



Development and Prospects of Bioenergy in Ukraine.

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(UABio)**

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Scientific-Engineering Centre
"Biomass"



LLC "Salix Energy"



Agricultural company "Danosha"



NGO "Renewable Energy Agency"



LLC "Kolbe Power Group"



TTS Eko s.r.o., Czech Republic



Ukrainian heat generating
company "Ukrteplo"



Corporation "INKA"



LLC "Kotloturboprom"



LLC "Engineering Centre
"EkoEnergoProekt"



LLC "ENERSTENA Ukraine"



Foreign company "Agro Vild
Ukraine"



LLC "Teplodar PV"



LLC "Boiler factory "Kriger"



LLC "DELTA Engineering"



LLC "Kyiv Green Energy"



LLC "Equator Sun Energy"



LLC "Volyn Kalvis"



LLC "Smilaenergopromtrans"



LLC "ETPC "ENERGYDESIGN"



LLC "Metropoliya Science and
Technology Company"

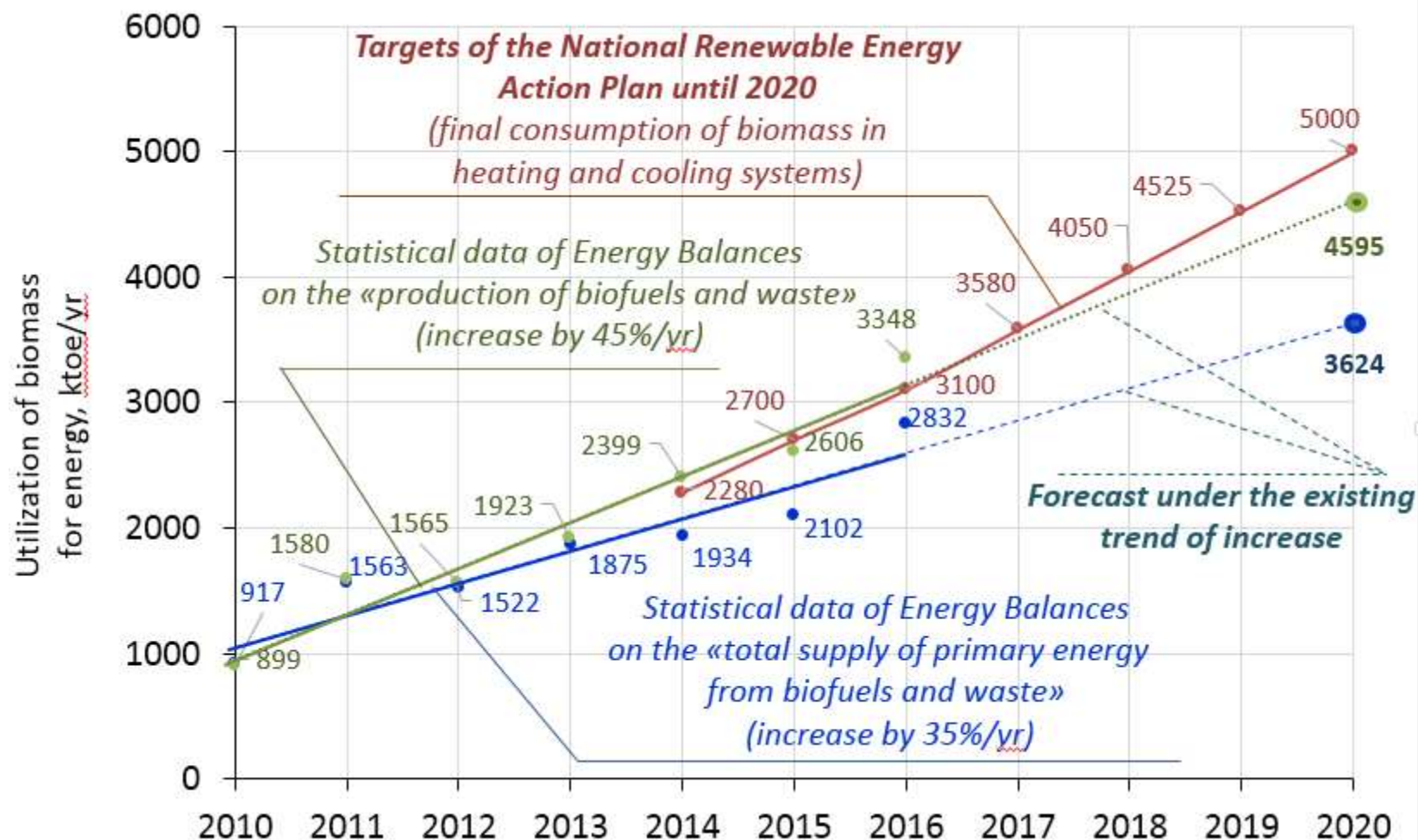


SC "Siemens Ukraine"

