The Estonian biogas sector – developed or undeveloped?

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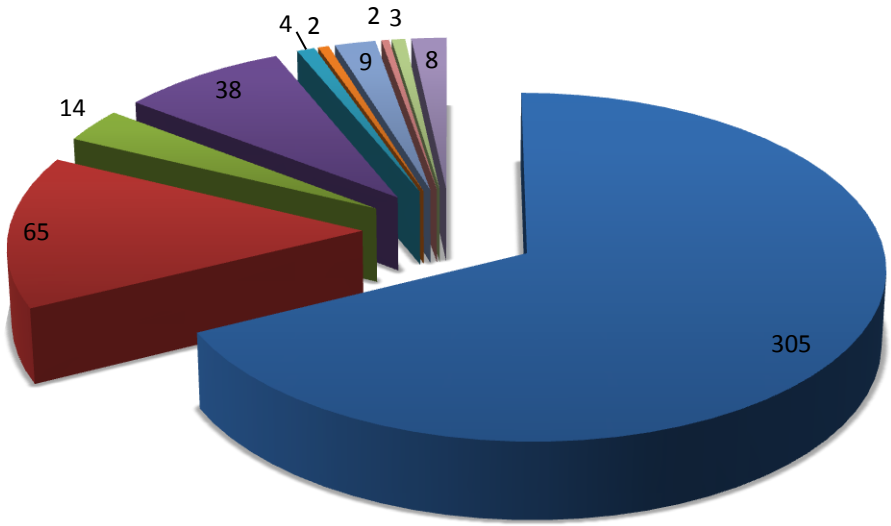
Points

- Estonian biogas potential
- Estonian current situation in biogas sector
- NREAP 2020 and Estonian Biofuel Strategy 2030 / ENMAK 2030
  - External and public benefits (energiatalgud.ee)
- Legal aspects
- Economical aspects: biomethane vs natural gas

Estonian biomethane potential is 450 mln Nm3 annually



silage from unmanaged grassland	305
silage [energy crops] from 5% agricultural land	65
hay from 25% semi-natural areas	14
72% cattle slurry [incl. Manure]	38
65% pig slurry	4
90% other biodegradable material from agriculture	2
80% biodegradable material from food industry	9
80% biodegradable material from catering [kitchen, etc]	2
80% waste water sludge	3
industrial [e.g. Aspen pulp]	8
Total	**450**

- silage from unmanaged grassland
- silage [energy crops] from 5% agricultural land
- hay from 25% semi-natural areas
- 72% cattle slurry [incl. Manure]
- 65% pig slurry
- 90% other biodegradable material from agriculture
- 80% biodegradable material from food industry
- 80% biodegradable material from catering [kitchen, etc]
- 80% waste water sludge
- industrial [e.g. Aspen pulp]

BIOMETHANE FROM SILAGE AND HAY

50 % UNMANAGED LAND

222 mln Nm^3

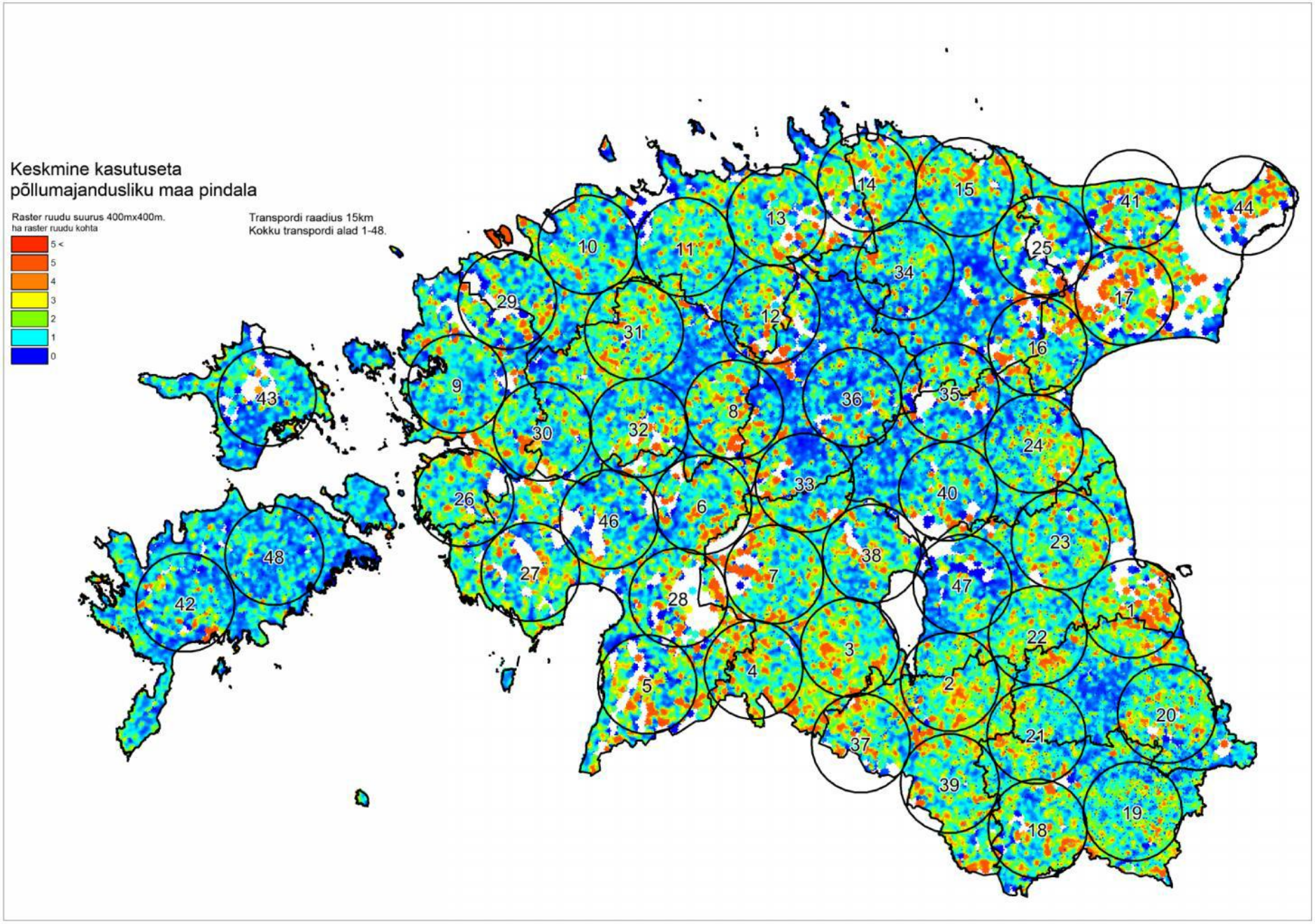
5% AGRICULTURAL LAND

65 mln Nm^3

30% SEMI-NATURAL AREAS

14 mln Nm^3

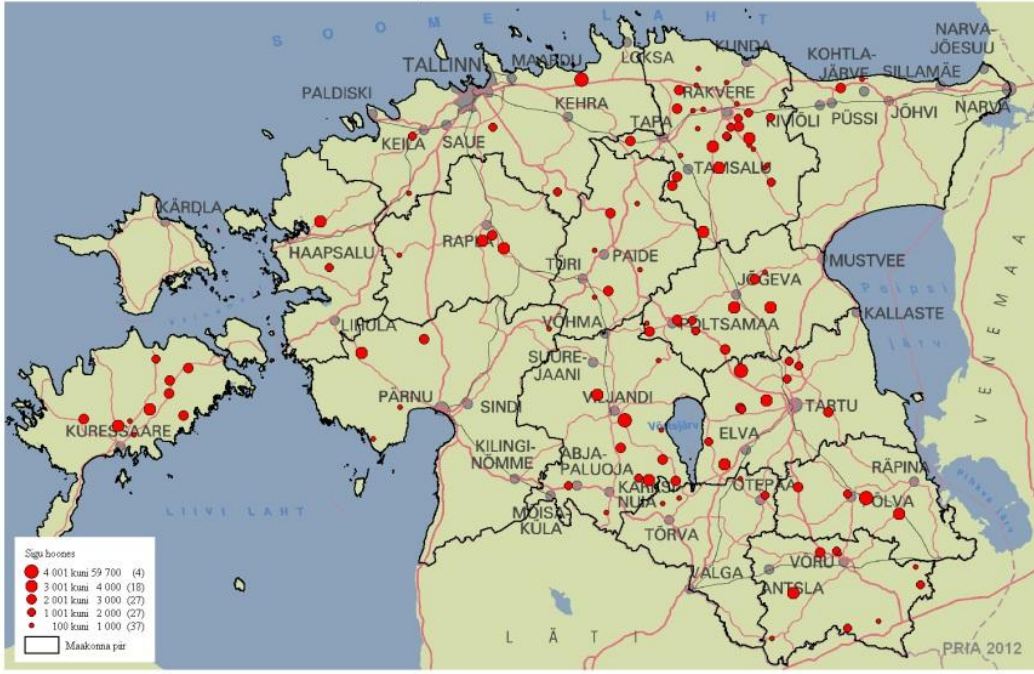
SILAGE FROM MANAGED GRASSLAND **83** mln Nm3



Source: Vohu, V. 2014. **KASUTUSEST VÄLJAS OLEVA PÕLLUMAJANDUSMAA RESSURSS, STRUKTUUR JA PAIKNEMINE** , Estonian Development Fund, Tallinn. [The resource, strucutre and location of unmanaged agricultural land in Estonia by 2012 data]

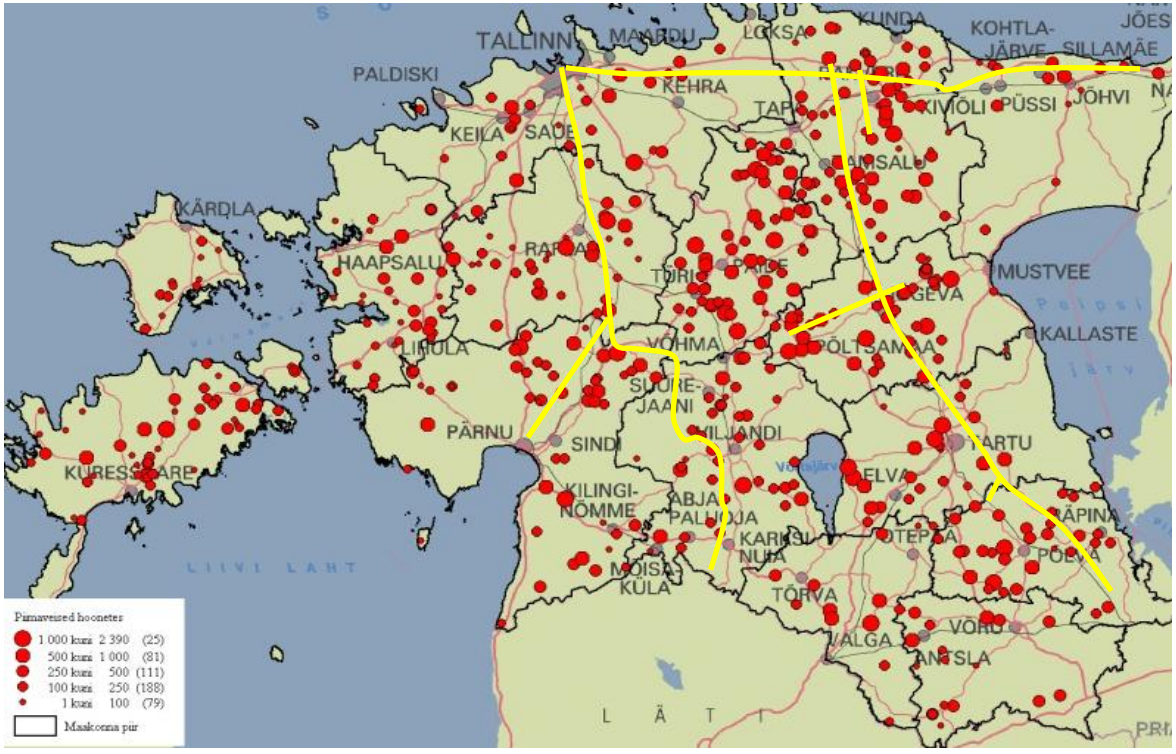
72% of cattle slurry biomethane potential

