

Framework, potential and state of the art of biogas technology in the Ukraine

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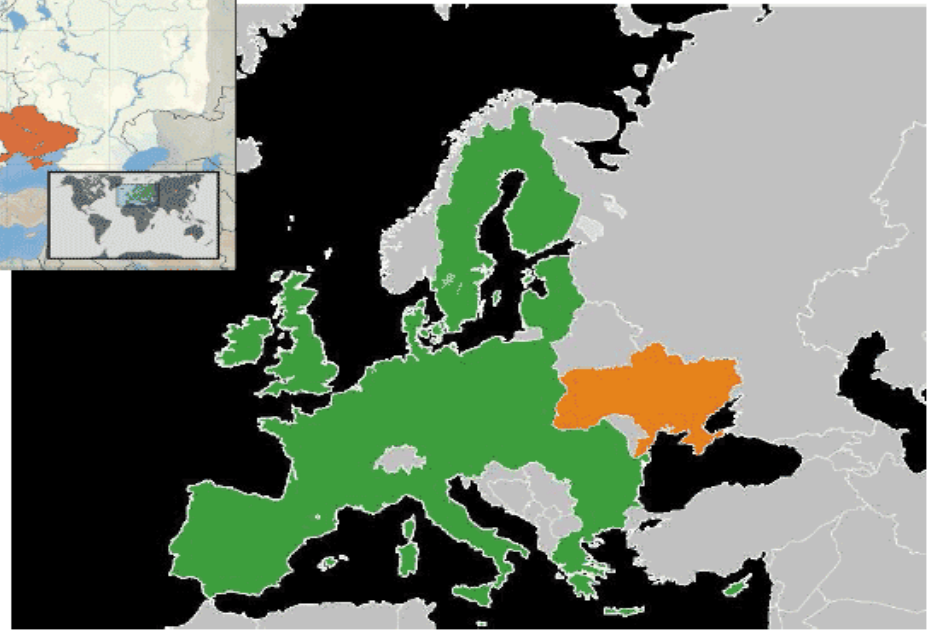
SEC Biomass
Kiev, Ukraine

14 October 2011
Krakow

Presentation structure

- Ukraine – general information
- Energy resources / Natural gas market
- Biogas potential – current and future
- Existing projects in agriculture
- Other biogas (LFG, WWTP, distilleries)
- Market conditions
 - Green tariff
 - Kyoto protocol
 - Players in the market
- Problems and prospects

Ukraine – general information



- Population total – 46 mill
- Population urban – 31 mill
- Population density – 76 inh./km²
(from 45 till 180 in Donetsk region)
- Area – 60.37 mill ha
- Total arable land – 27.1 mill ha
- Free arable land – 3.9 mill ha

Ukraine – general information

Agriculture - products:

grain, sugar beets, sunflower seeds, vegetables; beef, milk, rape seed

GDP - real growth rate:

-14.1% (2009 est.)

2.1% (2008 est.)

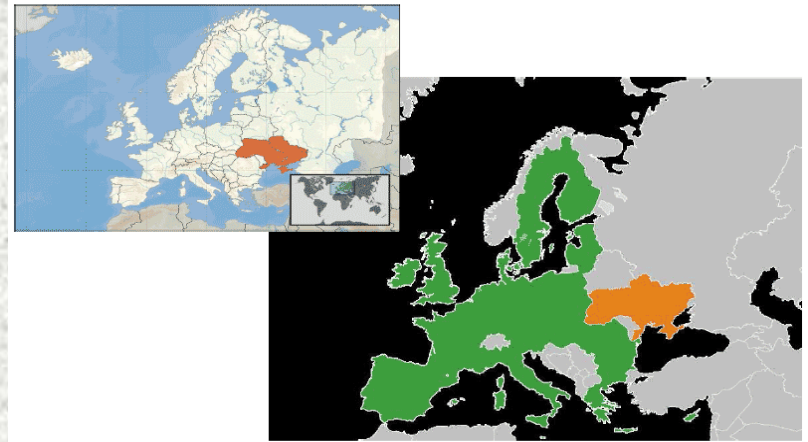
7.9% (2007 est.)

GDP - per capita (PPP):

\$6,400 (2009 est.)

\$7,500 (2008 est.) \$7,200 (2007 est.)

note: data are in 2009 US dollars



The structure of energy resources consumption in Ukraine

	World	Ukraine	EU-15 Countries	USA
Natural gas	21%	39.5%	22%	24%
Oil	35%	11.8%	41%	28%
Coal	23%	28%	16%	23%
Uranium	7%	18%	15%	8%
RES	14%	2.7%	6%	7%

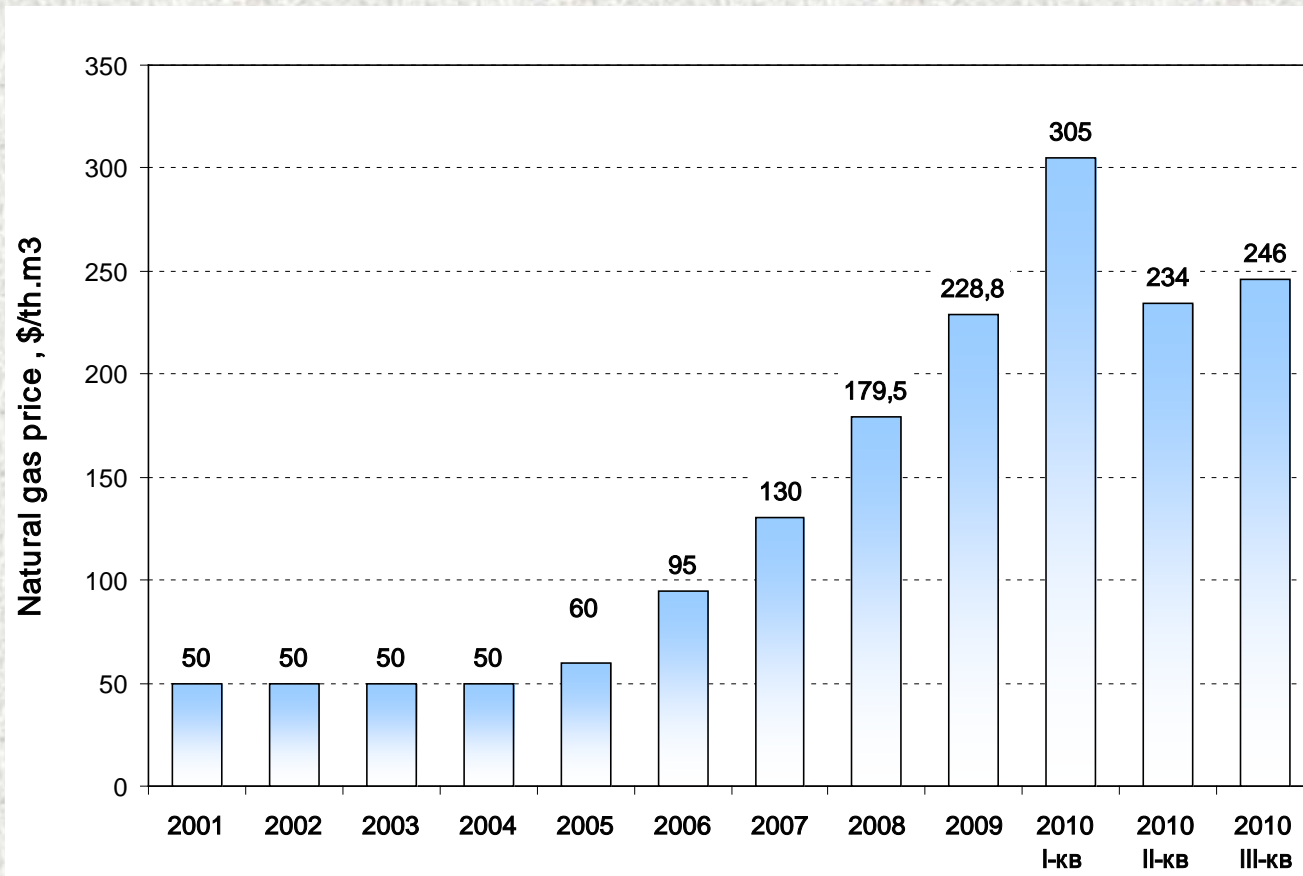
Unreasonably high part of natural gas in Ukraine's energy balance – approximately 2 times higher than in other countries

