

The role of Renewable Energy and Energy Efficiency as a key issue for economic development, 28th-29th of April 2011, Vienna

## Experiences on how to overcome barriers for successful realization of biomass projects in CEE (case of Ukraine)



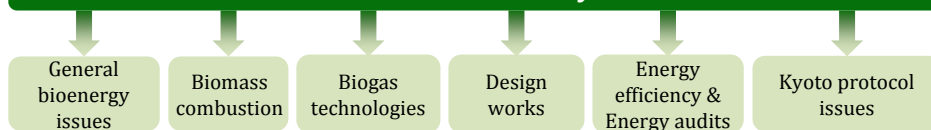
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### SEC "Biomass"

- SEC "Biomass" was found in 1998
- Currently the staff is 30 persons, including 7 PhD

#### SEC "Biomass" activity areas



#### Main types of work

• Research engineering	• Technical and economic assessment
• Energy audits	• Business planning, project management
• Potential evaluation of different biomass types	• Organization and holding the core conferences, seminars and study courses
• Consultations about technologies of energy production from biomass	• Development of Project Idea Notes (PIN), Project Design Documents (PDD), portfolios of JI projects, Green Investment Scheme (GIS) projects
• Design work and development effort	• Management and monitoring of JI projects

## Driving forces and barriers of bioenergy development in Ukraine (1)

Driving forces	Barriers
Fast growing prices on natural gas on the border. High dependence on NG.	Subsidized prices of natural gas inside country.

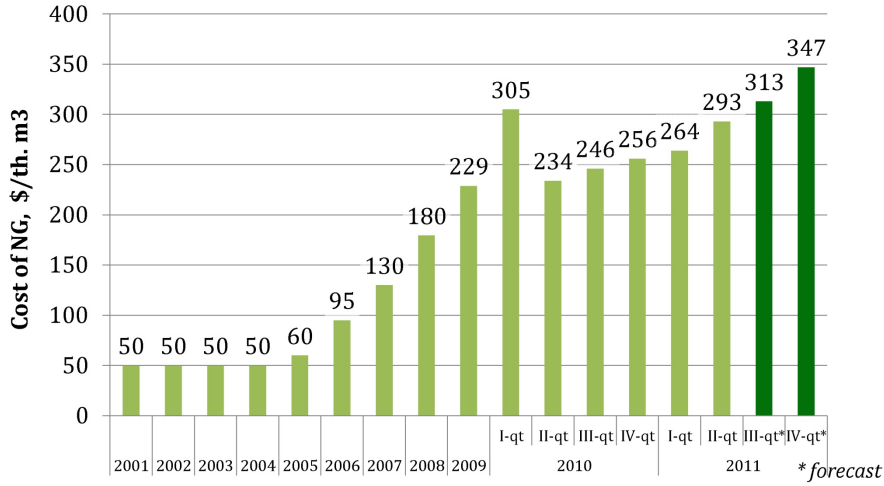
## The structure of energy resources consumption in Ukraine

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

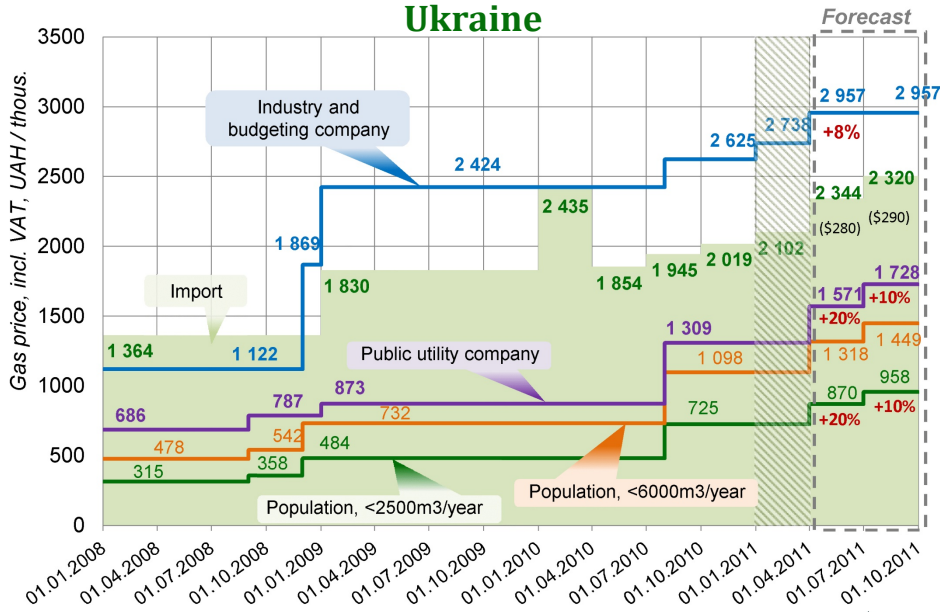
### Conclusions:

1. Unreasonably high part of natural gas in Ukraine's energy balance – approximately 2 times higher than in other countries
2. About 50% of natural gas is used for heat supply

## Cost of imported natural gas at the Ukraine's border



## The price of natural gas in the domestic market of Ukraine



• Prices for industry and state-financed organizations are given without costs of gas transportation and delivery and target markup of 2% which makes additional 10-15% of gas price in total.



## Driving forces and barriers of bioenergy development in Ukraine (2)

Driving forces	Barriers
Fast growing prices on natural gas on the border. High dependence on NG.	Subsidized prices of natural gas inside country.
Good economic indicators of some bioenergy projects in Ukraine.	Lack of political will: no clear target, state program/ action plan, responsible agency.

## The cost comparison of the solid fuels and natural gas

	Cost UAH/t	LHV MJ/kg	Cost of energy in the fuel UAH/GJ	The ratio of energy cost in NG to the energy cost from other fuels					
				<i>NG for industry and budgetary organizations</i>			<i>NG for housing and communal services sector</i>		
				before 1/08/10	to 1/08/10	after 1/07/11	before 1/08/10	to 1/08/10	after 1/07/11
Wood wastes	50	11	4,5	15,2	16,5	18,6	5,5	8,2	10,9
Fuel wood (chip)	250	11	22,7	3,0	3,3	3,7	1,1	1,6	2,2
Wood pellets	800	17	47,1	1,5	1,6	1,8	0,5	0,8	1,0
Wood briquettes	700	15	46,7	1,5	1,6	1,8	0,5	0,8	1,1
Straw in bales	300	13	23,1	3,0	3,2	3,7	1,1	1,6	2,1


	Cost UAH/t	LHV MJ/kg	Cost of energy in the fuel UAH/GJ	The ratio of energy cost in NG to the energy cost from other fuels					
				<i>NG for population, &lt;2500 m3/year</i>			<i>NG for population, &lt;6000 m3/year</i>		
				before 1/08/10	to 1/08/10	after 1.07.11	before 1/08/10	to 1/08/10	after 1/07/11
Wood wastes	50	11	4,5	3,0	4,6	6,0	4,6	6,9	9,1
Fuel wood (with delivery)	250	13	19,2	0,7	1,1	1,4	1,1	1,6	2,2
Wood pellets	800	17	47,1	0,3	0,4	0,6	0,4	0,7	0,9
Wood briquettes	700	15	46,7	0,3	0,4	0,6	0,4	0,7	0,9


## Driving forces and barriers of bioenergy development in Ukraine (3)

Driving forces	Barriers
Fast growing prices on natural gas on the border. High dependence on NG.	Subsidized prices of natural gas inside country.
Good economic indicators of some bioenergy projects in Ukraine.	Lack of political will: no clear target, state program/ action plan, responsible agency.
Green tariff Law from 01.04.2009	No green tariff for power from biogas, MSW, co-combustion of biomass with coal; any support to green heat.

## “Green” tariff factor

GT factor	RES	Type of power plant, installed capacity
1.2	wind	≤ 600 kW
1.4	wind	600-2000 kW
2.1	wind	> 2000 kW
2.3	<b>biomass</b>	all the plants
4.8	solar	plants located on the land
4.6	solar	plants installed on the roofs of the buildings with capacity of more than 100 kW
4.4	solar	plants installed on the roofs of the buildings with capacity of less than 100 kW and for solar plants installed on the front of the buildings irrespective of their capacity
0.8	small hydro	≤ 10 MW

 **Biomass** is the products which completely or partly consist of the matters of vegetable origin, which can be used as a fuel\*