37 mln Nm^3



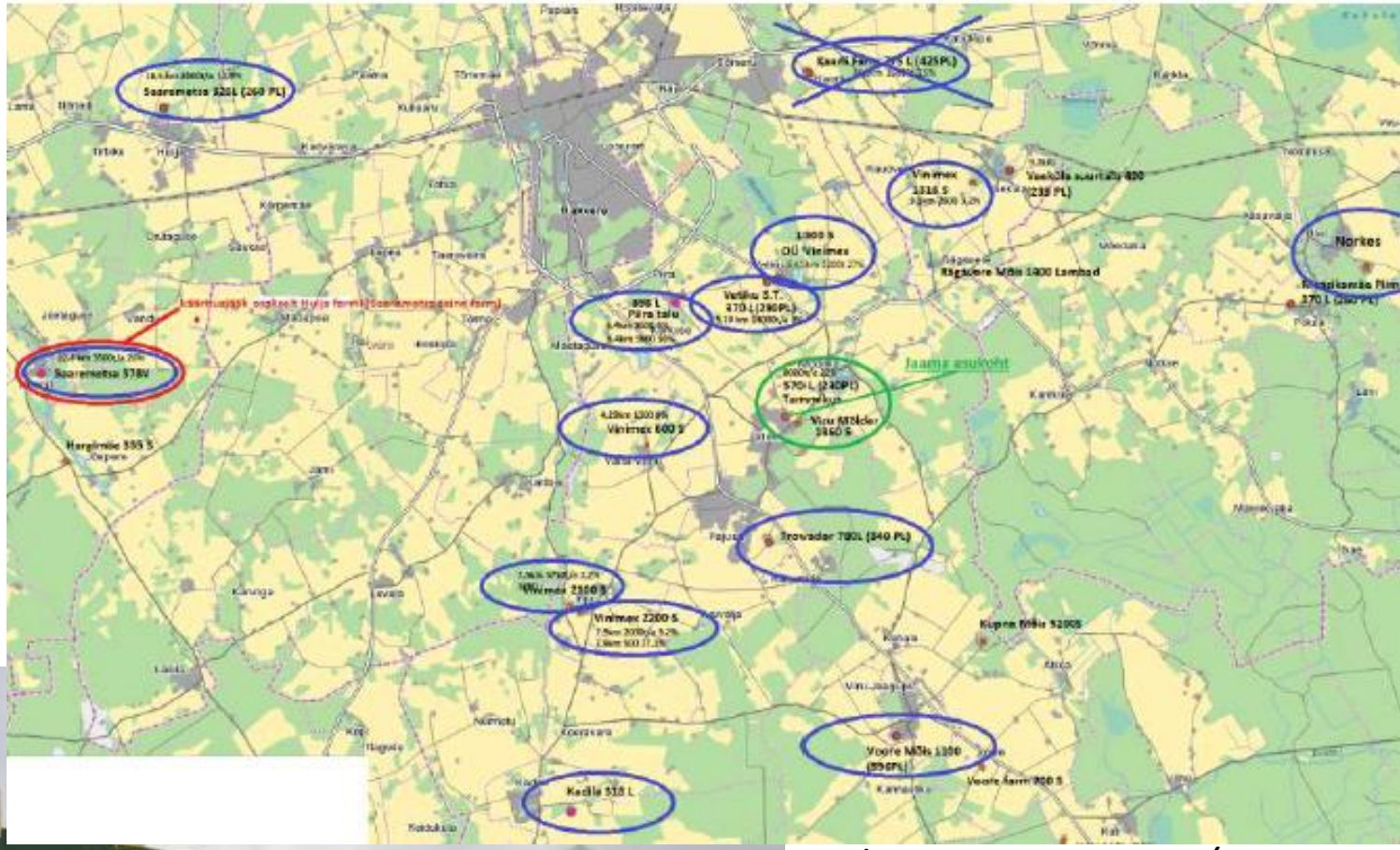
65% of pig slurry Biomethane potential

4 mln Nm^3



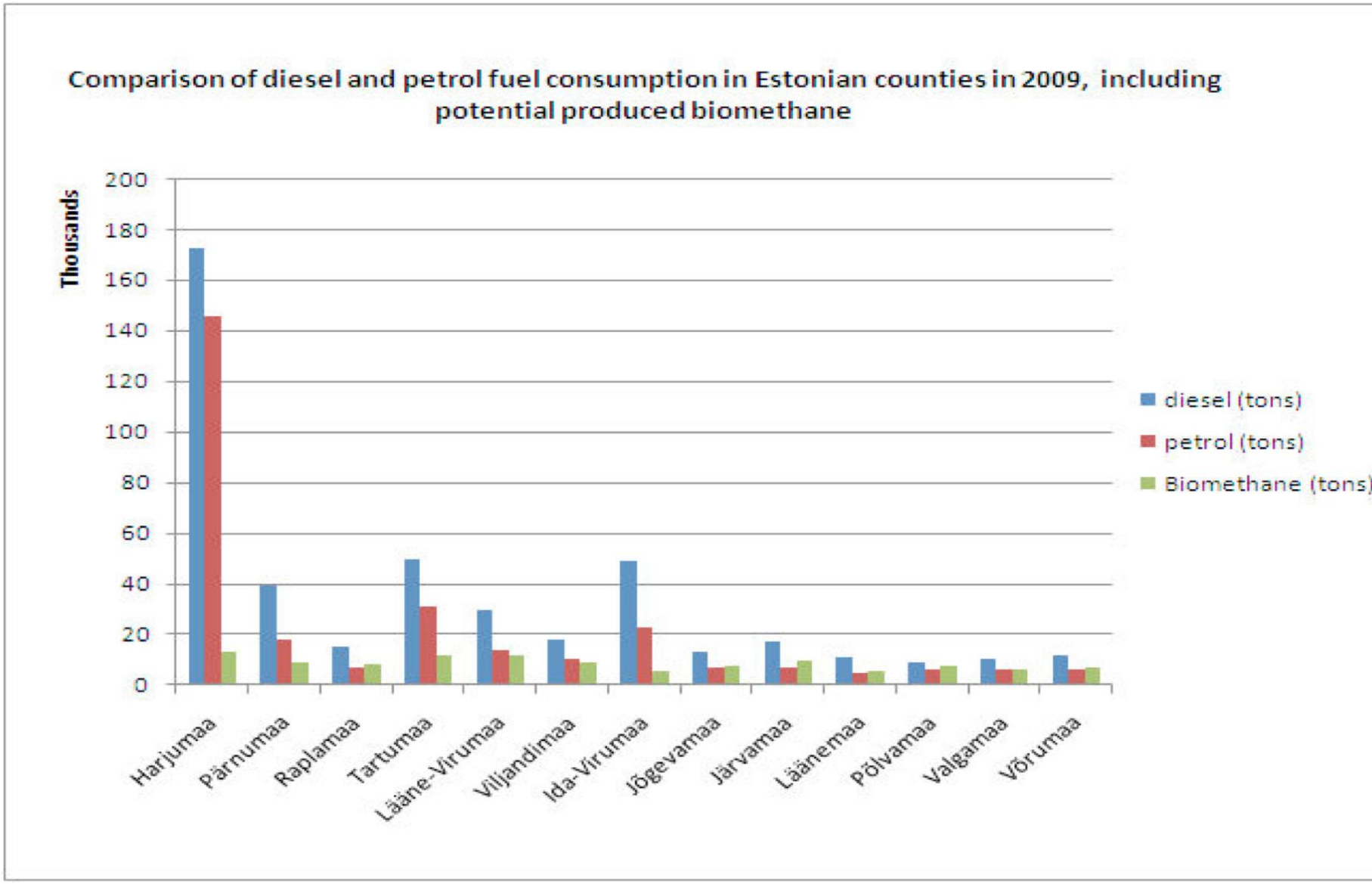
Source: Argo Normak, EMÜ, project Baltic Manure : Sõnnikust biogaasi tootmise hetkeseis ja võimalused Eestis, Interreg, Baltic Sea regional program

Vinni Biogaas OÜ CHP both efficiencies 42%



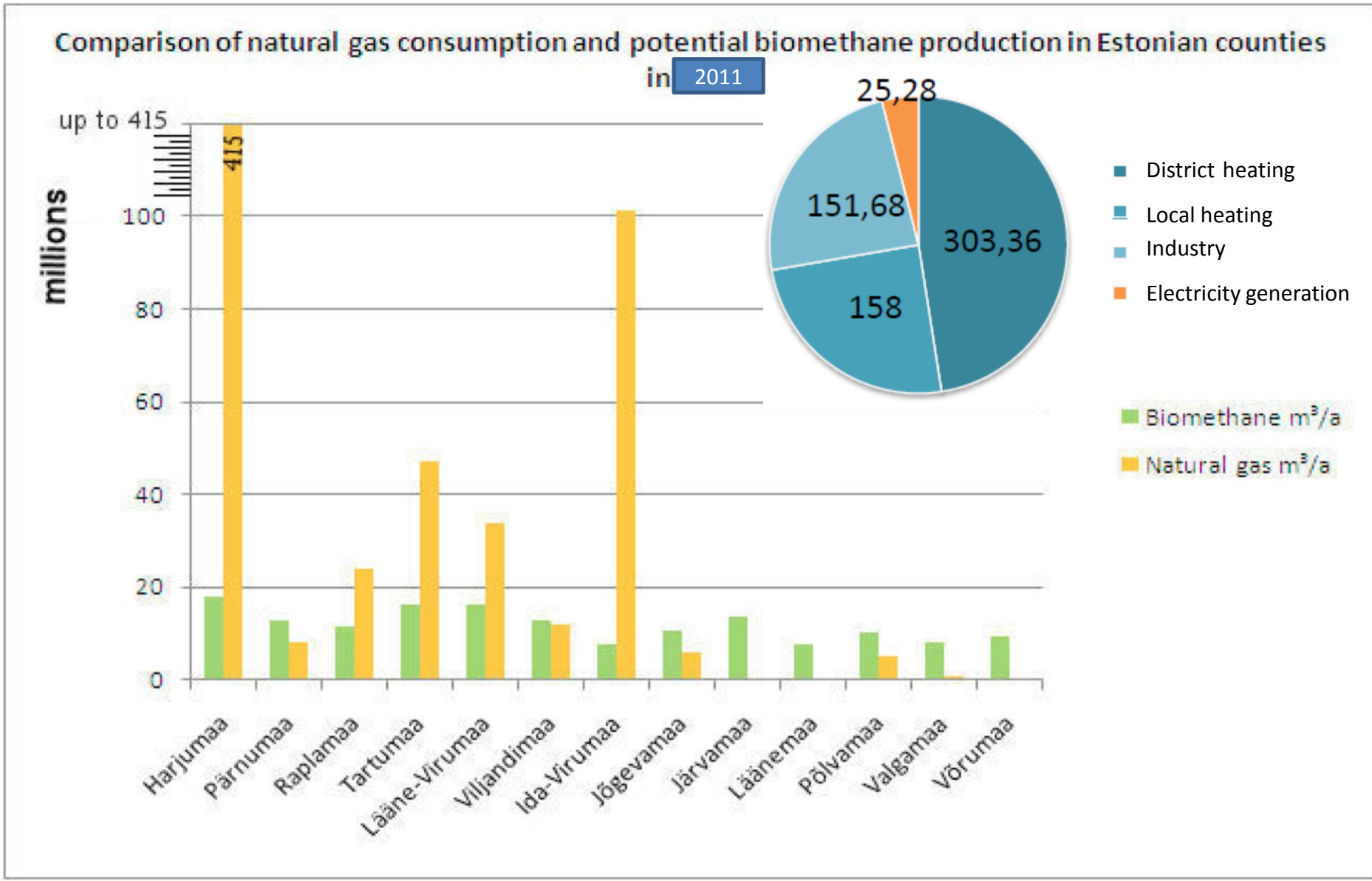
substrates: ~90 000 t/a biodegradable material (85% manure and slurry, 15% biodegradable material)

Nominal power of electricity:
1,36 MW
Annual electricity
9200 MWh/a


Comparison of diesel and petrol fuel consumption in Estonian counties in 2009, including potential produced biomethane
Thousands
200
180
160
140
120
100
80
60
40
20
0
Harjumaa
Pärnumaa
Raplamaa
Tartumaa
Lääne-Virumaa
Viljandimaa
Ida-Virumaa
Jõgevamaa
Järvamaa
Läänemaa
Põlvamaa
Valgamaa
Võrumaa
diesel (tons)
petrol (tons)
Biomethane (tons)

CONSUMPTION OF NATURAL GAS 581,8 mln Nm^3 2013.a.

VS BIOMETHANE POTENTIAL 450 mln Nm^3 MAAKONNITI



Estonian Biogas producers – 18 plants

AGRICULTURAL MIXED SUBSTRATES
Valjala Seakasvatus [pig farms] Ltd.
Aravete Biogaas Ltd
Tartu Biogaas Ltd
Vinni Biogaas Ltd
Oisu Biogaas Ltd.

Waste Water Sludge
Tallinna Vesi AS
Tartu Vesi AS
Narva Vesi AS
Kuressaare Veevärk AS

Industrial process waste water sludge
OÜ Eastman [chemical prod. benosaad]
Salutaguse Pärmitehas OÜ [east prod.]
Estonian Cell [dry aspen pulp]

BIOMETHANE PRODUCTION - 0

Biogas from Landfill
Pääsküla [closed] landfill [BEP]
Tallinna Prügilagaas OÜ [Jõelähtme}
Paikre OÜ [close to Pärnu]
AS Uikala Prügila
Aardapalu [closed] landfill [Doranova B.]
Väätsa landfill

Biogas used in CHP-s in 2013-2014, electricity **42,8 GWh**, which corresponds with amount of biogas **25 mln* Nm3**

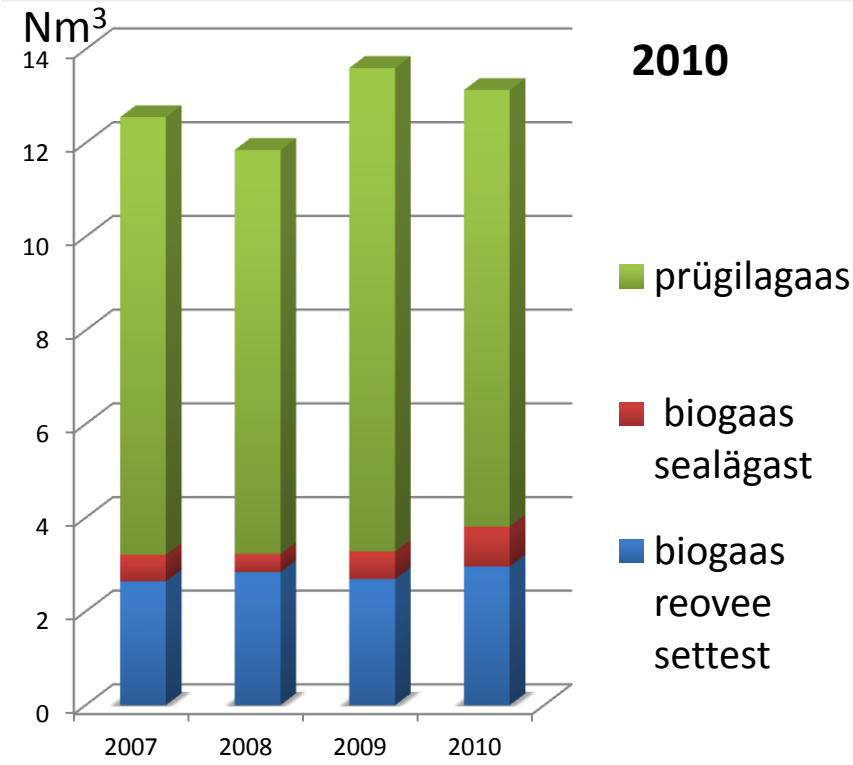
JAAM	Installeeritud elektriline nimivõimsus MWel | 2014.a	elektrienergia toodang (MWh) | 2013.a	elektrienergia toodang (MWh) | 2014.a
Jööri (Valjala)	0,35	1247	1125
Aravete	2	7587	7935
Oisu	1,2	4941	7639
Ilmatsalu	1,5	0	4077
Vinni	1,36	3351	8221
KOKKU:	6,41	17126	28997
Paikre OÜ ehk Rääma prügila	0,15	1097	874
Pääsküla prügila	0,86	3835	2774
Jõelähtme prügila	1,94	9977	8632
Aardlapalu prügila	0,4	0	1500
KOKKU:	3,35	14909	13780
KOKKU:	**9,76** 2014. a	**32035** 2013. aastal toodeti biogaasist 32 035 MWh elektrienergiat	**42777** 2014. a jaanuar-detsember biogaasijaamade elektritoodang

* 55% CH4 and 31% efficiency of electricity generation

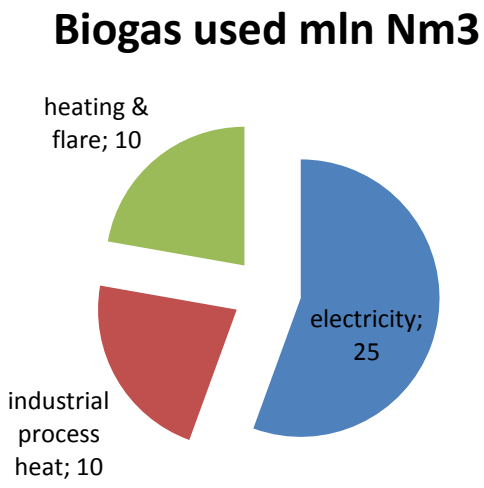
Amount of biogas flared – **why?**

	2007	2008	2009	2014
TOTAL BIOGAS PRODUCTION (mln Nm^3)	12.54	11.65	13.59	**45**
WASTE WATER SLUDGE	*2.64*	*2.84*	*2.69*	*10*
SLURRY AND MANURE [MINOR SILAGE & WASTE]	*0.57*	*0.39*	*0.59*	*25*
BIOGAS FROM LANDFILL	*9.34*	*8.62*	*10.32*	*10*

6.16



2010



2014

CNG filling stations [light blue] with option to be used for biomethan filling + biomethani cooperatives (off-grid) locations [green].