Total (bn. m3)	51.893
Production and process needs and coasts	5.443
Regional administration funds, including	28.64
- community and public sector	17.757
- district heating enterprises	10.109
- unbalance	0.097
- TAP of gas distribution enterprises	1.001
Industry, including	18.487
- metallurgy	5.239
- energy complex	4.999

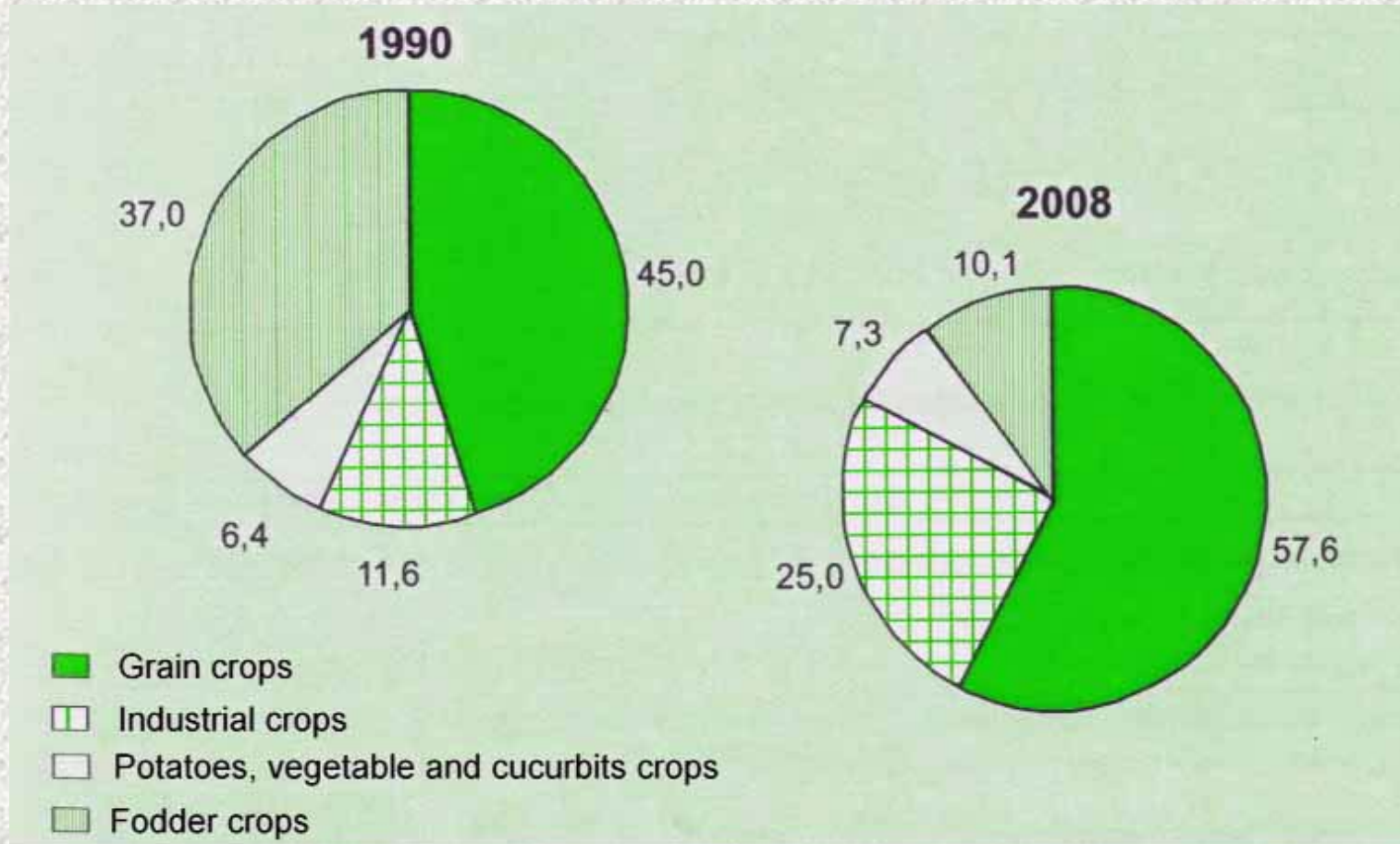
About 50% of natural gas uses for heat supply

* Data of Institute of Gas, NASU, Academician of NASU Karp I.N.

