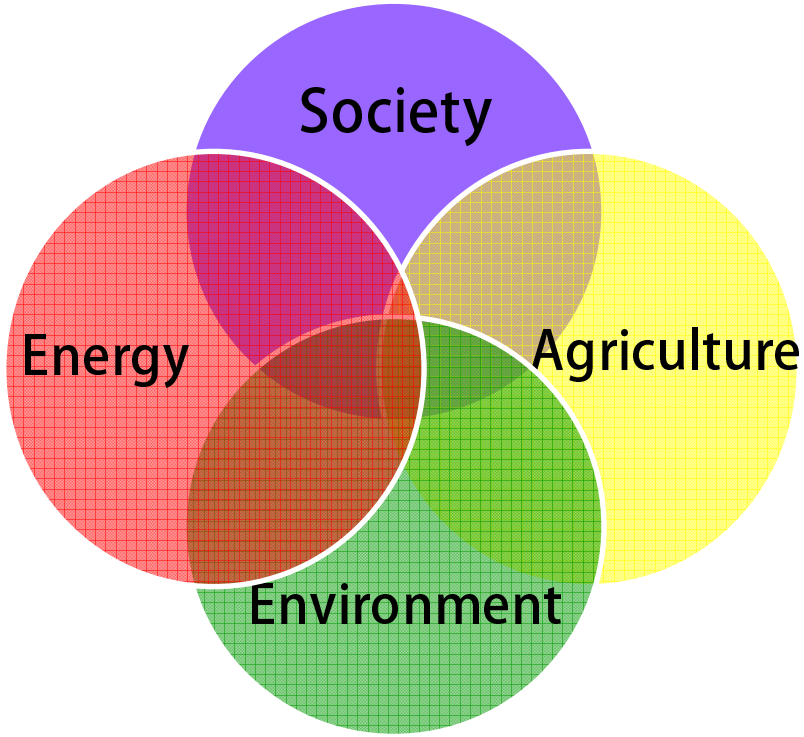
2012 and future prospective

- 76 biogas developers applied for the mandatory purchase quota
- For 30 companies quota has been cancelled
- 20 companies are operating
- More than 30 are currently under construction, but almost half of them are facing difficulties
- According to the NREAP in 2020 biogas will contribute with 92M e (biogas target)
- New "Renewable Energy Law" under discussion in the Parliament

Biogas Benefits

Biogas production and use is an integrated process and contributes to several sectors:

- Energy
- Environment
- Agriculture
- Society



Environmental friendly solution

- In contrast to fossil fuels, burning biogas only releases the amount of atmospheric CO_2 that was stored in the plant during its growth. Thus, the carbon cycle of biogas is closed. For that reason, utilisation of biogas reduces CO_2 emissions and helps to avoid an increase of the CO_2 concentration in the atmosphere, which helps fighting global warming.
- Furthermore other GHG emissions, such as methane and nitrous oxide from untreated manure, are reduced.

GHG emission savings

- In general GHG saving due to biogas utilization can be arising by:
  - Manure management: potential emissions saved due to CH_4 utilisation of animal manure and slurry
  - Substitution effect: Emission saved due to electricity and heat (cogeneration) produced from biogas
  - Replacement of fossil fertilisers: Emission saved due to replacement of mineral fertilisers with digestate