- Eestis küllaltki hästi välja arendatud maagaasi võrk
- Lisaks palju võrguarendajaid väljaspool EG-d

GREEN– Biomethani stations (off-grid, 25 pc)

DARK BLUE – CNG/cmb stations in fuure(on-grid 25 pc)

Light blue – existing CNG stations (5 pc)

NREAP 2020 **TARGET**:

10% TRANSPORT FUEL FROM RENEWABLE SOURCES

92 ktoe ~ 120 mln Nm^3 biomethane

	2005	2010	2020
taastuvatest energiaallikatest toodetud energia osakaal energia summaarsest lõpptarbimisest (%)	16,6	20,90%	25,00%
taastuvatest energiaallikatest toodetud energia osakaal energia summaarsest lõpptarbimisest (ktoe)	514	666	863
Sh küte ja jahutus (ktoe)	*505*	*612*	*606*
Taastuvelekter (ktoe)	*9*	*53*	*165*
transpordikütused (ktoe)	*0*	*1*	*92*

5%	the obligation to mix biofuels with fossil liquid fuels	46	ktoe
4-5%	**biomethane in transport**	**37-46**	**ktoe**
0-1%	electromobility	1-9	ktoe

5% (**46** ktoe) of biomethan in transport **means** ca 4'320 petrol light passanger cars, 507 dieselbuses and 794 diesel trucks in total **5'621** vehicles, today ~**300** CNG **vehicles**

	Petrol passanger cars under 3.5 t	trucks diesel	Buses (diesel)	TOTAL
Biomethan amount needed [mln Nm^3]	10	30	20	**60**
Biomethan amount needed [ktoe]	6	24	16	**46**
Amount of vehicles [pc]	**4'320**	**794**	**507**	**5'621**
Share of biomethane-driven vehicles from total [%]	*1%*	*3%*	*13 %*	
Total nr vehicles [pcs]	432'028	26'472	3'899	462'399

Source: 1. Jüri Olt, 2012. EESTI MOOTORSÕIDUKIPARGI ISELOOMUSTUS NING SELLE GAASKÜTUSELE ÜMBEREHITAMISE VÕIMALUSTE ANALÜÜS, EMÜ. 2. EESTI BIOGAASI ASSOTSIATSIOON

Biomethane cooperative in Jameln, Germany

Public external benefits of biomethane – indirect positive impact to society

- Biomethane – creates **positive** effects
- or avoids adverse negative effects to society
  - those impacts can be called **public goods**:
- Calculation of impacts
  - Non-monetary [decriptive]
  - Monetary
- Estonian Development Fund calculated biomethane public goods twice
  - In 2012 - the result was **271** mln € per year
  - In 2014 - the result was **600** mln € per year in maximum

List of public benefits of biomethane production

Positive public benefits

Energetics

- Renewable energy;
- CHP;
- Decentralized;
- Energy security and independent;
- Climate neutral, local ;

Waste management

- Biowaste use to energy creation;
- Waste water sludge for energy, less smell;
- Less fossil fuels in waste water management;

Agriculture

- Better slurry management, better fertilizer;
- Energy crops increases variability;
- Less weed seeds and pathogenes;
- Use for unmanaged land;

Environmental protection

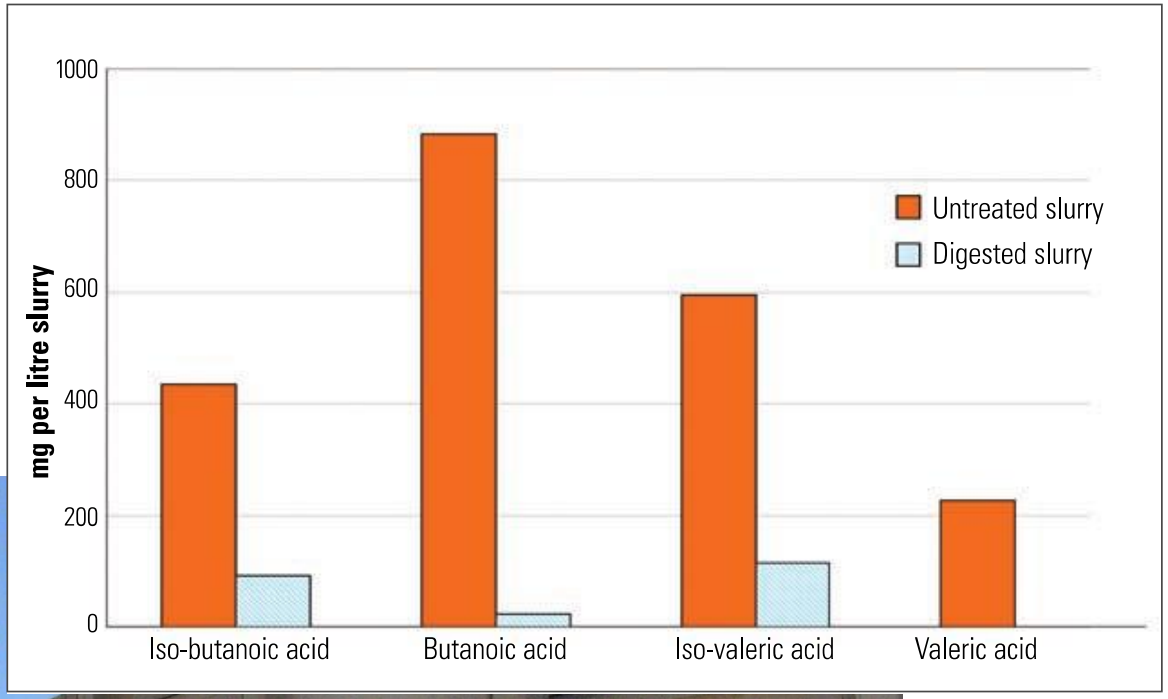
- Decreases methane and CO2 pollution from agriculture;
- Decreases nitrate pollution to soil;
- Subtitutes fossil fertilizers;
- Biomethane is local, renewable fuel with sustainability criteria

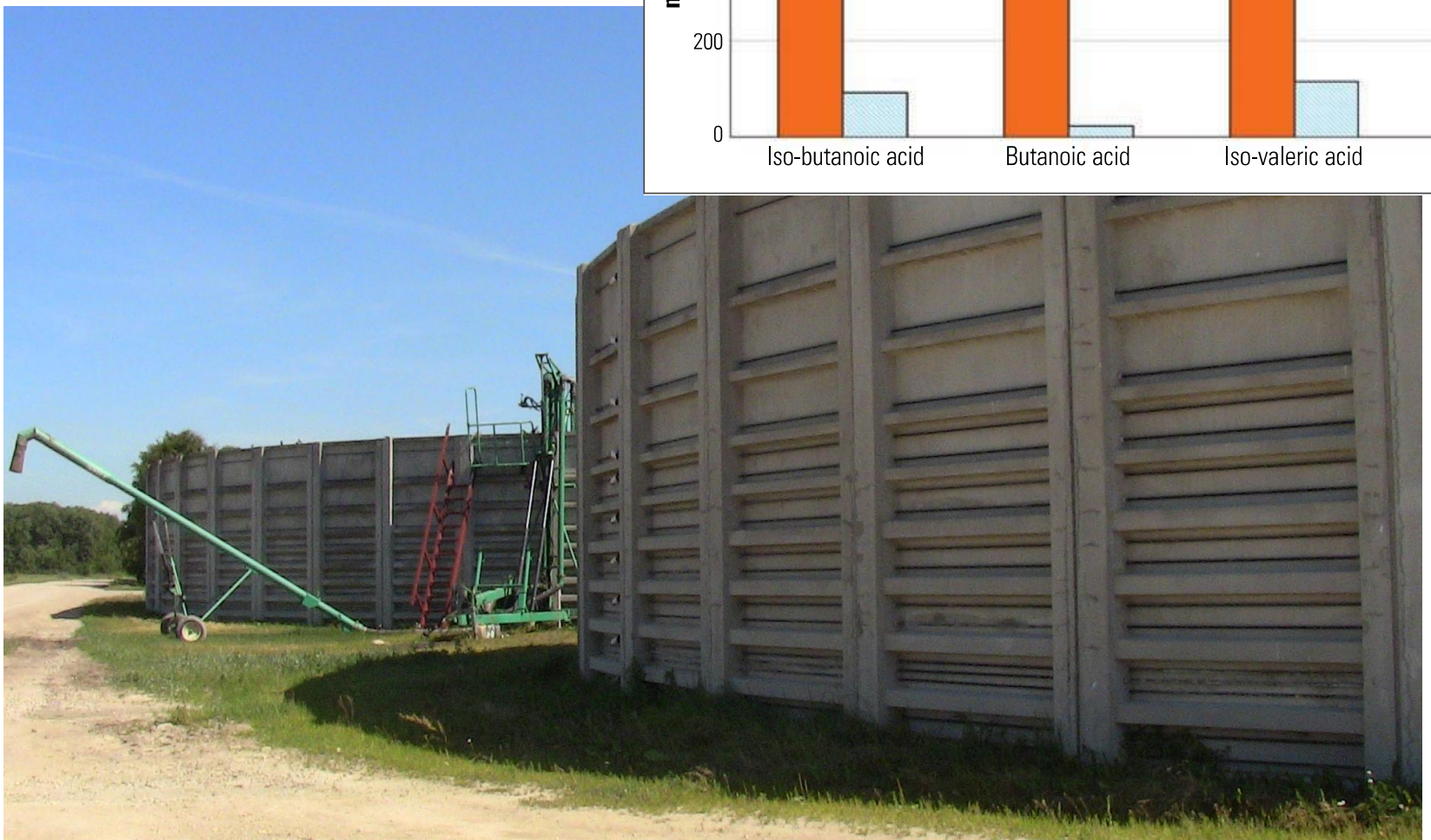
Regional development

- Lowers cost of district heating in regions;
- Better living environment, less smell, higher property values;
- Promotes jobs and businesses;

Reference: Eesti Biogaasi Assotsiatsioon, European Biogas Association, European Biogas Roadmap

Example of non-monetary external benefit of AD





AD reduces the **smell** pollution from slurry management significantly, BUT in EUR **???**

Biomethane positive positive impact to the economy

Indicator	Unit	2015	2020	2025	2030	2035	2040	2045	2050	
GROSS DOMESTIC PRODUKT (GDP)										Average
GDP_Basic prognosis	MEUR	18 362	21 842	25 237	28 643	31 738	34 530	36 897	38 693	29 493
GDP CHANGE_ENMAK IMPACT	MEUR	71	280	281	472	479	513	554	589	405
increase	%	*0,39%*	*1,28%*	*1,11%*	*1,65%*	*1,51%*	*1,49%*	*1,50%*	*1,52%*	*1,31%*
GDP per capita (PPP**)_Basic prognosis	EUR/person	18 585	21 301	24 027	26 907	29 698	32 279	34 368	36 054	27 902
GDP per capita_ENMAK impact	EUR/person	72	274	267	443	449	480	516	549	381
increase with ENMAK impact	%	*0,39%*	*1,28%*	*1,11%*	*1,65%*	*1,51%*	*1,49%*	*1,50%*	*1,52%*	
GOVERNMENT SECTOR & FOREIGN TRADE										
Government sector netto-income	MEUR	8	33	66	69	129	137	147	156	93
Foreign trade saldo	MEUR	-94	-81	6	-63	125	173	208	263	67
Foreign trade saldo/GDP	%	*-0,5%*	*-0,4%*	*0,0%*	*-0,2%*	*0,4%*	*0,5%*	*0,6%*	*0,7%*	*0,13%*
LABOUR MARKET										
Jobs_Basic prognosis	persons	635 000	629 933	620 541	607 653	593 262	575 952	552 230	523 165	
Jobs created with _ENMAK impact	persons	2 037	5 286	4 404	6 185	5 049	4 808	4 724	4 528	
change	%	*0,32%*	*0,84%*	*0,71%*	*1,02%*	*0,85%*	*0,83%*	*0,86%*	*0,87%*	*0,79%*
Productivity_Basic prognosis	EUR/employee	28 916	34 674	40 669	47 137	53 498	59 952	66 814	73 960	50 703
Productivity with_ENMAK impact	EUR/employee	28 936	34 827	40 832	47 431	53 848	60 340	67 243	74 442	50 987
ENMAK/Basic prognosis		*100,1%*	*100,4%*	*100,4%*	*100,6%*	*100,7%*	*100,6%*	*100,6%*	*100,7%*	*100,6%*

So far so good – what's the problem? Why biomethane **is not produced in Estonia**

1. **cost** of biomethane production is higher than the price of natural gas imported from Russia
2. **no additional legal measures has been adopted**

- "delta question":
  - How to compensate the higher price of biomethane to producer

- Estonian Biogas Association has proposed 4 measures

- Without the political decision to adopt some legal measures risks of biomethane producers are unproportionally high
- Nobody will not invest to loss making industry