The price of imported natural gas at the Ukraine's boundary

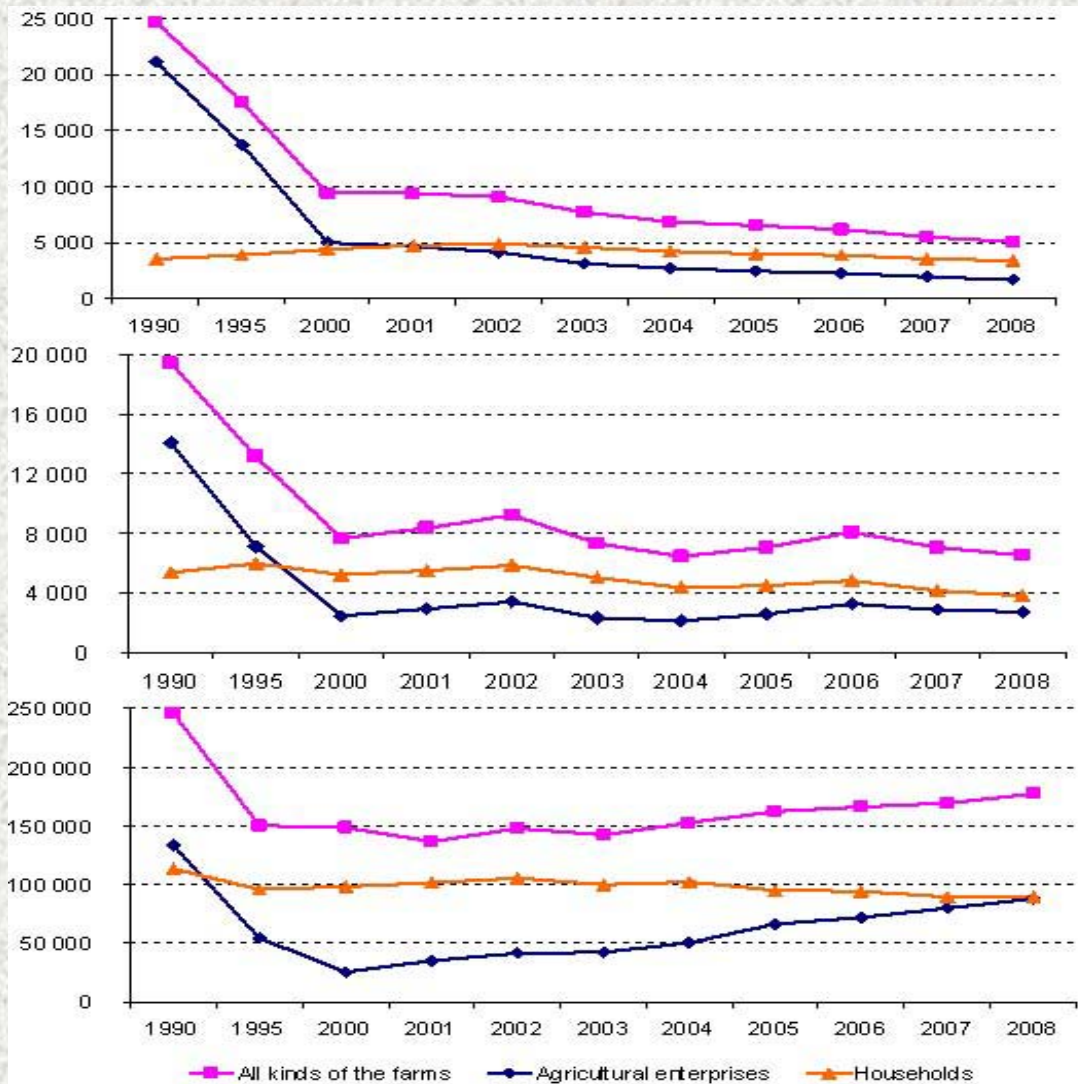


Structure of the sown area

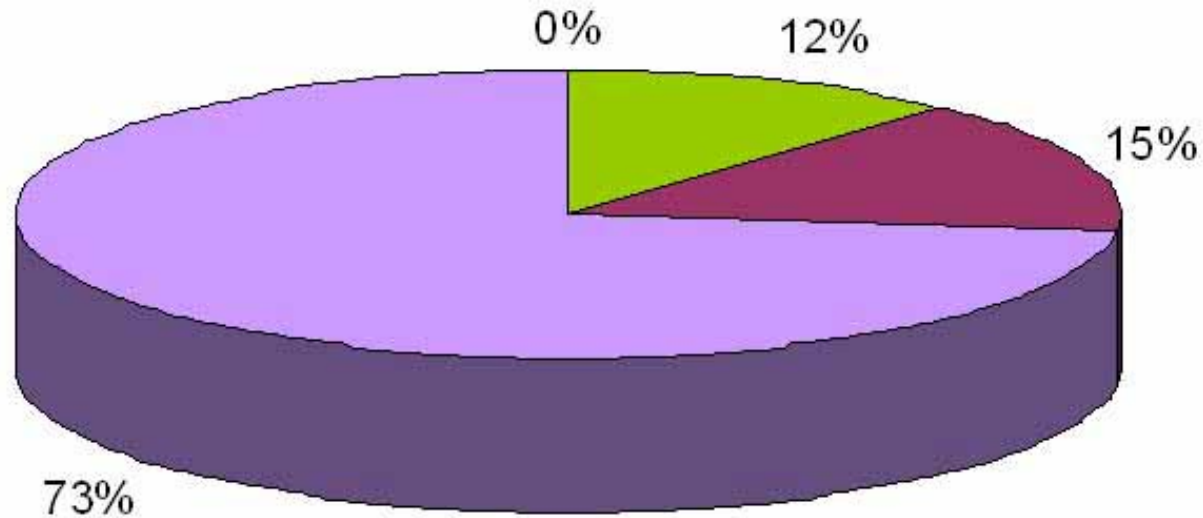


Change in the sown area structure under main agricultural crop

Change in animal population, ths. heads



Potential of biogas production based on waste in crop production, animal farming and food processing (2008)



- Crop/plant production
- Food processing
- Animal farming
- Energy plants

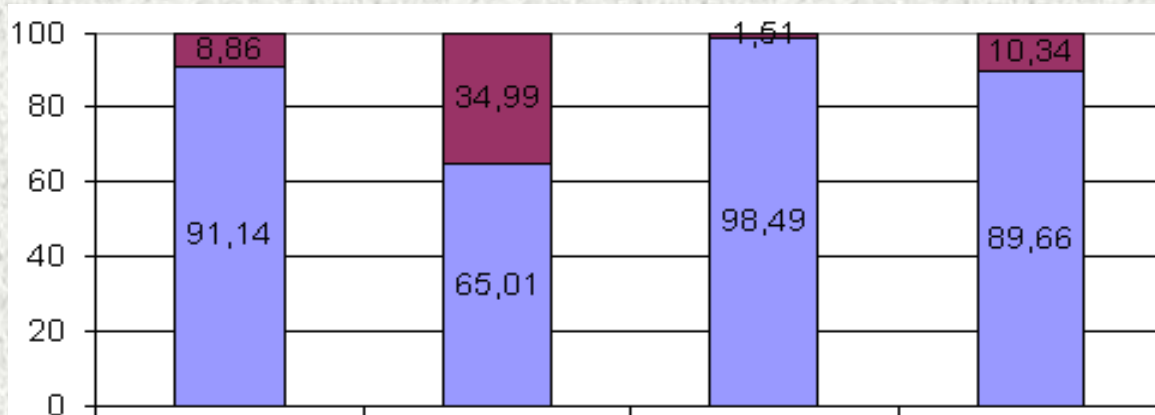
2 578 mill m³ CH₄ in total

Biogas plants construction potential in animal farming (2008)