 *The definition of “biomass” differs from that in the Law of Ukraine “On Alternative Types of Fuel”. The definition is narrower that may result in excluding the power produced from biogas from the effect of “green” tariff.*

## Driving forces and barriers of bioenergy development in Ukraine (4)

Driving forces	Barriers
Fast growing prices on natural gas on the border. High dependence on NG.	Subsidized prices of natural gas inside country.
Good economic indicators of some bioenergy projects in Ukraine.	Lack of political will: no clear target, state program/ action plan, responsible agency.
Green tariff Law from 01.04.2009	No green tariff for power from biogas, MSW, co-combustion of biomass with coal; any support to green heat.
Well functioning JI procedure for 2008-2012.	Risk of post Kyoto period. JI market pessimism.

## JI project: Utilization of sunflower seeds husk in CHP at oil-extraction plant OJSC "Kirovogradoliya"



Steam boiler E-16-3,9-360 D

Fuel type	<i>sunflower seeds husk</i>
Fuel consumption	<i>80 000 t/year</i>
Boilers efficiency	<i>86 %</i>
Number of boilers	<i>3</i>
Total steam productivity	<i>48 t/h</i>
Electricity output	<i>1.7 MWe</i>
Electrical efficiency	<i>31%</i>
GHG ER	<i>45 000 tCO2/y</i>



Steam turbine PBS Velkobites (Czech Republic)

## JI project: Utilization of waste wood at wood-working plant Uniptyt

Fuel type: wood-processing waste  
Fuel consumption: 40 000 t/year  
Boiler efficiency: 88%  
Total heat output: 13.3 MWth

Total steam productivity: 18 t/h  
Max steam pressure: 22 bar  
Max steam temperature: 260°C  
Nominal operating hours: 8000/year

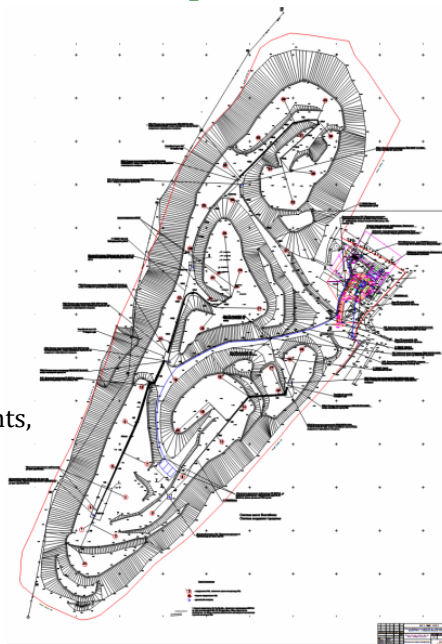


Greenhouse gas emission reductions:  
30 000 tCO<sub>2</sub>/year

## JI project: LFG utilisation at Mariupol Landfill



44 wells,  
3 gas collection points,  
total piping – 6 km



## JI project: LFG project in Mariupol Landfill (2)



TIS ECO

## Driving forces and barriers of bioenergy development in Ukraine (5)

Driving forces	Barriers
Fast growing prices on natural gas on the border. High dependence on NG.	Subsidized prices of natural gas inside country.
Good economic indicators of some bioenergy projects in Ukraine.	Lack of political will: no clear target, state program/ action plan, responsible agency.
Green tariff Law from 01.04.2009	No green tariff for power from biogas, MSW, co-combustion of biomass with coal; any support to green heat.
Well functioning JI procedure for 2008-2012.	Risk of post Kyoto period. JI market pessimism.
<b>Big bioenergy potential. Good opportunities in the next years.</b>	<b>Internal market of biomass as a fuel is not developed.</b>



## Total potential of biomass in Ukraine, 2009

Types of biomass	Energy potential, mtce		
	Theoretical	Technical	Economic
Straw of grain crops	20,30	10,17	2,43
Straw of rape	2,94	2,06	1,34
Residues of production of corn for grain	8,79	6,15	3,94
Residues of sunflower production	6,68	4,48	4,36
Secondary agricultural residues	1,13	0,91	0,65
Wood biomass	2,53	2,07	1,63
Biodiesel	1,38	1,38	0,45
Bioethanol	3,47	3,47	1,09
Biogas from manure	3,10	2,32	0,35
Landfill gas	0,77	0,46	0,26
Sewage gas	0,21	0,13	0,09
Energy crops			
- poplar, miscanthus, acacia, alder, willow	12,10	10,28	10,28
- rape (straw)	1,94	1,36	1,36
- rape (biodiesel)	0,92	0,92	0,92
- corn (biogas)	1,47	1,03	1,03
Peat	0,77	0,46	0,4
<b>TOTAL</b>	<b>68,50</b>	<b>47,65</b>	<b>30,58</b>