Biomethane cost components

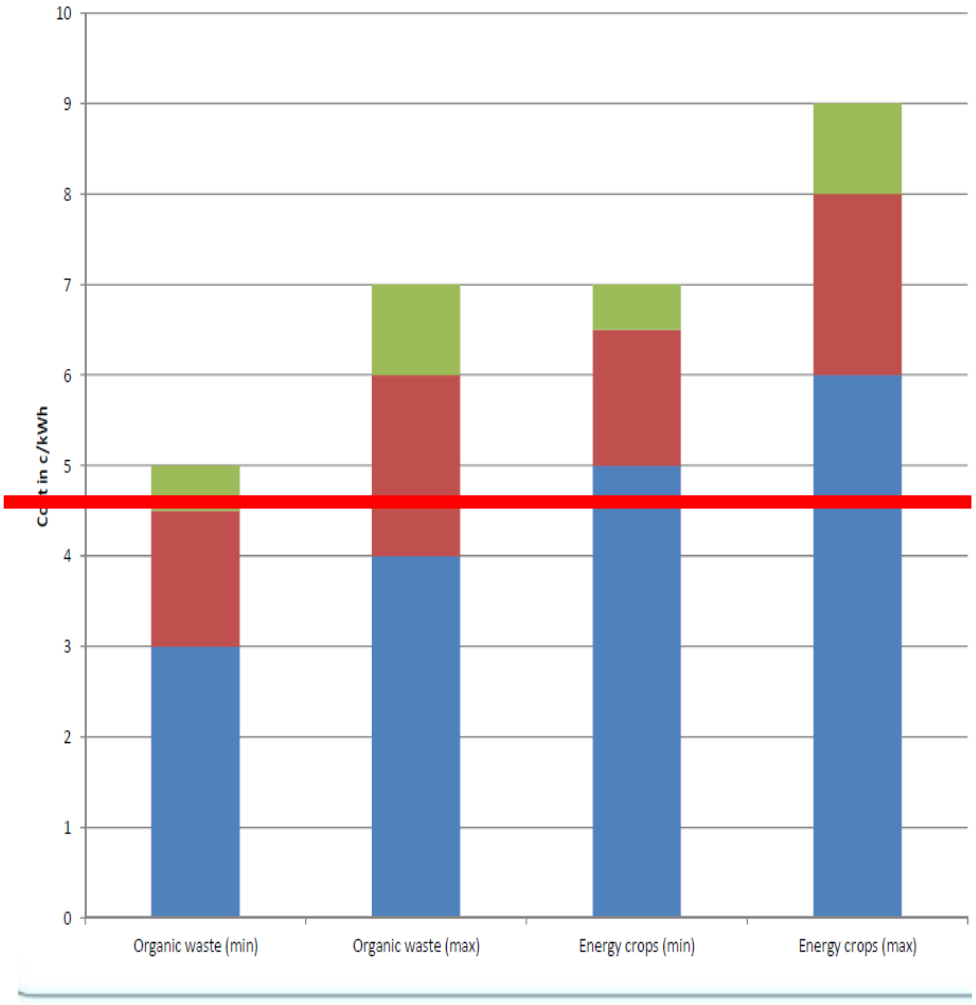
	I plant	II plant	Average
	€/Nm3	€/Nm3	€/Nm3
Raw material cost	0.17	0.12	0.146
Heating & electricity	0.14	0.17	0.153
Other cost	0.21	0.16	0.187
Amortisation	0.14	0.18	0.159
Loan intrest	0.14	0.07	0.104
Biomethane price in plant	**0.80**	**0.70**	**0.749**
Transport to consumer	0.10	0.04	0.07
Price with transport	0.90	0.74	0.82
profit margin	7%	7%	7%
Price with transport and profit margin	0.96	0.79	0.88
Income from selling co-products (biofertilizer, lower cost to pesticides)	0.12	0.04	0.08
Price in filling station without VAT	***0.84***	***0.75***	***0.80***

Germany:

Biomethane cost from **waste** **0.50-0.70 EUR/Nm³**

The price of biomethane from **energy crops** **0.70-0.90 EUR/Nm³**

CNG ***0.46*** EUR/Nm³,



GREEN– CONNECTION COST TO GRID

In range: 0.05-**0.09** EUR/Nm³

RED– UPGRADING COST –(TO GET BIOMETHANE)

In range: 0.14 – **0.18** EUR/Nm³

BLUE – BIOGAS PRODUCTION COST

In range: 0.27 – **0.54** EUR/Nm³

THE FEED-IN-TARIFF IN GERMANY IS DIFERENTIATED BY INPUT AND SIZE

		2012	2013
Basic tariff (1), (3)	up to 150 kWel	14,3	14,01
	150 kWel up to 500 kWel	12,3	12,05
	500 kWel up to 5 MWel (8)	11	10,78
	5 MWel up to 20 MWel	6	5,88
Special tariff for small plants (2)	up to 75 kWel	25,00	24,5
Substrate tariff (3)			
Input substrate category I	up to 500 kWel	6/6 (4)	6/6 (4)
	500 kWel up to 750 kWel	5/2,5 (4)	5/2,5 (4)
	750 kWel up to 5 MWel	4/2,5 (4)	4/2,5 (4)
Input substrate category II	up to 500 kWel	8	8
	500 kWel up to 5 MWel	8/6 (5)	8/6 (5)
Biomethane upgrading (6)	up to 700 Nm3	3	2,94
	700 Nm3 up to 1000 Nm3	2	1,96
	1000 Nm3 up to 1400 Nm3	1	0,98
Biowaste fermentation facilities (7)	up to 500 kWel	16	15,68
	500 kWel up to 20 MWel	14	13,72

(1) incl. heat use commitment of 60 %; exceptions: biomethane, plants with ≥ 60 % slurry/solid manure input

(2) Small slurry plants with ≥ 80 % slurry input

(3) Maximum 60 % corn and grain

(4) Bark and forest residues

(5) For slurry and solid manure apply 8 ct/kWh up to 500 kWel and 6 ct/kW up to 5 MWel

(6) 700 Nm³/h (ca. 2,8 MWel). 1000 Nm³/h (ca. 4,0 MWel), 1400 Nm³/h (ca. 5,5 MWel)

(7) ≥ 90% Biowaste

(8) 2014 for new plants > 750 kWel remuneration only as market premium

(9) Annual regression of basic tariff and boni 2%, does not apply on substrate tariffs

Reference: Aino Martikainen, Agency for Renewable Resources (FNR), 2011
Fachagentur Nachwachsende Rohstoffe e.V. (FNR), Nachwachsende-rohstoffe.de

Example: Biomethane in Sweden

Capital intensive business with still small profit margins need additional drivers and good framework conditions

- **Tax exemption + high fossil fuel taxes**
  - Upgraded biogas: buy at 0.5-0.8 €/m3, retail at 1.6 (8.5SEK/€)
- **Long-term high-volume contracts securing the market**
  - Waste management + procurement of public transport
- **Substrate costs escalation in harmony with market growth?**
  - Learning curves + Increasing and volatile fossil fuel prices increase → better profit margins
  - Challenge: Starting with free or cheap waste, now followed by more expensive substrates, e.g. energy crops
- **Not provided: Extension of existing policies, no new ones to facilitate production growth**

Situation in **Finland**

Biomethane price in Finland in filling station **1.42 EUR/kg** (=0.9 EUR/l or Nm3) and the price of CNG **1.3 EUR/kg** (0.832 EUR/l or Nm3).

Feed-in-Tariff (FIT)

Anaerobic Digestion

Capacity	Original Tariff – from April 2010	RPI Adjusted Tariff – from April 2011	New Tariff – from September 2011
<250 kWe	11.5 p/kWh	12.1 p/kWh	14.0 p/kWh
250 – 500 kWe			13.0 p/kWh
>500 kWe	9.0 p/kWh	9.4 p/kWh	9.4 p/kWh

For Comparison:

PV (<50* – 100kW)	31.4	32.9	19.0 (12.9 *)
PV (<100* – 5MW)	29.3	30.7	15.0 – 8.5 *
Wind (100 – 500kW)	18.8	19.7	19.7

* Proposed banding differs – aggregated here for comparison only.

The UK National Centre for Biorenewable Energy, Fuels and Materials

Biomethane	Biomethane injection	All scales	6.8
For Comparison:			
Small Biomass	Solid Biomass; Municipal Solid Waste (incl. CHP)	< 200	Tier 1: 7.6 Tier 2: 1.9
Medium Biomass		200 – 1,000	Tier 1: 4.7 Tier 2: 1.9
Large Biomass		≥ 1,000	1.0 (2.6)
Solar thermal	Solar thermal	< 200	8.5
Small ground source	Ground-source heat pumps; water-source heat pumps; deep geothermal	< 100	4.3
Large ground source		≥ 100	3.0

The situation in UK: biomethane producer receive:

0.75 EUR/Nm^3

=8.32 €c/kWh 0.75 €/Nm^3

SITUATION IN DENMARK
Guaranteed price for producer 1 €/Nm3

Case Study - Denmark

	Number	GWh/a	
Agriculture	76		
Industry		5	
Sewage sludge	61		
Landfill	25		
Total	**167**		**1'165**

Political commitment

- Guaranteed price of 0,772 DKK/kWh (10.3 €cts/kWh)

- The government has a set up a green growth plan (➔ Subsidies):

- Until 2020 four large scale co-digestion plants shall be buit per year until 2020
- Until 2020, 50% of the animal waste shall be digested (today it is 3-6%)
- The goal is the production of 12PJ from biogas (today it is 4,2PJ)

Biogas support measures in current law

- Price premium for all renewable electricity, irrelevant of size, source and location = 5,3 €c/kWh + Nordpool price
- Biogas use in district heating is excise-tax free
- Biomethane (and CNG) has no excise tax in transport
- Biomethane has to fulfill all same quality criteria as natural gas to allow grid injection

Legal proposals of EBA to promote biomethane in tranport

{to achieve 10% target}

- To adopt biomethane **blending obligation** with natural gas 1:1
- To include biomethane **consumption obligation** in public transport (buses) procurement conditions
- To support biomethane with price premium on the basis of energy content **(5,3 €c/kWh)**
- The **adopt fuel excise tax to CNG (50-70%** of petrol and diesel tax) and with this tax income support biomethane producers

	MoEcon proposal for CNGi excise tax, €/1000 Nm^3	EBA proposal for CNG excise tax, €/1000 Nm^3	Price of CNG in filling station, with VAT €/kg	The price of compressed biomethane in filling station with VAT, €/kg	The price of compressed biomethane in filling station **without VAT, €/m3**	Average cost of biomethane production, atractive to invest, without VAT €/Nm^3	The price difference of CNG and CBM, €/Nm^3 km-ta	Additionl price subsidy for CBM until 2020, €/Nm^3
2014	0	0	0.779	0.779	0.464	0.75	-0.286	-0.286
2015	28.14	28.14	0.826	0.826	0.492	0.75	-0.258	-0.230
2016	33.77	33.77	0.844	0.844	0.503	0.75	-0.247	-0.214
2017	40.52	53.98	0.869	0.869	0.518	0.75	-0.232	-0.178
2018	48.63	74.76	0.904	0.904	0.538	0.75	-0.212	-0.137
2019	58.35	103.54	0.953	0.953	0.567	0.75	-0.183	-0.079
2020	75.86	143.41	1.020	1.020	0.607	0.75	-0.143	**0.000**

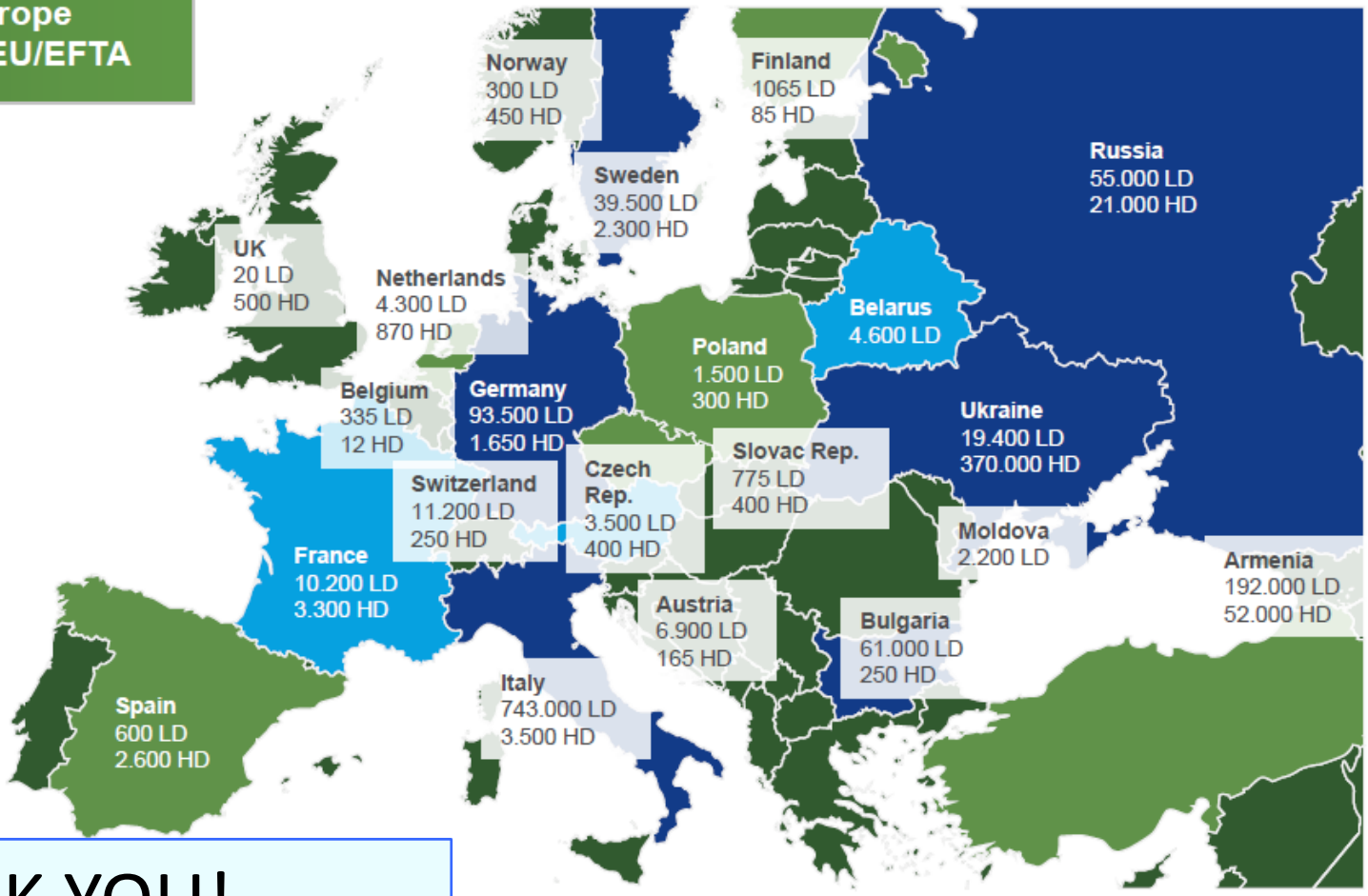
- **Biomethane producer receives 0.75 €/Nm3, but can sell in filling station with price of 0.61 €/Nm3,**
- The price difference is covered **from CNG excise tax income 0.14 €/Nm3**
- This biomethane support mechanism **is state-budget-neutral in 2020, if such tax will be introduced step-by-step**

Is Estonian biogas sector developed or undeveloped?