Total

Number of units

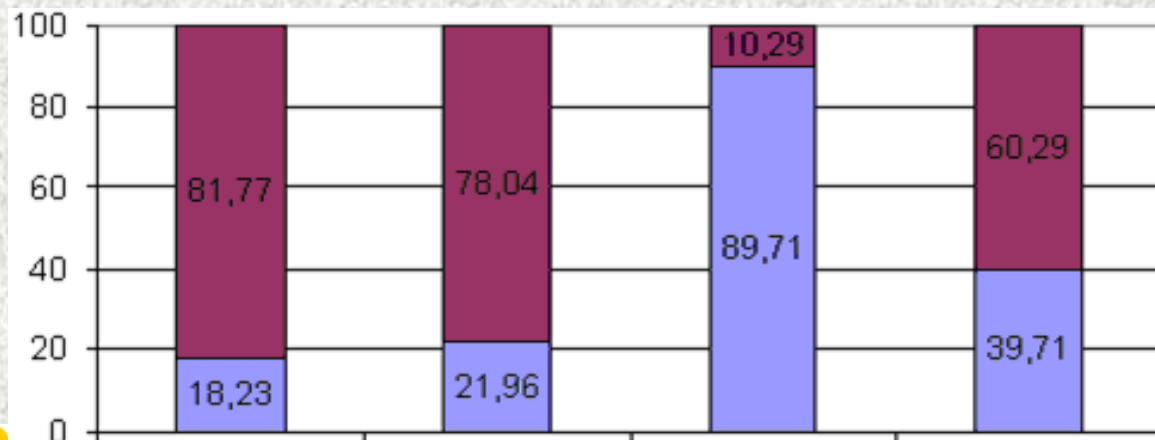


Digester volume < 200 m³

8715

Digester volume > 200 m³

2783



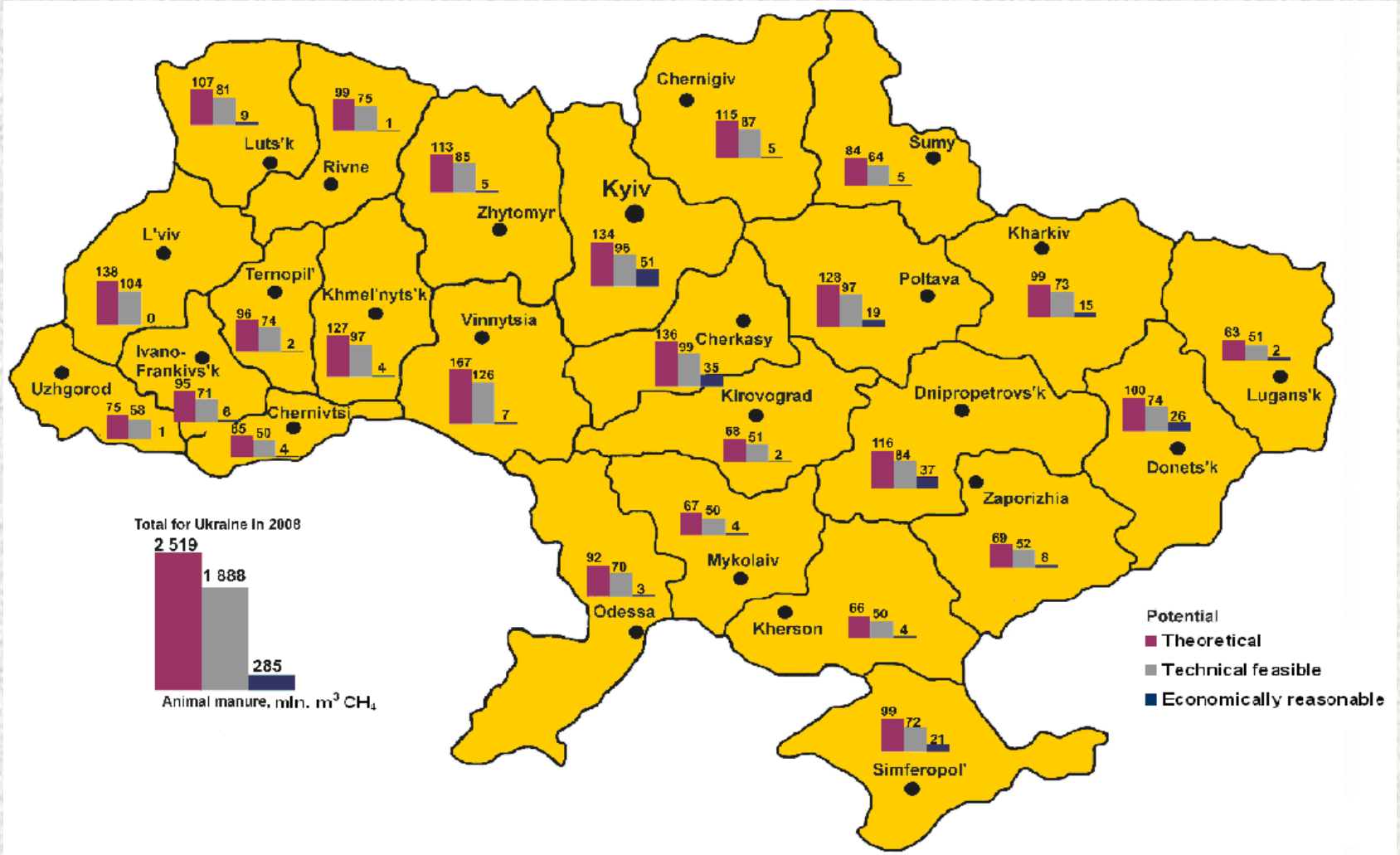
CHP capacity < 200 kW

11210

CHP capacity > 200 kW

288

Biogas production potential based on manure and poultry litter (2008) – regional distribution