16,6  
mtce

13,6  
mtce

## Utilisation of solid biomass as a fuel

Rural population consume about 2 mill solid m<sup>3</sup>/y of fire wood (500 th. tce/y)



Traditional stove heating in rural areas in Ukraine

- ≈ 25 sunflower husk fired boilers
- they consume ≈ 500 th. t/y of husk



"Energomashproekt" boiler, Ukraine

More than 20 boilers



UTEM boiler, Ukraine

- ≈ 500 wood fired boilers
- more than 1000 boilers converted from fossil fuels to wood combustion
- consumes ≈ 400 th. t/y of wood residues



"Zhitomirremkharchomash" boiler, Ukraine

## Opportunities for investments in Ukraine's bioenergy sector (biomass boilers and CHPs)

Type of equipment	Estimation of Ukrainian market volume, units	Installed capacity		Substitution of NG, bln. m <sup>3</sup> /y	GHG reduction in CO <sub>2</sub> eq, mio. t/y	Required investments, mio. Euro
		MW <sub>th</sub>	MW <sub>e</sub>			
Wood fired heating boiler installations, 0.5-10 MW <sub>th</sub>	900	450		0,26	0,50	22,5
Wood fired industrial boilers, 0.1-5 MW <sub>th</sub>	400	280		0,22	0,43	14
Wood fired domestic boilers, 10-50 kW <sub>th</sub>	35 000	1 050		0,6	1,17	73,5
Wood fired mini-CHP plants, 1-10 MW <sub>e</sub>	10	100	50	0,21	0,41	1 45
Straw fired farm boilers, 0.1-1 MW <sub>th</sub>	10 000	2 000		1,18	2,32	1 60
Straw heating boilers, 1-10 MW <sub>th</sub>	1 000	2 000		1,18	2,32	1 20
Straw-fired mini-CHP plants, 1-10 MW <sub>e</sub>	10	100	50	0,21	0,41	1 45
Farm sunflower and corn stalk fired boilers, 0.1-1 MW <sub>th</sub>	9 000	1 800		1,06	2,09	1 44
Peat boilers, 0.5-1 MW <sub>th</sub>	800	600		0,34	-0,67	30
<b>TOTAL:</b>	<b>57 120</b>	<b>8 380</b>	<b>100</b>	<b>5,26</b>	<b>9,0</b>	<b>854</b>

5,26 bln. m<sup>3</sup> NG · 211 Euro / 1000 m<sup>3</sup> = **1100** mio. Euro/year

## Opportunities for investments in Ukraine's bioenergy sector (biogas projects)

Type	Market niche, units	Total capacity, MW <sub>th</sub> +MW <sub>e</sub>	Substitution of NG, bln. m <sup>3</sup> /year	GHG reduction CO <sub>2</sub> eq*, mio t/year	Investments, mio. Euro
Small biogas plants with digesters 200...600 m <sup>3</sup>	2 253	152+96	0,23	0,55	4 62
Biogas plants with digesters 600...3000 m <sup>3</sup>	827	271+173	0,42	1,09	7 39
Big biogas plants with digesters more than 3000 m <sup>3</sup>	4	6+4	0,01	0,01	17
CHPs on the landfill gas	60	90+60	0,13	2,4	30
<b>Total</b>	<b>3 144</b>	<b>519+333</b>	<b>0,79</b>	<b>4,05</b>	<b>1250</b>

\* in comparison with natural gas

### Possible realistic targets of bioenergy sector development in Ukraine

Year	2010	2015	2020	2025	2030
The share of biomass in the total energy consumption	<b>0,5%</b>	<b>2,5%</b>	<b>5%</b>	<b>7,5%</b>	<b>10%</b>

**Thank you for your attention!**

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