- Biogas potential is huge,
  - BUT mostly **unused**
    - **PURE Economically and with current support scheme biogas production for CHP is not feasible**
- Biogas sector for use in CHP has started,
  - BUT **stopped**
    - Because investment subsidy scheme for AD plants was finished
- Biomethane **positive impacts** to GDP are significant
- Economic, social and environmental **benefits justifies support**
- Biomethane is **not produced**, (need for 5% is 60 mln Nm3)
    - Gov ernment recognizes the problem, but not adopting the solutions
    - The first investment subsidy for the 1st pilot plant was decided, but this is not enough, investor stopped the process

- Estonia has good preconditions to become developed!

1,7 M NGVs in Europe
1 M NGVs in the EU/EFTA



THANK YOU!

Ahto Oja

http://www.eestibiogaas.ee/

+ 372 5082990

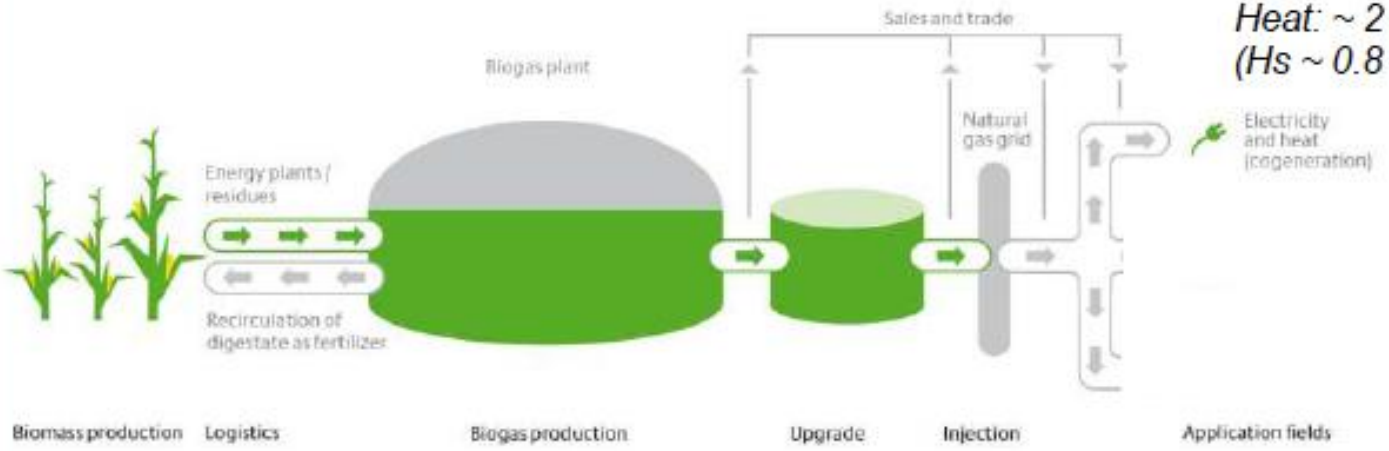
Back up slides

Allikas: Ludvig Dinkloh. Upgrading biogas to natural gas quality, 2011.

Value of Biomethane in Germany
Basis: Energy Crops

BIOENERGIE

Electricity: ~ 17 – 23 c/kWh el
(Hs 6.8 – 9.2 c/kWh)
+
Heat: ~ 2 – 6 c/kWh th
(Hs ~ 0.8 – 2.4 c/kWh)



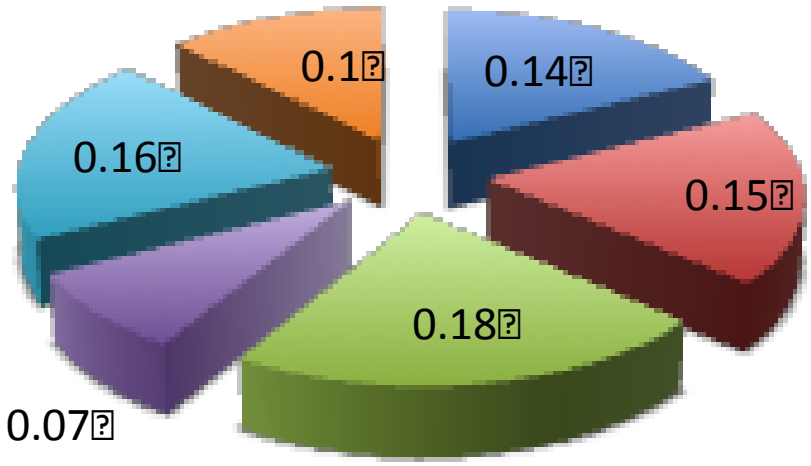
Prices/Costs for Hs:

Raw biogas
~ 5.5 – 6.0 c/kWh

Biomethane to Grid
~ 6.7 – 7.3 c/kWh
+
0.7 c/kWh
(Bonus for decentral energy production)

Biomethane to CHP
~ 7.3 – 7.7 c/kWh
+
~ 0.2 – 0.6 c/kWh
(Transport)