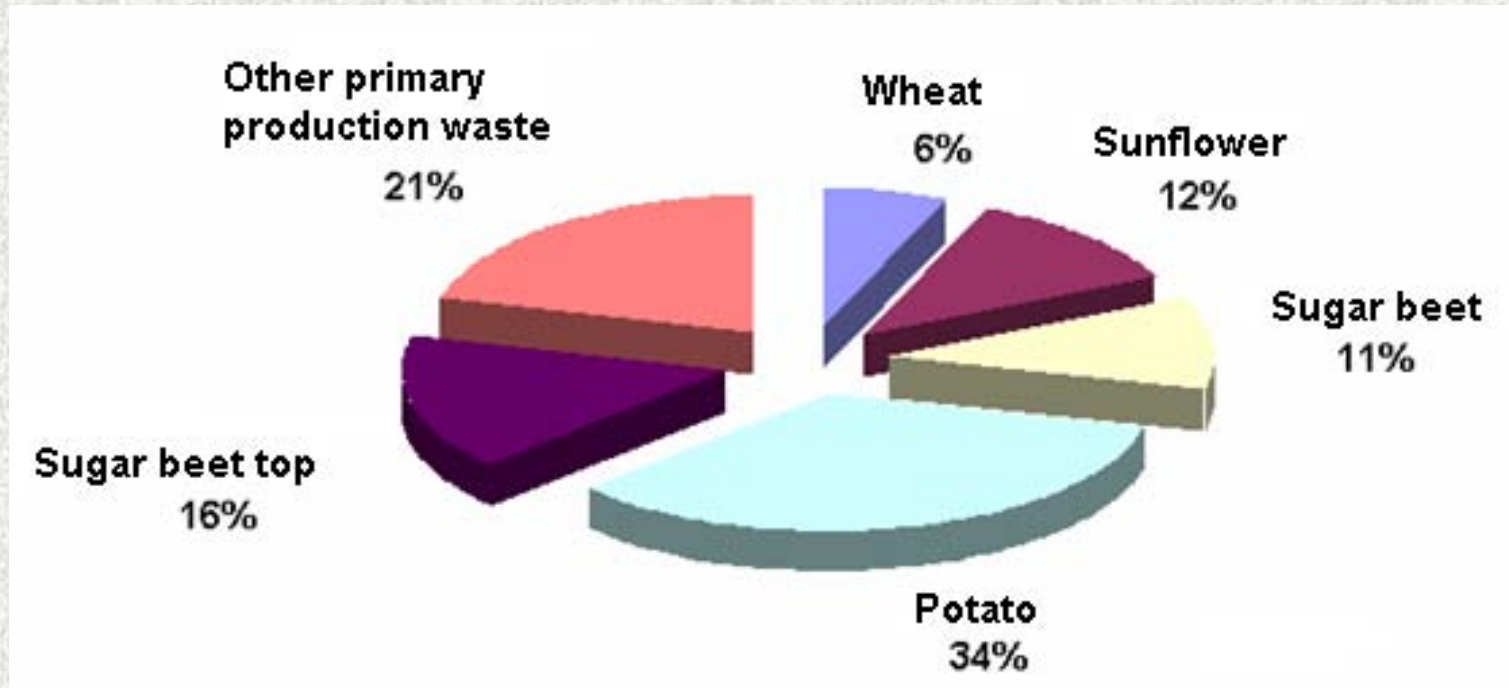


Potential of biogas market in Ukraine

Type	Market volume, biogas units	Total installed capacity, MW _{th} +MW _{el}	NG substitution bill. m ³ /an	GHG emission reduction, CO ₂ [*] , mill t/an	Investment, Mill Euro
Small biogas plants (BGP) with digesters 200...600 m ³	2253	152+96	0,23	0,55	462.9
Mid size BGP with digesters 600...3000 m ³	827	271+173	0,42	1,09	739.8
Big BGP with digesters more than 3000 m ³	4	6+4	0,01	0,01	17.1
CHP based on landfill gas (LFG)	60	90+60	0,13	2,4	30.0
Total	3144	519+333	0,79	4,05	1250.0