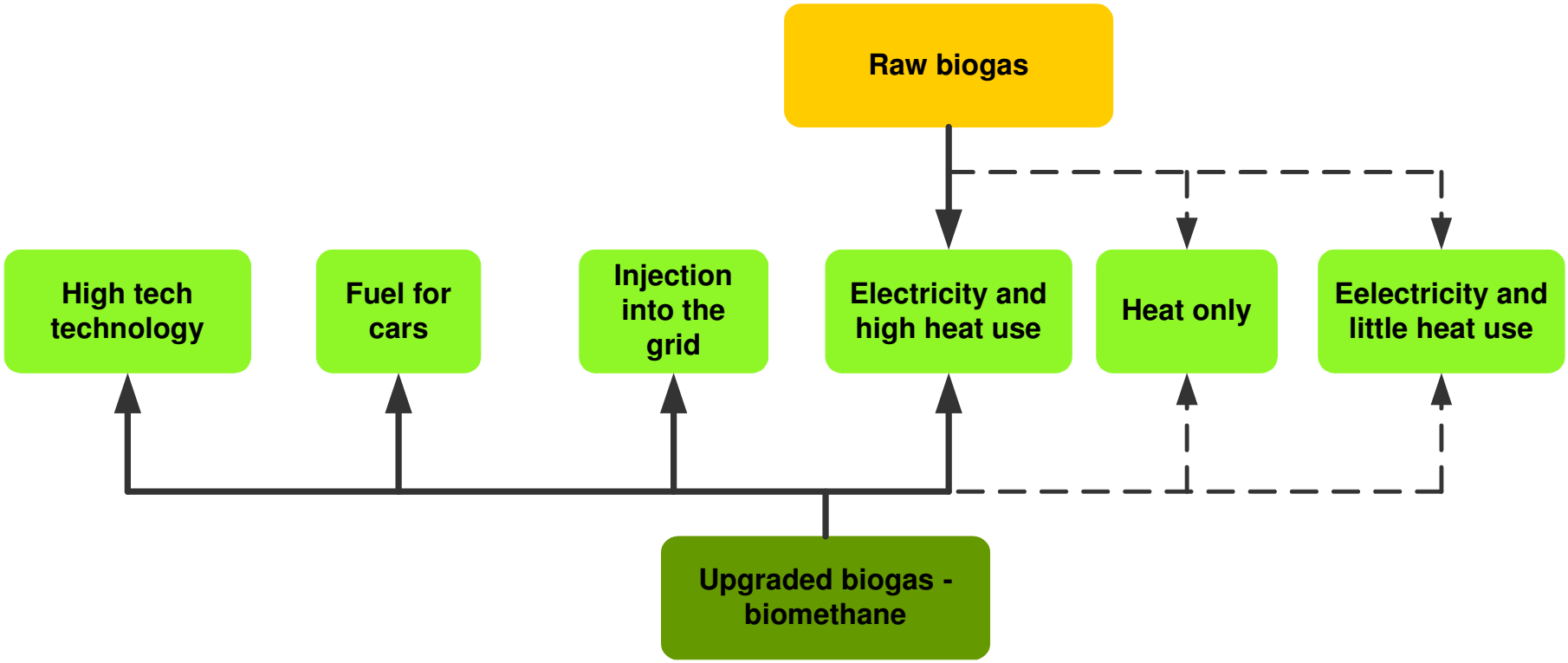
Best Agricultural Practice

- Ability to use biodegradable waste as a feedstock
- Excess of manure in intensive livestock breeding areas can be effectively used for biogas production
- Produced digestate contributes to compliance of a closed nutrient cycle
- Digestate has improved fertiliser efficiency due to homogeneity and higher nutrient availability
- Reduction of odours and flies due to the biodegradation and improved veterinarian safety
- Digestate can be used as a substitute for synthetic fertilisers

Renewable energy production

- Biogas covers a variety of markets.
- Biogas is versatile energy carrier and most commonly is used for production of electricity and/or heat, upgraded for injection into the gas grid or used as vehicle fuel.
- As biogas is a high value energy carrier that can be easily converted into other energy forms it should not be used as source of heat or electricity alone but mainly for the combined heat and power generation or as transportation fuel.

Efficient biogas pathways



Source: AEBIOM European Biomass Association, A Biogas Roadmap for Europe, October 2009

Socio economic issues

- Biogas production has many social benefits and most of these are related to job creation and rural development:
  - The development of a biogas sector stimulates the establishment of new enterprises (increased income, more job opportunities), but also increase the economic growth of the area.
  - Biogas utilisation contributes to reducing the dependency on fossil fuels, ensures energy diversification, security, competitiveness and sustainable supply.
  - Biogas production and utilisation influences the socio-economic structure in rural areas. Improve the social cohesion of the local population.

Local employment

- Increase in both – direct and indirect jobs during the all project phases and lifetime
- Estimated direct employment of biogas plants

  560 jobs/TWh *

  - 420 jobs/TWh in O&M
  - 140 jobs/TWh in construction works

- In 2009, the German biogas sector (~4 500 biogas plants) employed approximately 11 000 people**

Sources:

* The Danish Organization for Renewable Energy et. Al. 2006

** German Federal Ministry of Economics and Technology

BiogasIN case study: Benefits in Greek target areas

Calculation methodology was developed by BiogasIn partners, input data for Greek regions were provided by CRES

Calculation of Regional Benefits*

Target region / Biogas advantages	Larissa	Aitoloakarnania	Preveza	Evia
GHG emission savings, ktCO_2-eq per year	190.77	237.81	99.08	60.12
Artificial fertilizers saving, t/yr	13 963	18 346	4 501	7 220
Artificial fertilizers saving, M€/yr	4.039	5.307	1.302	2.088
Electricity production potential (CHP), GWh	70	84	35	17
Biogas energy share in national renewable energy target in 2020, %	0.3	0.3	0.1	0.1
Biogas energy share in national biogas target in 2020, %	1.0	1.2	0.5	0.3
Installed capacity, MW	9.4	11.3	4.7	2.3
Number of biogas plants**	19	23	9	5
Local job creation***	29-179	35-214	15-89	7-43
Number of households supplied with electricity (generated in CHP)	16 340	19 638	8 122	3 961
Investment costs (M€)	29.5	35.4	14.9	7.2

* Biogas exploitation using 100% livestock manure available in the four target areas
** With installed capacity of 0.5MW
*** Min – direct (O&M), Max – including indirect jobs

Conclusions

- Saving of about 587.78 ktCO_2-eq or 0.92% of the Greece GHG emissions for the year 2008
- Contribution with 0.8% to the national renewable energy target in 2020 and with 3% to the national biomass/biogas target. The theoretical electricity generation in the selected areas can cover more than 70% of the biogas target for 2020 (895GWh)
- Total installed capacity of about 27.67MW with investment costs of M€86.9
- About 55 new small biogas plants (0.5MW each) creating a range of 87-526 new jobs
- saving of about 44,031 t/yr artificial fertilizers worth of 12,737,233 €/yr
- 48,061 households can be supplied with electricity produced from biogas in CHP plants

More information:

More information on biogas benefits and calculations can be found on BiogasIN web-site – both in Greek and English:
www.biogasin.org

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