Biomethane price components are in range of 0.6-0.9 Eur/Nm3



Toorme ostukulu 0.14 €/Nm3

Kulu küttele ja elektrile 0.15 €/Nm3

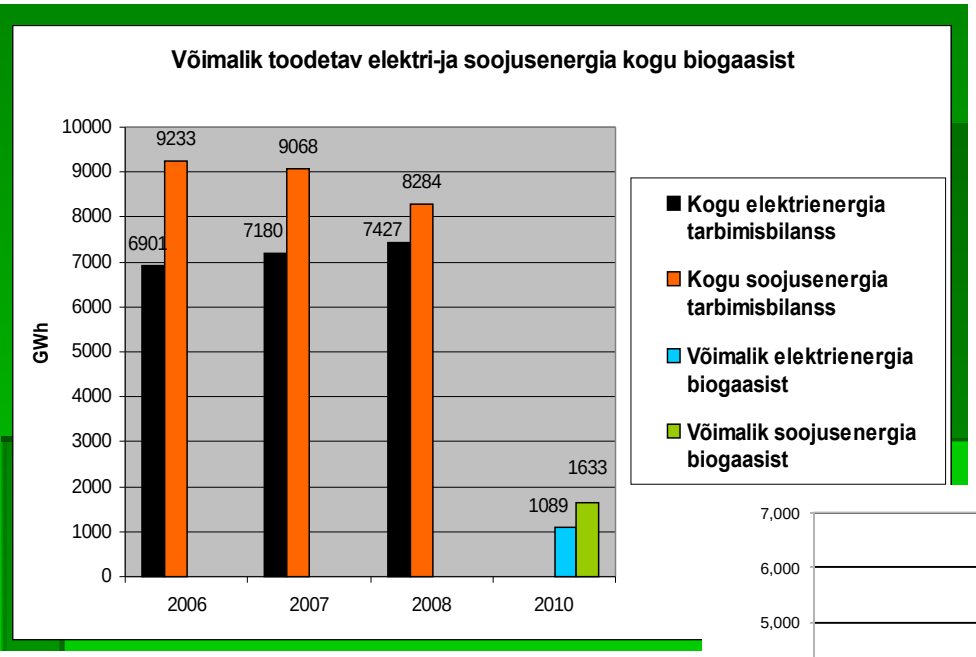
Muud tegevuskulud 0.18 €/Nm3

Transpordikulud lõpptarbijani 0.07 €/Nm3

Amortisatsioon 0.16 €/Nm3

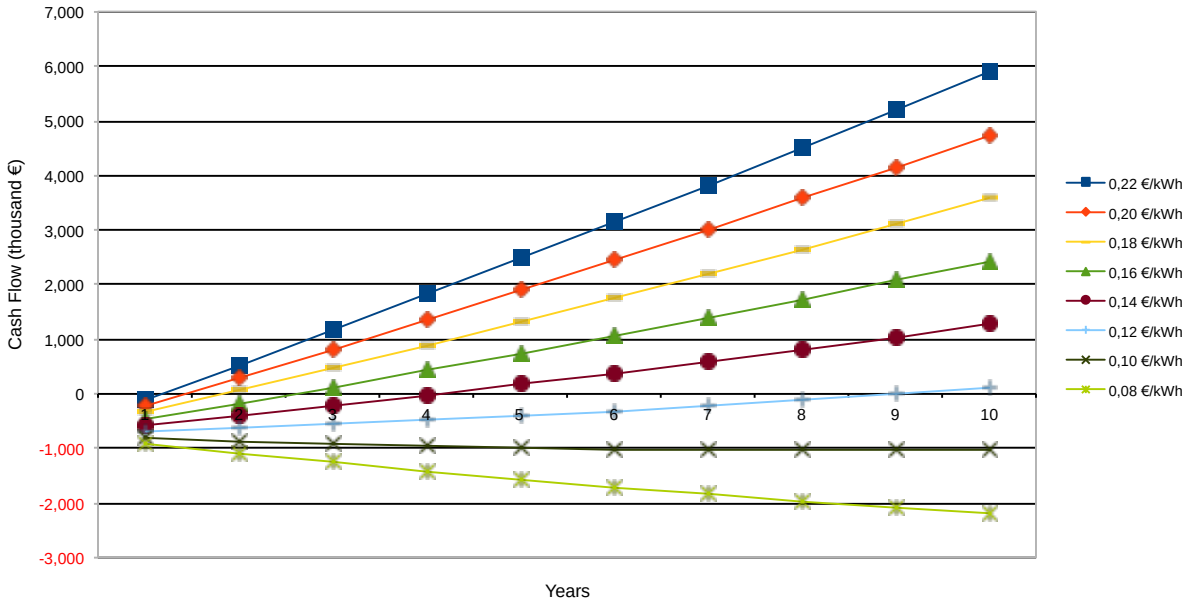
Finantskulu 0.10 €/Nm3

BIOGAS use: 1) **CHP NOT FEASIBLE** WITHOUT SUBSIDY

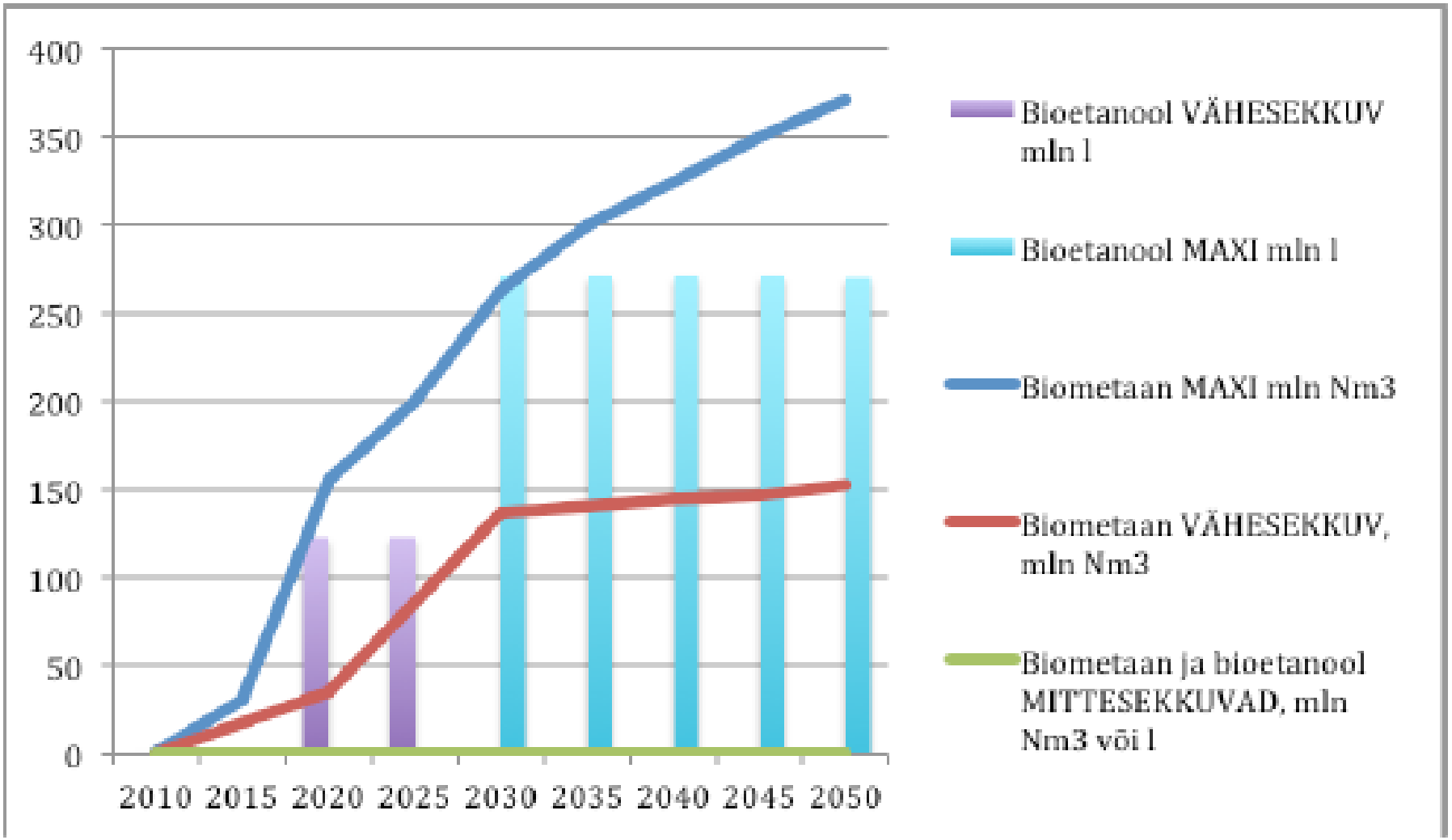


THE POTENTIAL OF HEAT AND POWER IS 10-15% FROM FINAL ENERGY CONSUMPTION

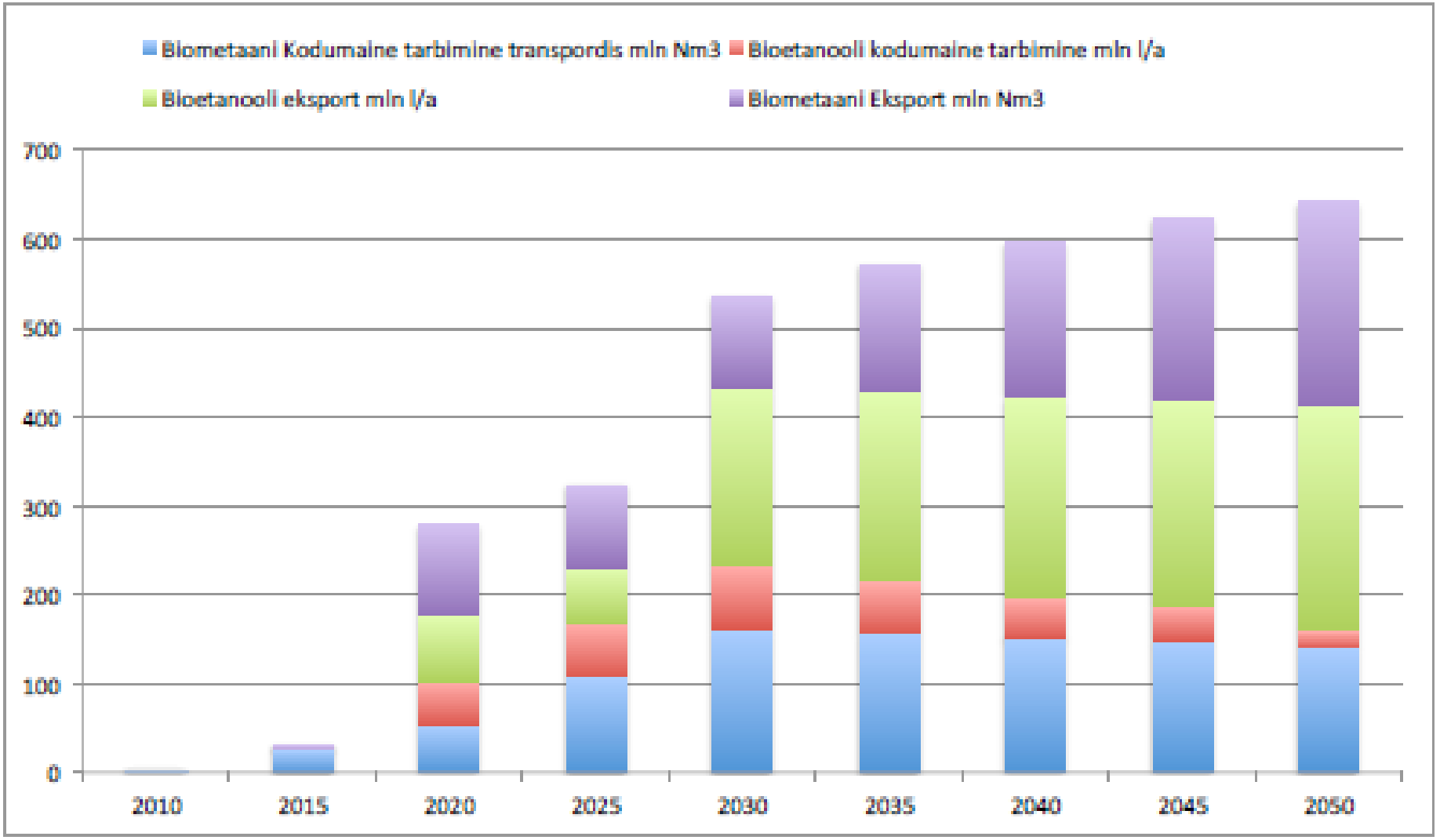
RENEWABLE ELECTRICITY PREMIUM IS 5,3 €C/kWh, should BE 18 €c/kWh



Biomethane ja bioethanol potential



Half of biofuel potential to export



Ettepanek nr 1

	Kütteväärtus, MJ/Nm^3	Hind tanklas, km-ga, €/kg	Hind ilma käibemaksuta, €/kg	Soovitav hind lõpptarbijale €/kg, ilma km-ta, 2020	Vahe tänase seisuga €/kg
Biometaan	**36**	**1.26**	**1.05**	**0.85**	**-0.20**
Maagaas	**36**	**0.779**	**0.649**	**0.85**	**0.20**
erinevus	**0**	**0.481**	**0.401**	**0**	**0**

käibemaksuta 0.85 €/kg, koos km-ga 1.08 €/l

- See on diiselkütusest tanklas **22 % soodsam.**
- **Bensiiniautode puhul, kus liitri bensiiniga saab sõita sama vahemaa nagu 1 Nm^3 biometaaniga, on**
- **biometaani hind lõpptarbijale 30% soodsam bensiinist**

- **Maksustades import fossiilkütust toetatakse kodumaist taastuvkütust!**

Teiste riikide kogemused biometaani tootmise käivitamiseks sh toetused ja biometaani hinnakomponendid

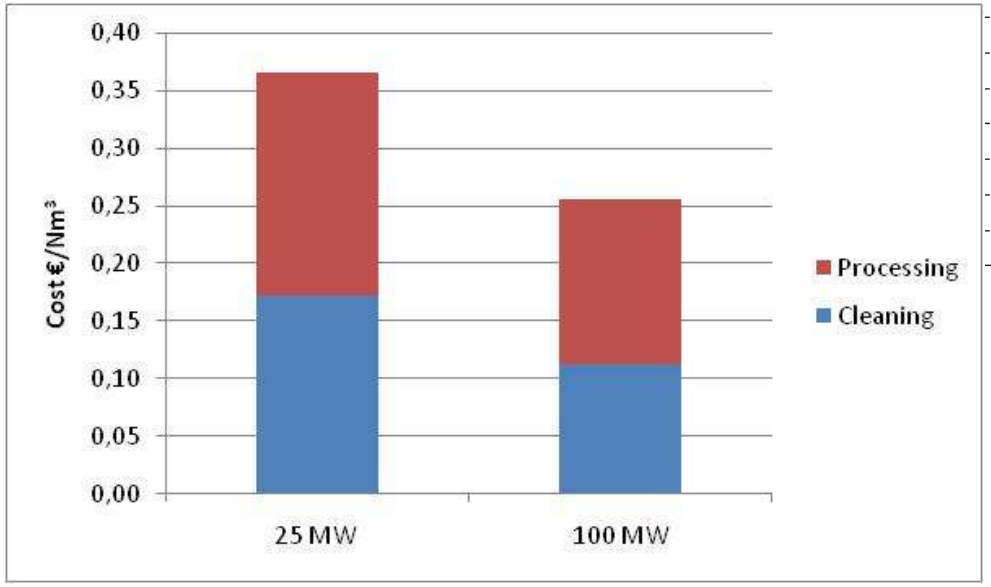
- UK
- Saksamaa
- Rootsi
- Taani
- Prantsusmaa

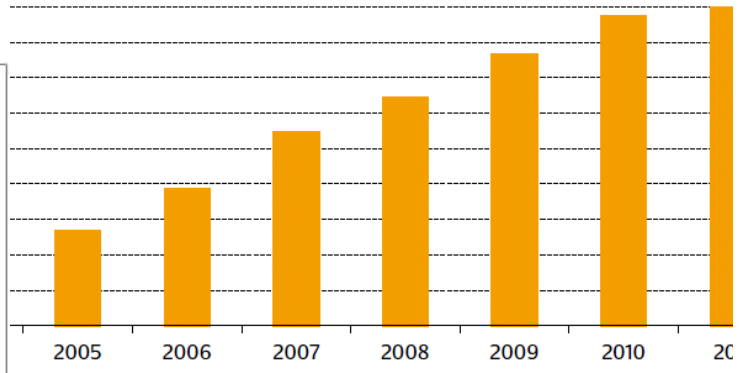
Saksamaal on 85 000 metaankütusega sõitvat sõidukit 0,2% sõidukite koguarvust 50 miljonist

Status of CNG and biomethane: vehicles.

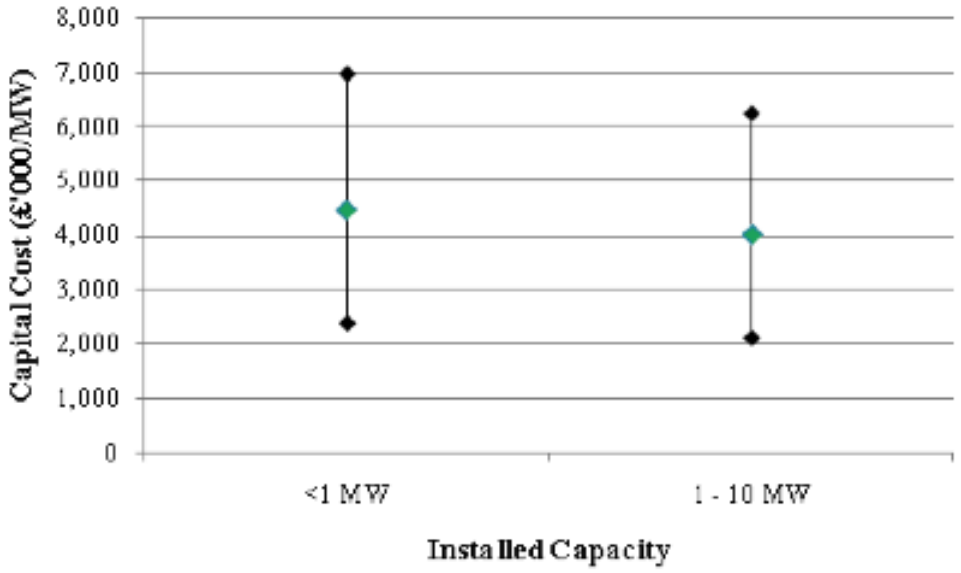
- For many years, steady growth – but at a low level.
- Currently only 85,000 NGVs - 0.2 % of German vehicle fleet (approx. 50 million).
- Mix of cars to commercial vehicles is 80:20.