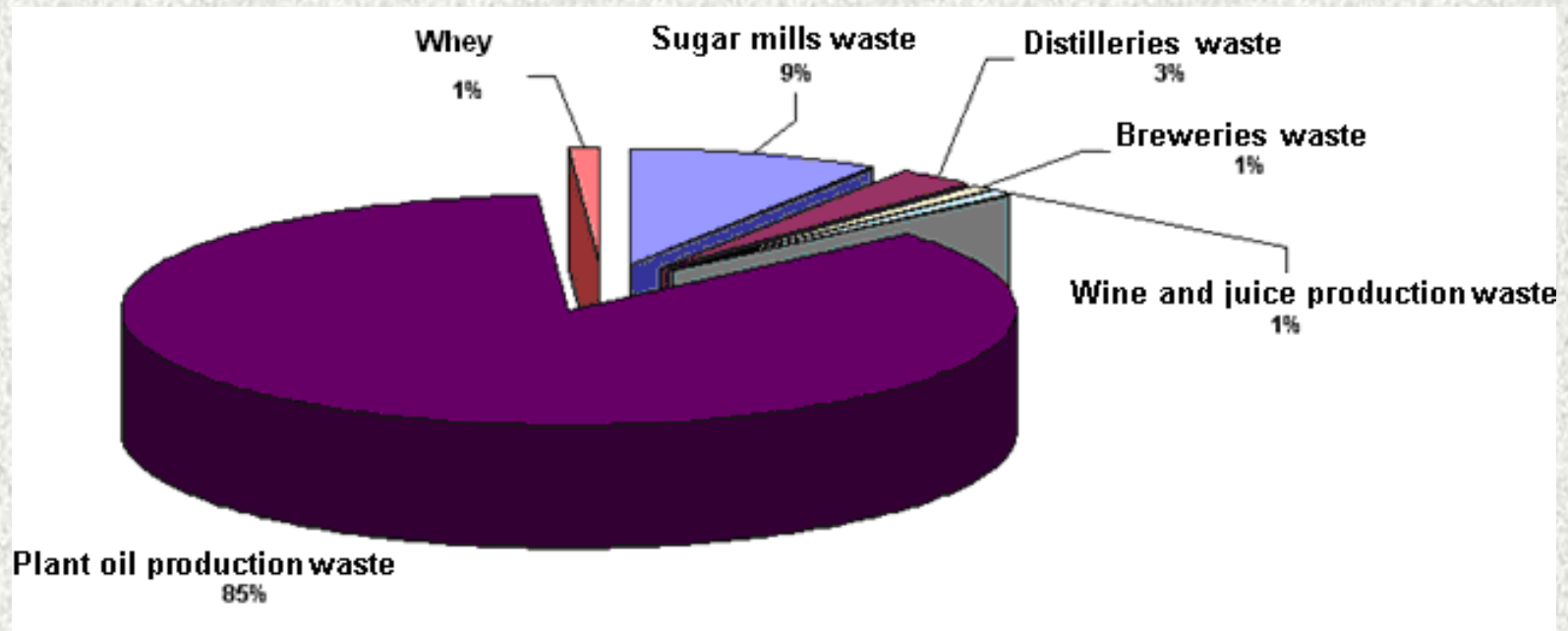
* In comparison with natural gas

Biogas production potential by crop/plant production

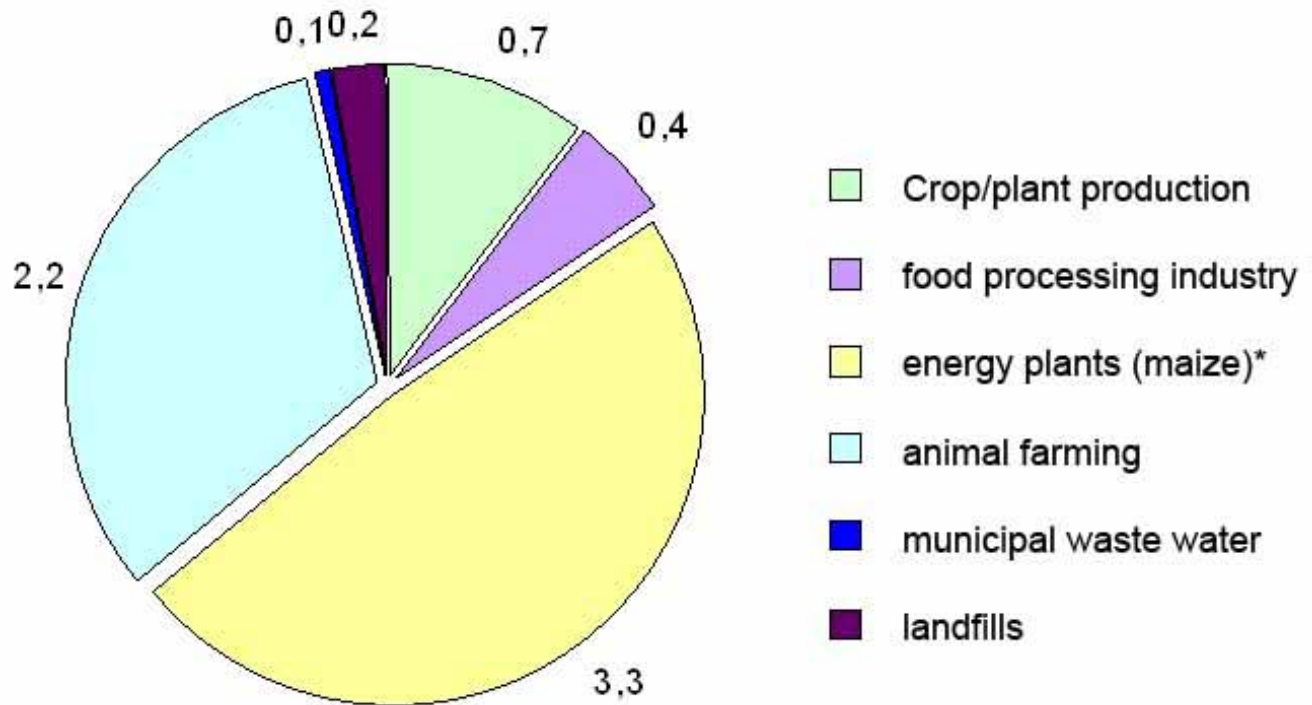


300 mill m³ CH₄ in total

Biogas production potential in food processing



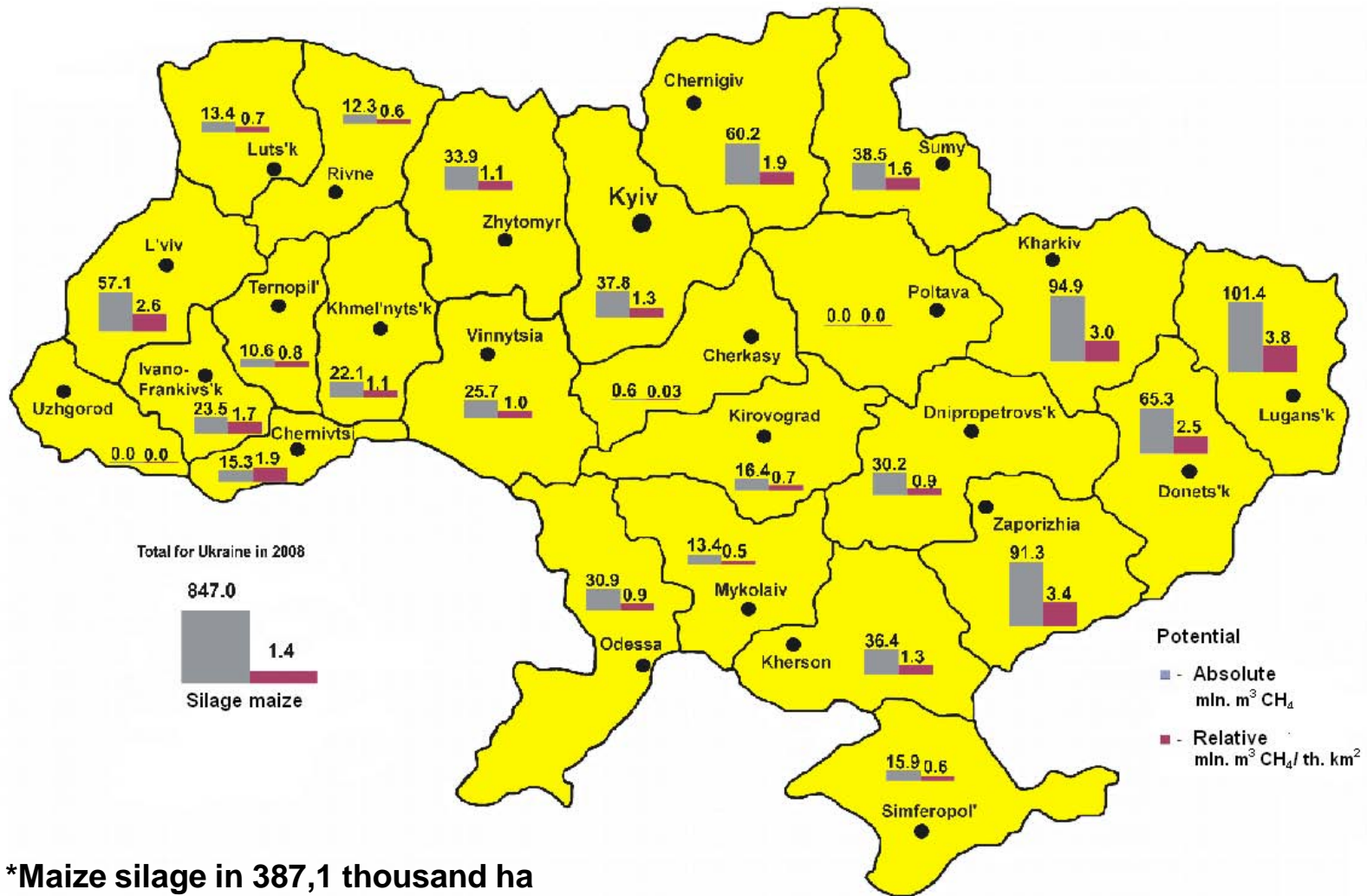
Total biogas production potential



* in case of use of 50% free agriculture land (1.86 mill hectares in 2008)

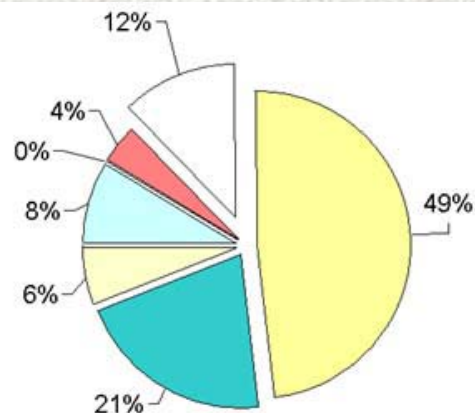
6.9 mill toe in total

Biogas production potential based on maize (2008) – regional distribution

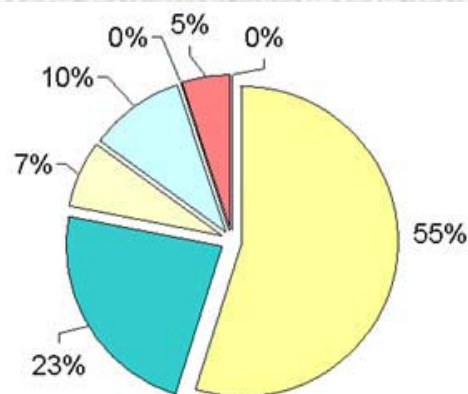


*Maize silage in 387,1 thousand ha (10% free land in 2008)

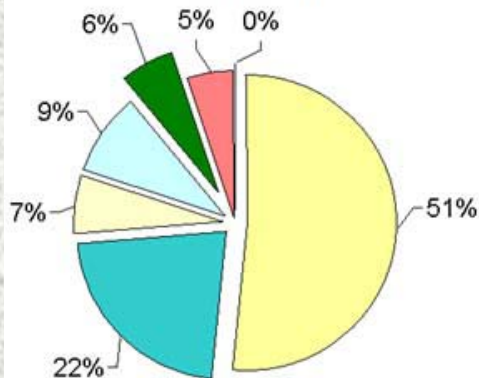
Different scenarios of agriculture land use



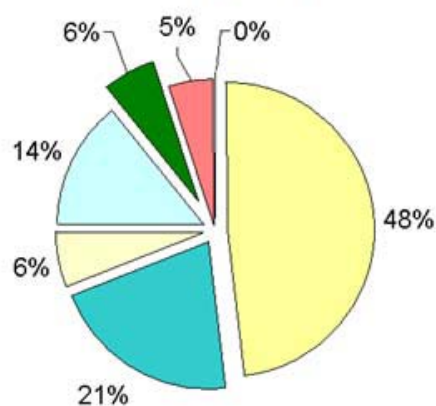
Base Scenario



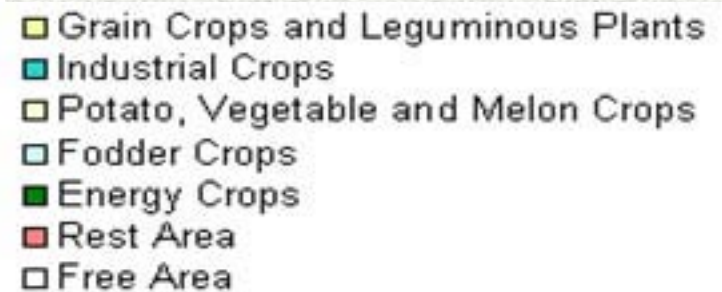
Scenario #1



Scenario #2, #3

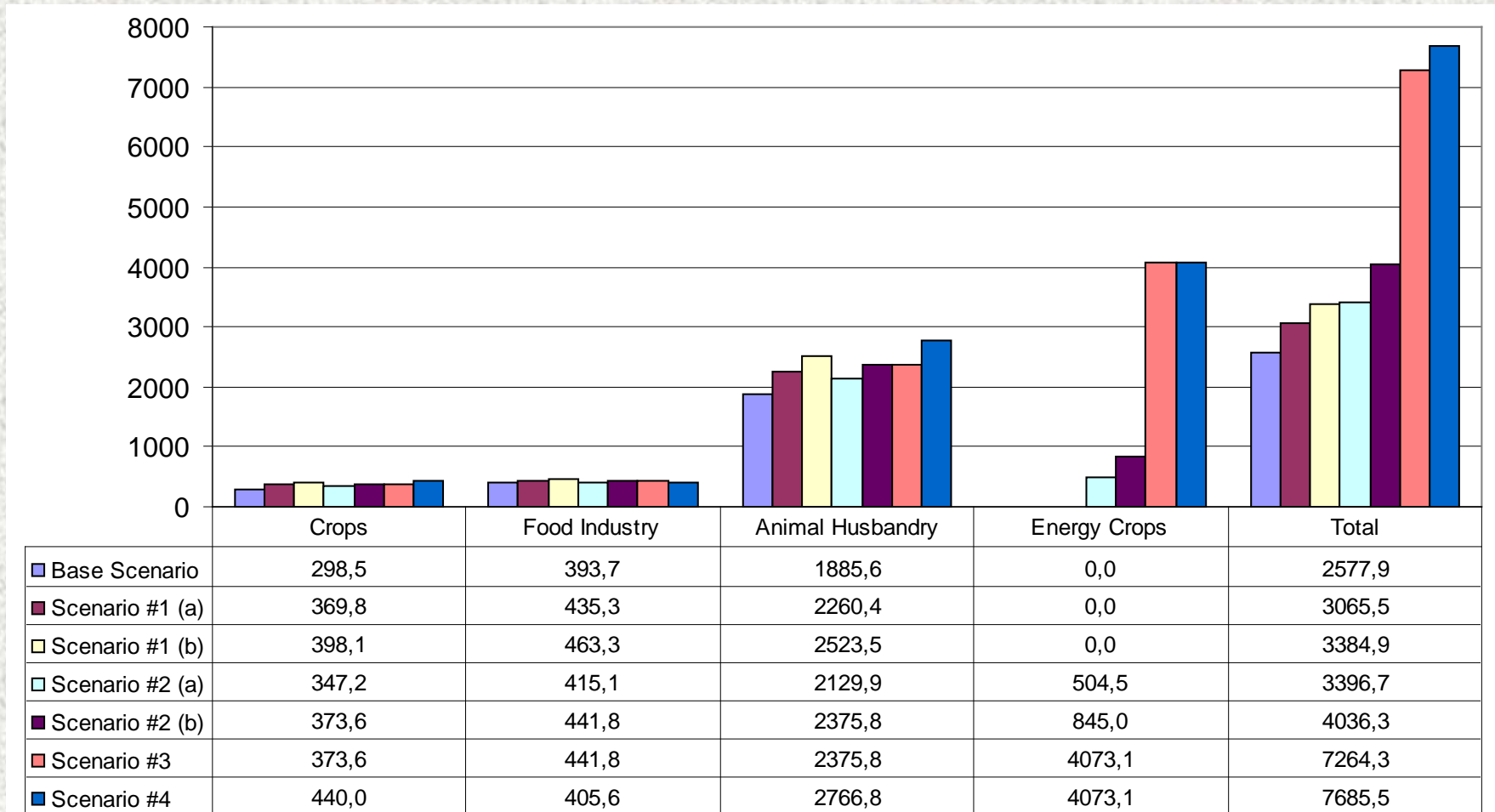


Scenario #4



Total area – 27.1 mill ha
Free area – 3.9 mill ha

Biogas generation potential for different scenarios, mill m³ of CH₄



Currently operated biogas plants



Location – Elenovka village,
Dnepropetrovsk region

Design – BTG (the Netherlands)
with SEC Biomass (Ukraine)