Cost estimates of gas upgrading



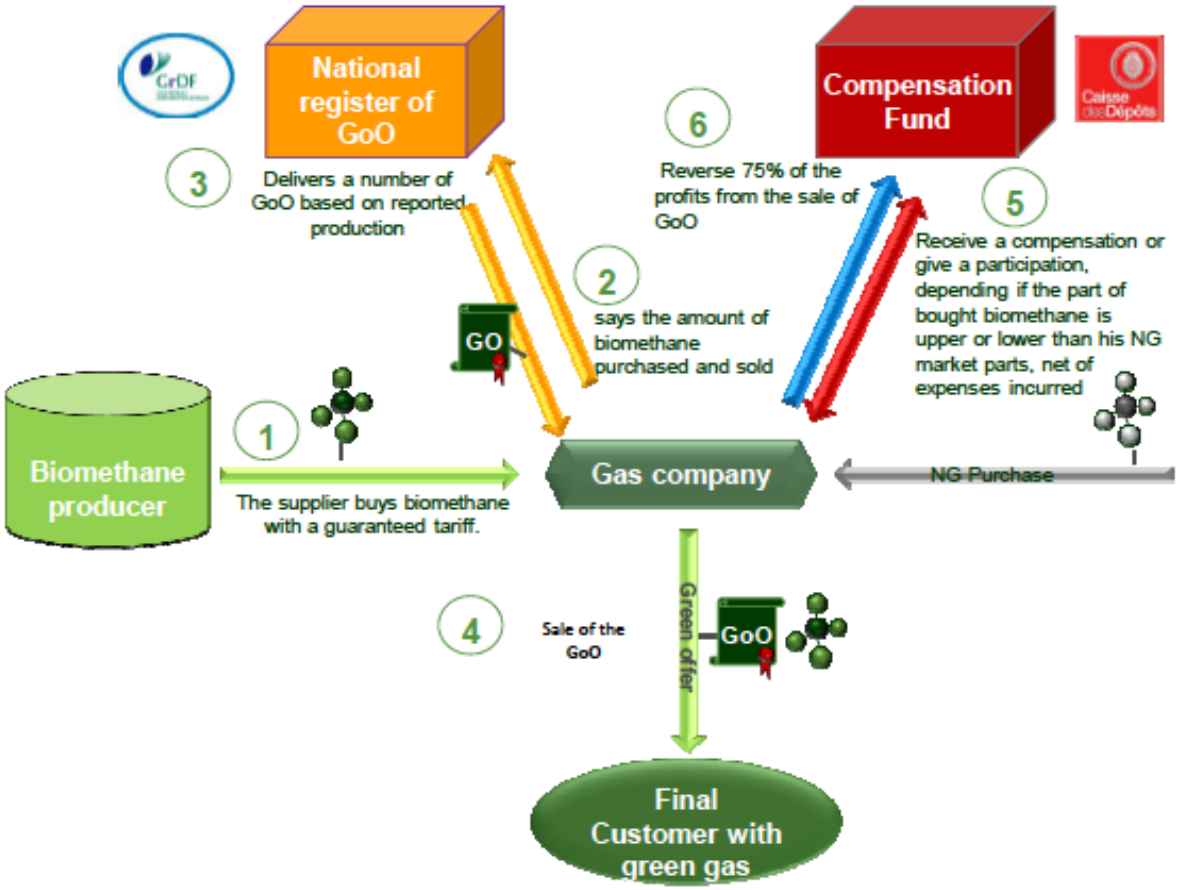


Capital Costs – AD in the UK



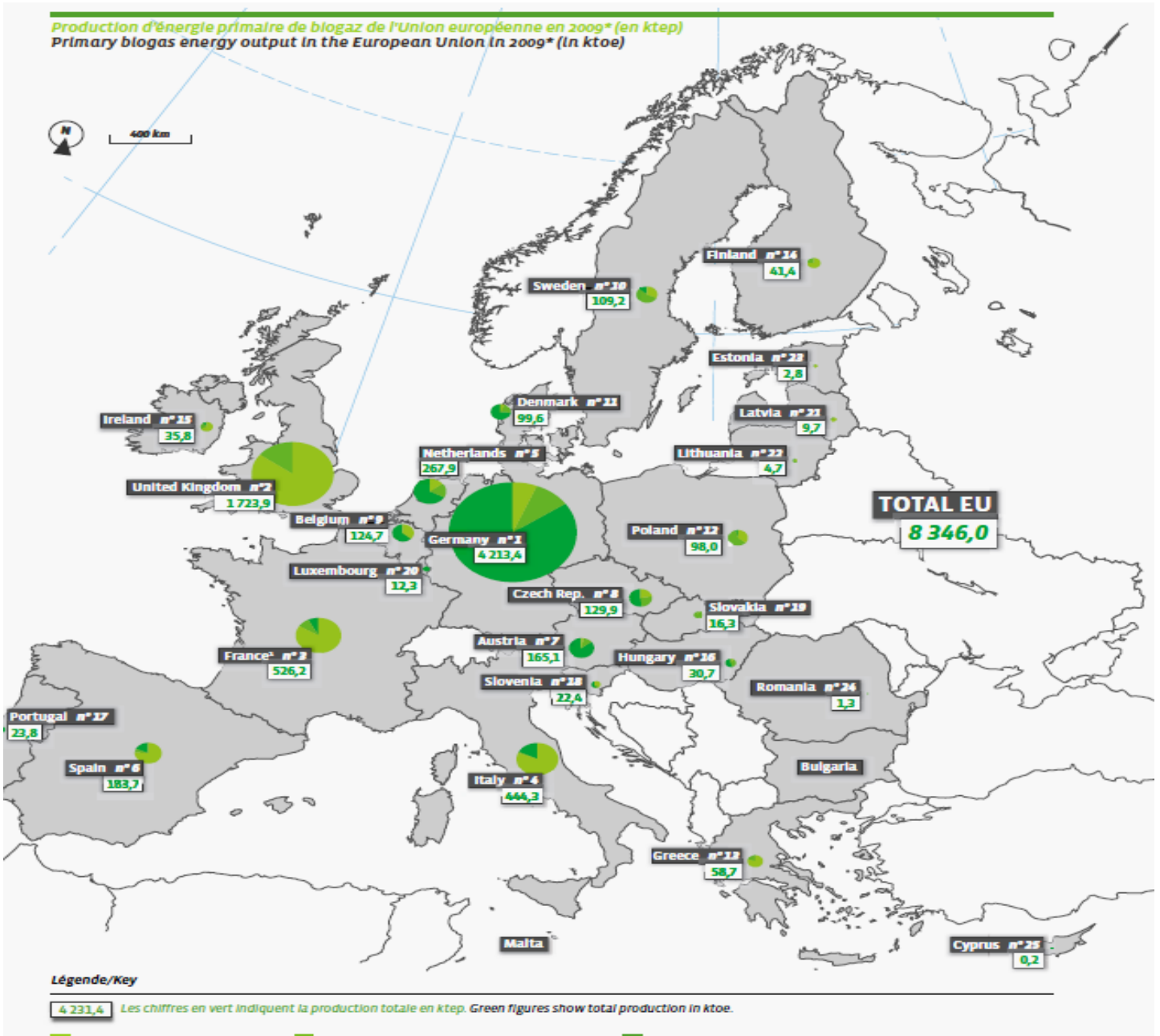
Capital Cost Item	%
Pre-development	8%
Construction	82%
Grid Connection	6%
Other Infrastructure	4%

The French GoO Mechanism



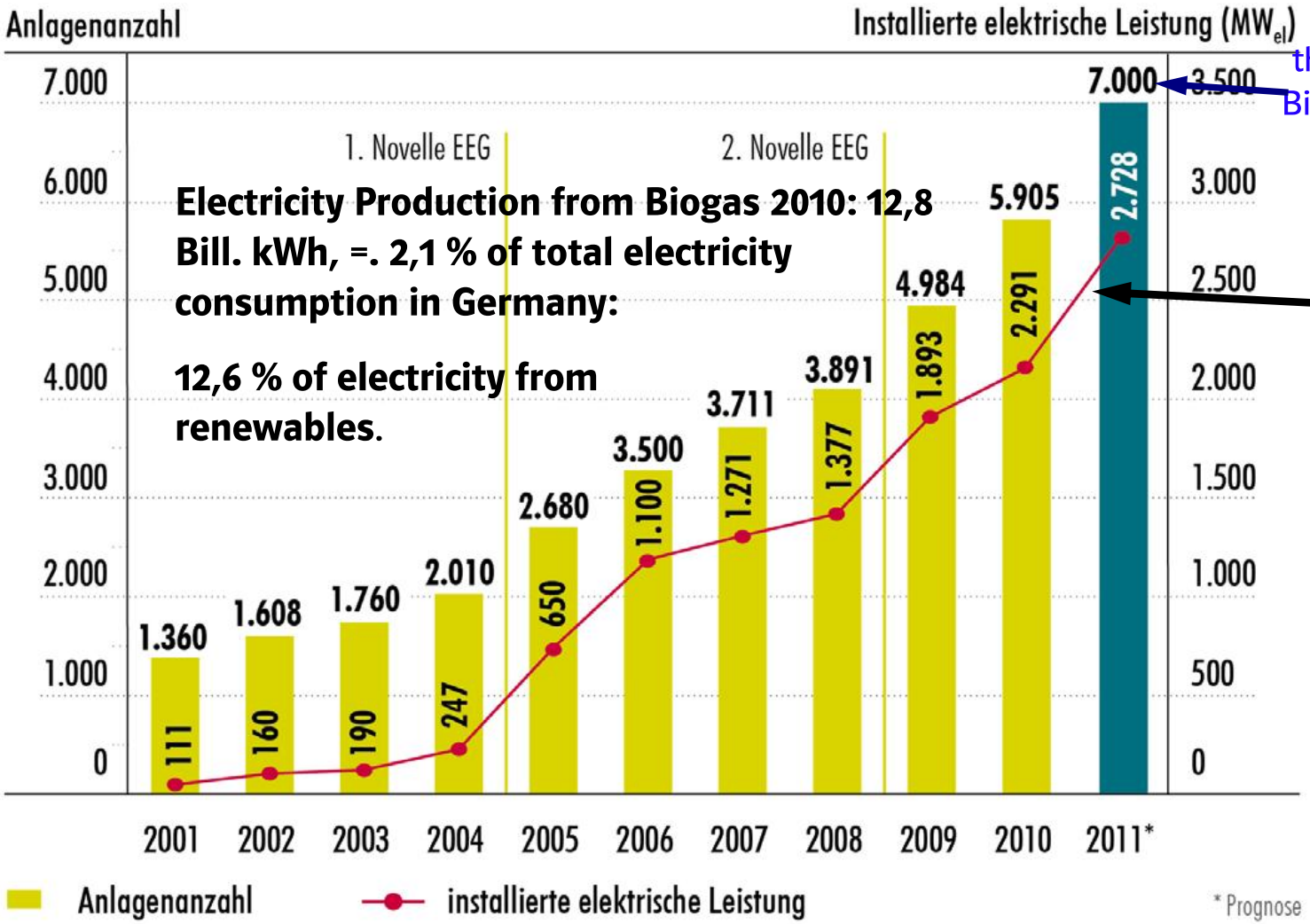
- The GoO life involves multiple actors
- The GoO aims to certify the biomethane origin when biomethane is produced
- It also enables to boost the gas renewable profession through a compensation fund
- However, the actual legislation don't exclude GoOs transfers or sales independent from the biomethane gas

Biogaasi tootmine Euroopas 2009, ktoe



Saksamaa edu taga on riiklik poliitika ja toetused →
Toetused elektritootmisele vähenevad ja biometaanile **suurenevad**

Case Study Germany: Development of Biogas Production



thereof about 100 Biomethane Plants = 1,4%

thereof about 250 MWel = 9% Biomethane

Biogaasi puhastamine biometaaniks Saksamaal

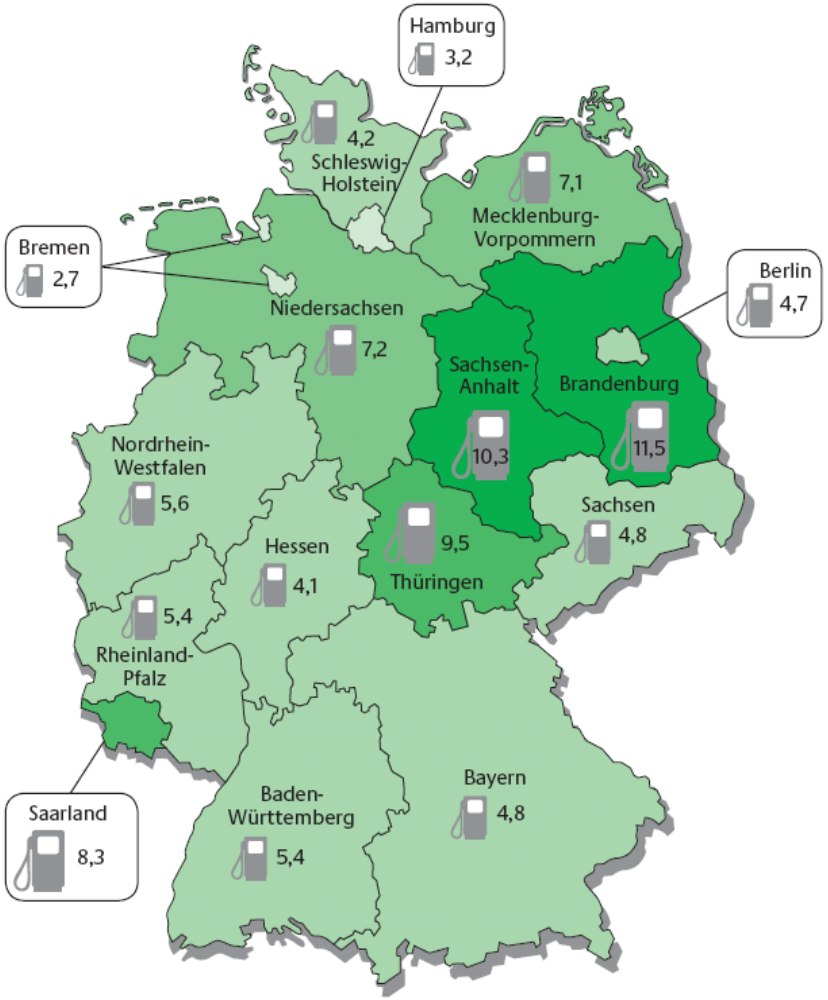
- 2006: First 2 upgrading plants in operation
- August 2011: 57 upgrading plants in operation
- Upgrading technologies (August 2011):
  - Water scrubber (12)
  - Pressure swing adsorption (15)
  - Chemical / Amine scrubber (25)
  - Membrane technology (1)
  - Unknown (4)

Metaankütuste tanklaid on 860 nende osakaal tanklate koguarvust 14’500 on 2,7-11,5%, keskmiselt 90 sõidukit tankla kohta

Status of CNG and biomethane: filling stations.

- Approx. 860 CNG-stations (14,500 in total)
- Capacity utilisation very low (approx. 90 vehicles per filling station)
- Only two natural gas stations directly on motorways („Autobahn“)

Proportion of natural gas stations in fuel station network:



Biogas Map

= 24 Farm-Fed plants

+ c.54 plants with planning consent

Last updated 04 November 2011

Plus 146 existing sewage treatment facilities

= 44 Waste-Fed plants

+ c.64 plants with planning consent

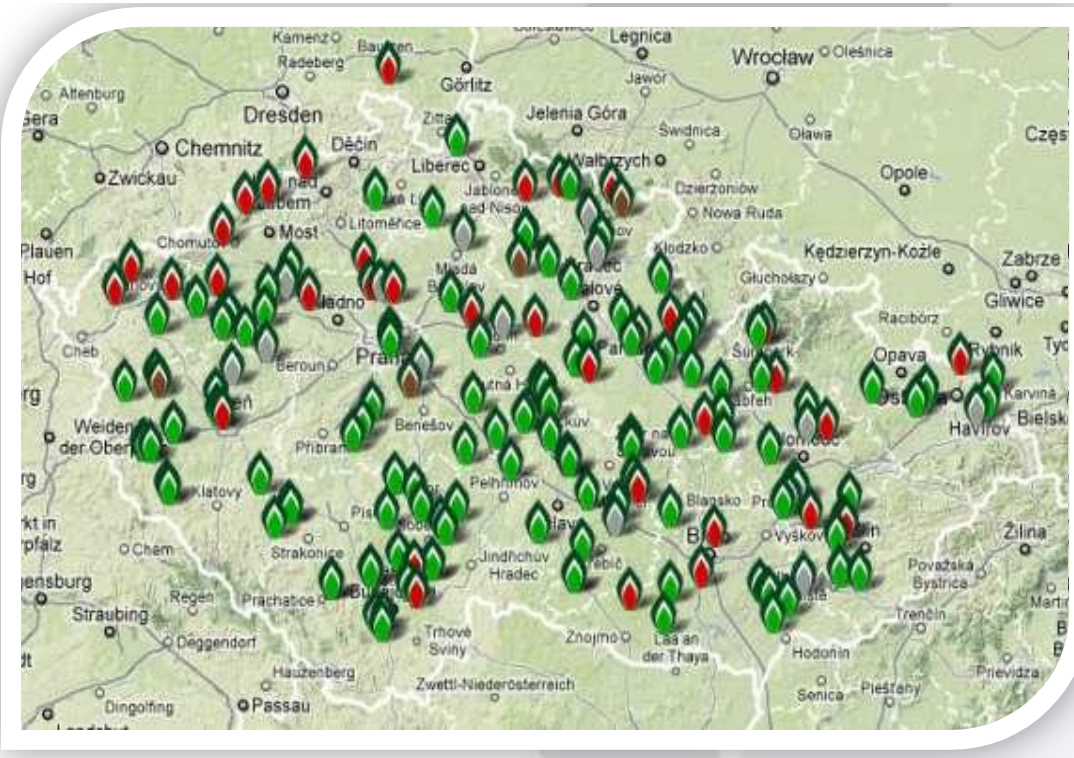
Last updated 04 November 2011

www.biogas-info.co.uk

Tšehhi oli 10 aastat tagasi samas seisus, kus täna on Eesti

Biogas in CZ due to	30. 6. 2012	← Tšehhi seis tänavu juunis
No. of biogas plants:	342	← biogaasijaamade arv
Installed power:	244.461 MW	← intalleeritud nimivõimsus
Electricity production per actual year:	639.6 GWh	← muundatud elektri kogus
Share of biogas on **RES:**	**13.7%**	**← biogaasi osakaal TE-s**

- interactive map on CZBA website – showing basic BGP parameters
- http://www.czba.cz/index.php?art=stanice