Start up in 2003

Daily load - 80 tones of big manure +
chicken feat waste

Two mezophilic digesters of 1000 m³
each

Biogas output – 3300 m³/day

Installed electrical capacity – 2x80 kW

Thermal capacity -2x160 kW

Power is used for own needs of pig
farm (15,000 heads)

Currently operated biogas plants



Start up in 2009

Daily load - 60 tones of manure (90% cattle + 10% pig) + fodder waste

One mezophilic digester of 1500 m³

Biogas output – 2150 m³/day

Installed electrical capacity – 250 kW

Thermal capacity -310 kW

Power is currently used for own needs of cattle (1000 heads). Sale to the grid by “green tariff” is planned

Location – Terezine village, Kiev region

Design –LIPP (Germany)

Currently operated biogas plants



Location – V.Krupil village,
Kiev region

Design – Zorg (Ukraine)

Start up in 2009

Daily load - 400 tones of cattle manuree

Three mezophilic digesters of 2600 m³ each

Installed electrical capacity – 625 kW. Additional 330 kW
is planned

Thermal capacity -686 kW. Additional 395 kW is planned

Power sale to the grid by “green tariff” is planned

Landfill gas recovery and utilization for power production (Mariupol)

Start up – February 2010

Stage 1 (2010) –
flaring at Hofstetter Umwelttechnik AG
HOFGAS® – Ready 800

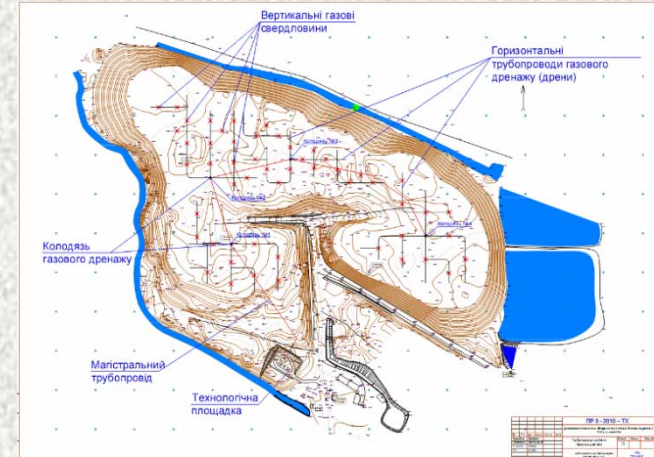


Stage 2 (2011) –
CHP Jenbacher engine 0,625 MW

Stage $\frac{3}{4}$ (2011-1012) -
Landfill #2



Landfill gas recovery and utilization for direct use in boiler house (Chernigov)



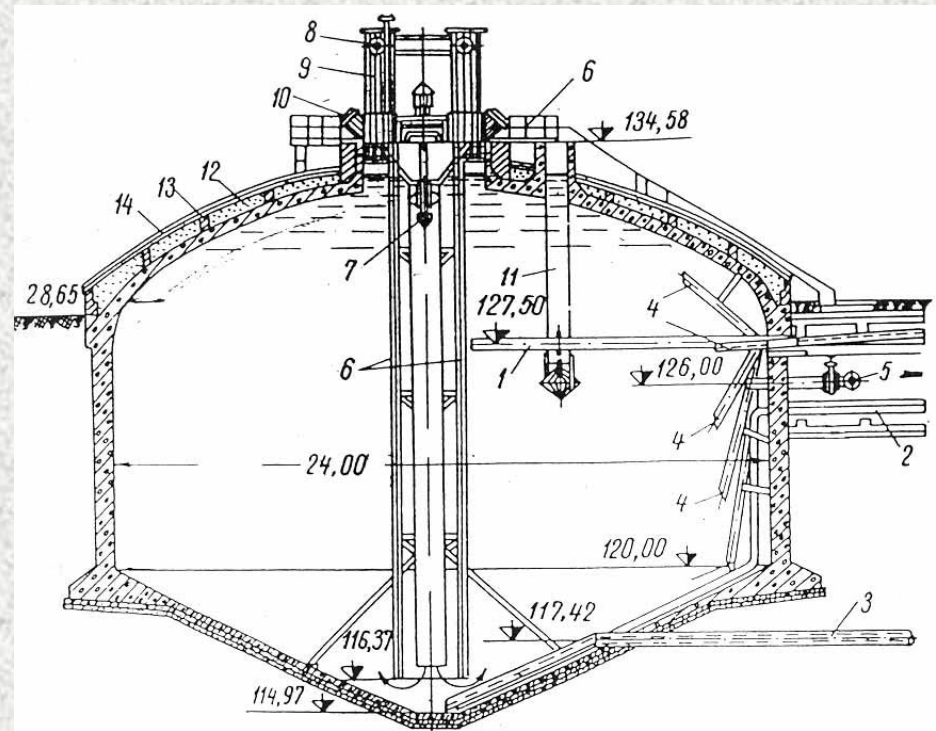
- Population – 300 000
- Landfill starting year – 1961
- MSW – 110 000 -180 000 t/a
- Area – 14.0 ha
- Depth – 15 - 20 m
- Waste in place -2.5 mill tones

- Wells number - 56
- LFG output – 300-500 m³/h
- GHG emission reduction – 20 000 - 35 000 t CO_{2eqv}/an

Bortnichi WWTP (Kiev)



8 digesters of 5500 m³ volume
each were installed in 1975-1985



1 - pipeline for loading; 2 - pipeline for digested sediment unloading; 3 – discharge pipeline; 4 - pipelines of silt water removal; 5 - steam injector; 6 – steam line, 7 – propeller mixer; 8 - gas pipeline, 9 - pipe of gas discharge to atmosphere, 10 - observation hatch, 11 - overflow pipe, 12 – heat-insulation (slag); 13 - brick, 14 - roof.

Luzhanskiy experimental distillery



2.300 m³ of biogas per day.
This biogas volume replaces 15% of daily natural gas
use at the plant

Why Ukrainian farmers do not install biogas plants?

- Relatively big investment, Lack of own financial resources
- Low local bank loan activities, particularly in agriculture
- Unstable political situation, lack of governmental support
- Lack of practical experience of local design company and approval authorities with biogas project
- Market conditions
 - Green tariff for renewable energy exist, can be used for biogas since October 2011. Potential problems with greed connection
 - Main driving force – waste treatment, energy production is a new idea
 - Kyoto protocol - Ukraine belongs to the list of Annex 1 countries of the KP, and fully eligible for JI projects – independent source of income up to 30% of project cost

Thank you for your attention

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