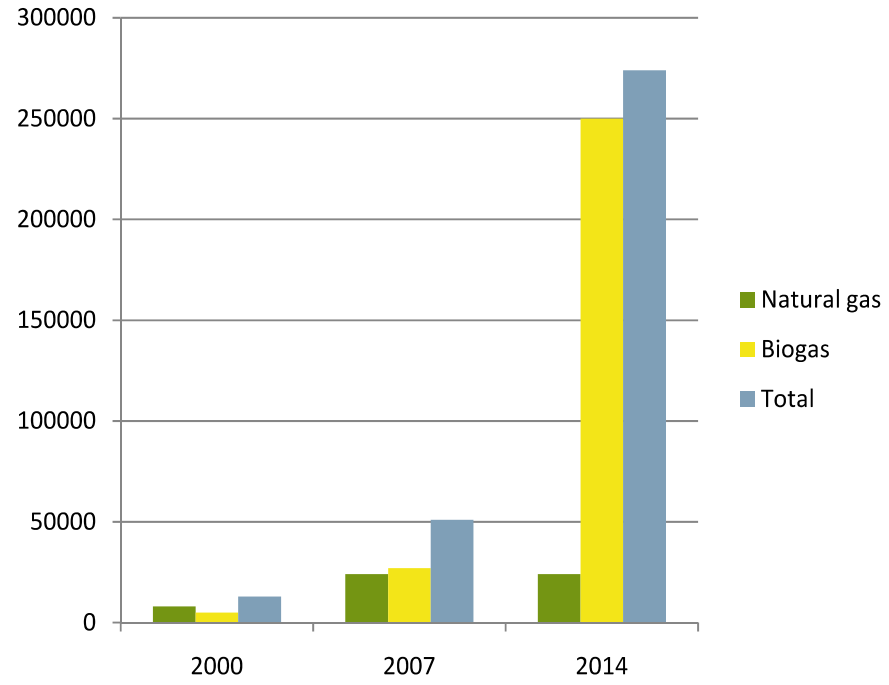


ROOTSI ON BIOMETAANI KASUTAMISEL TRANSPORDIS ESIMESTE HULGAS EUROOPAS

Biogas as vehicle fuel set to boom in Sweden

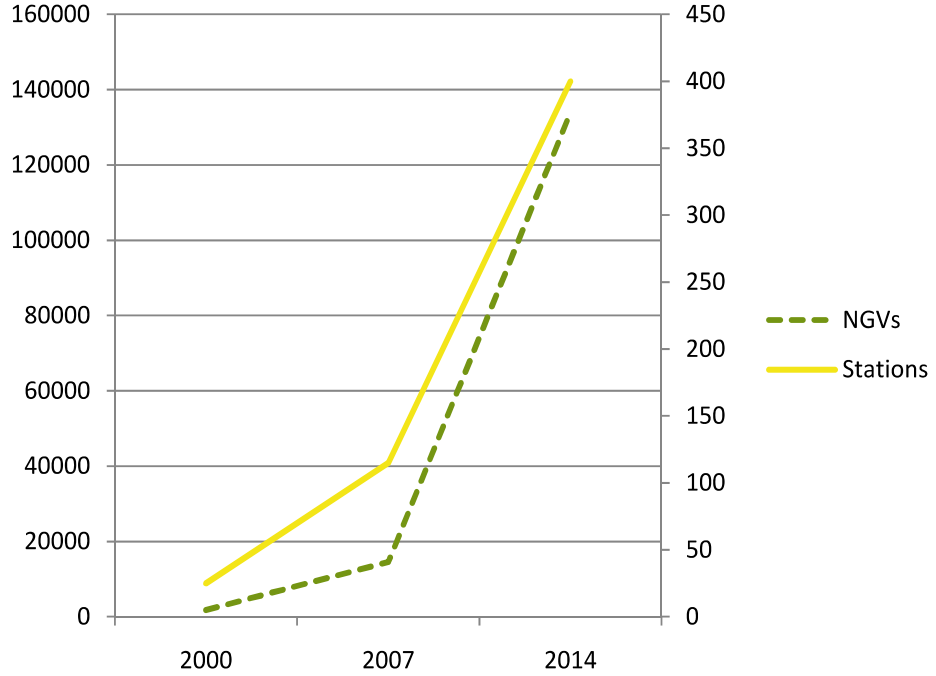
Supply of CNG and CBG for vehicles*

(thousand Nm^3)

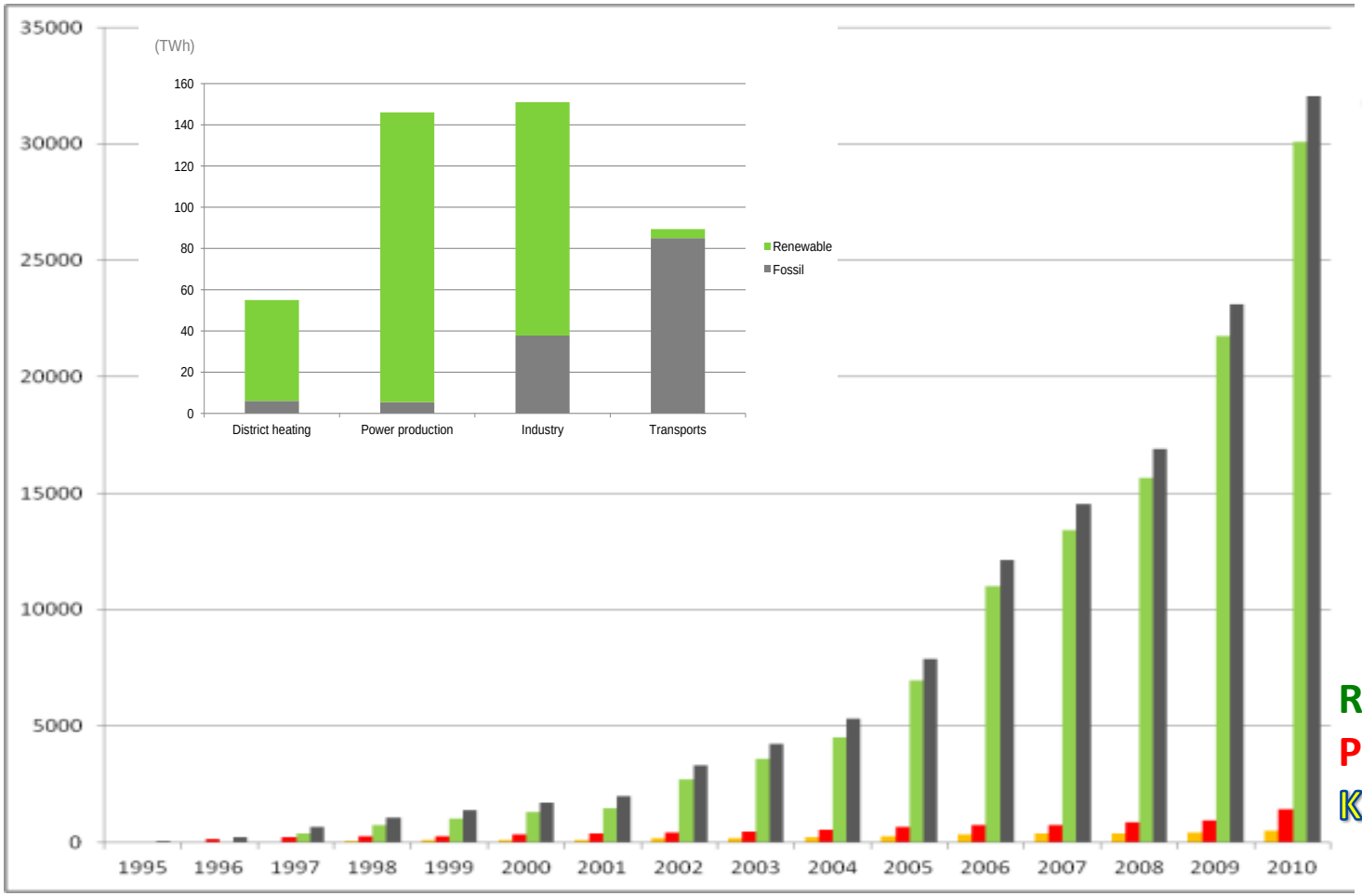


Number of NGVs and refuelling stations*

(number)



Rootsi metaansõidukite (NGV) arvu kasv ja jaotumine sõidukite lõikes

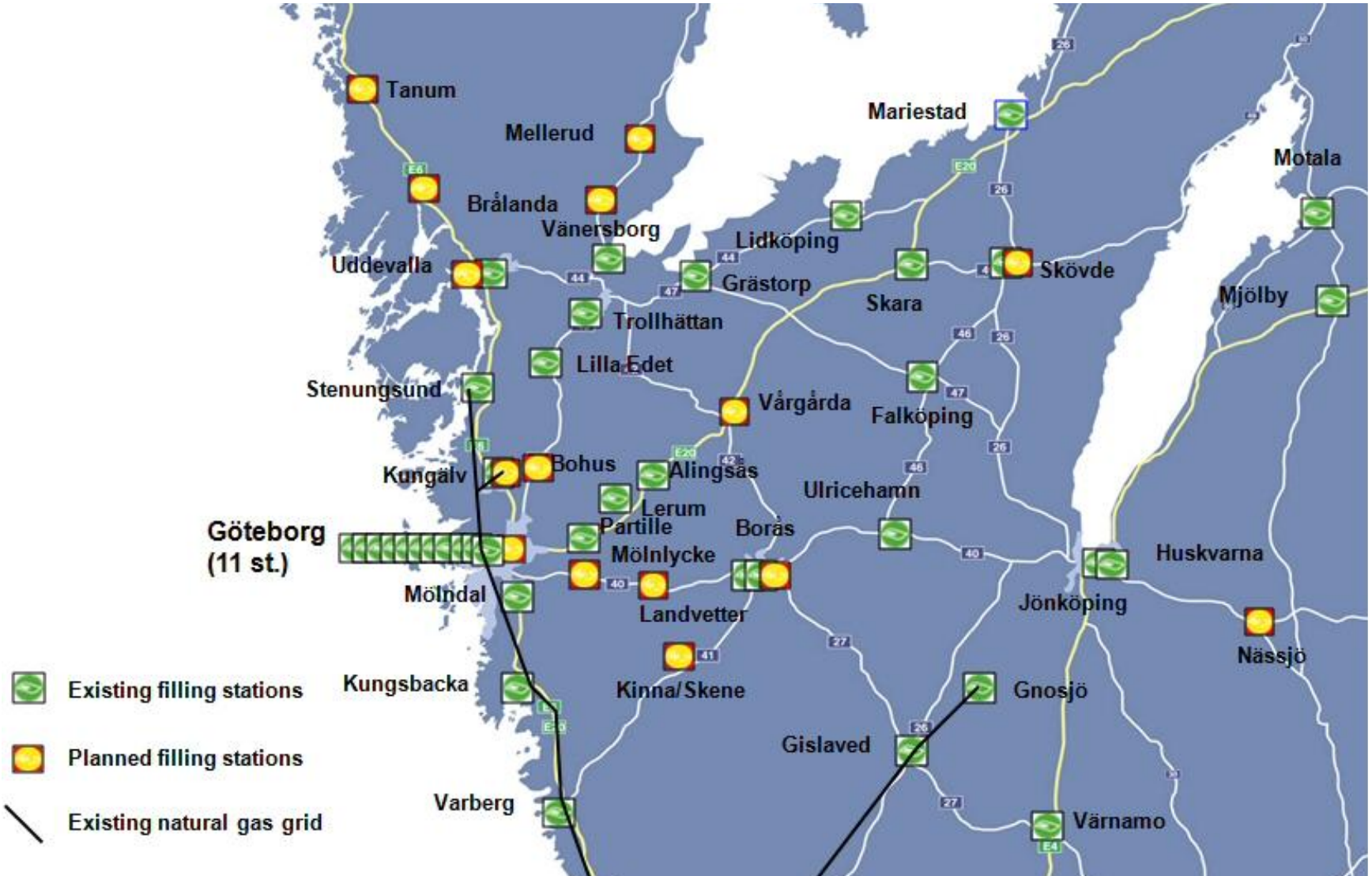


NGV kokku

Roheline – sõiduauto
Punane – buss
Kollane - veoauto

Allikas: FordonsGas, Rootsi

Rootsis on enamus biometaani tanklaid maagaasitorust eraldi (off-grid)



Companies working for the city – public transport (100 % biofuelled 2025)
– waste collection (100 % biofuelled 2010)
– taxis driving for the public (100 % biofuelled by 2009)

Impact of a 20% biogas as vehicle fuel by 2020 for Sweden

- 60 000 new jobs
- 460 M US$ consumer savings
- 27 840 000 ton carbon credits
- Utilize 10% of our agriculture area

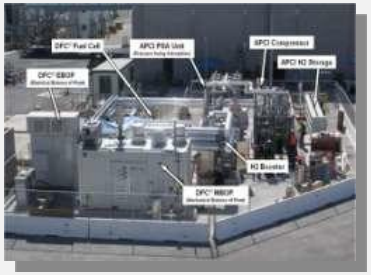
Technology Validation—Tri-Generation

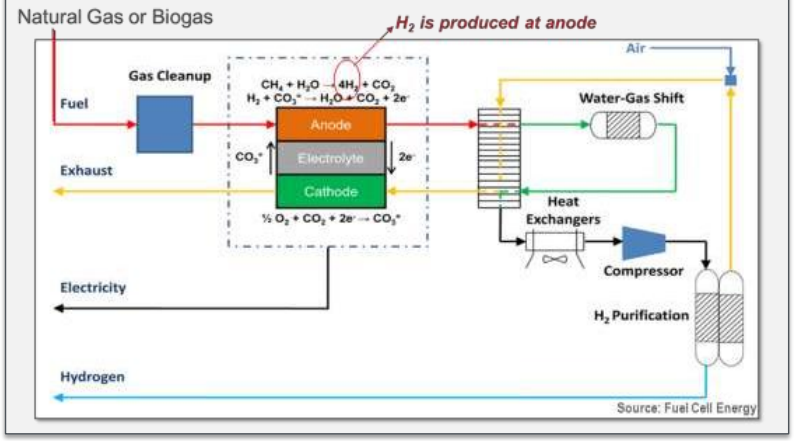
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

"Energy Department Applauds World's First Fuel Cell and Hydrogen Energy Station in Orange County"

Demonstrated world's first Tri-generation station (CHHP with 54% efficiency)

-Anaerobic digestion of municipal wastewater-





Fountain Valley demonstration

- ~250 kW of electricity
- ~100 kg/day hydrogen capacity (350 and 700 bar), enough to fuel 25 to 50 vehicles.
- 47% LHV electrical efficiency (>80% LHV overall efficiency)

Tänan!

BIOMETAANIGA TASUB TEGELEDA JA SELLE TOOTMIST TOETADA! TÄNA ON SEE KA RIIGI PRIORITEET – TOETUSED JÄRGMISEL EL EELARVEPERIOODIL 2014-2020

www.eestibiogaas.ee
www.monusminek.ee
www.gashighway.net