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Trends of bioenergy development in Ukraine



Energy Balance of Ukraine for 2016:

- Share of biofuels in the final energy consumption – 3.3%
- Share of biofuels in the structure of RES production – 81%

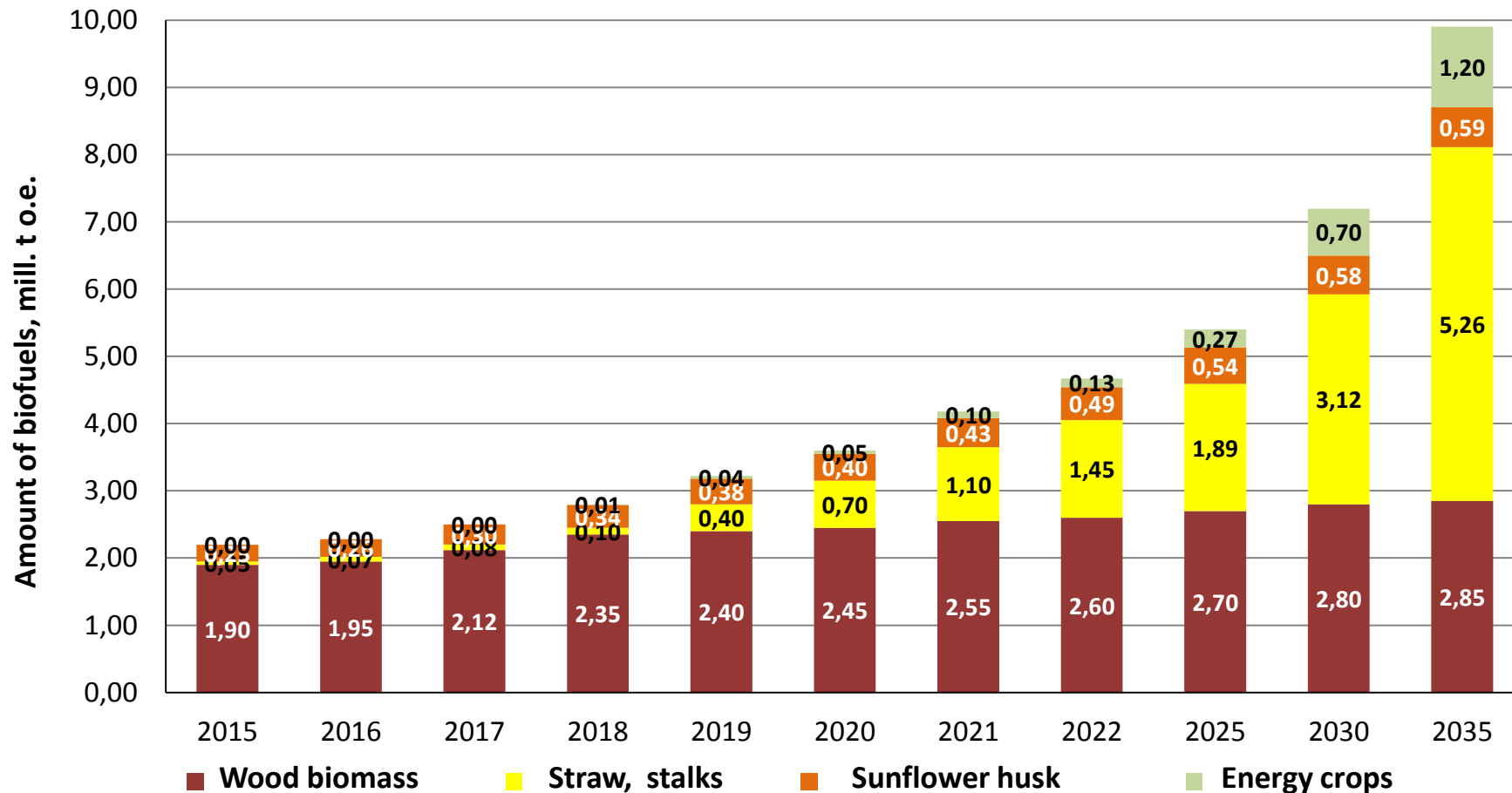
Priorities of New Energy Strategy of Ukraine till 2035 Relevant for Bioenergy (citations)

- Support of competitive market of biofuels development;
- Support of biomass CHP projects development;
- Establishment of conditions for formation of logistic systems and collection infrastructure for biomass for its future transportation;
- Development of DH systems on renewable energy (biomass pellets, MSW, etc);
- Increase of stock exchange share for trade of energy carriers including for all fuels, from 10% in 2016 till 60% in 2035.

Structure of Total Primary Energy Supply According New Energy Strategy of Ukraine till 2035

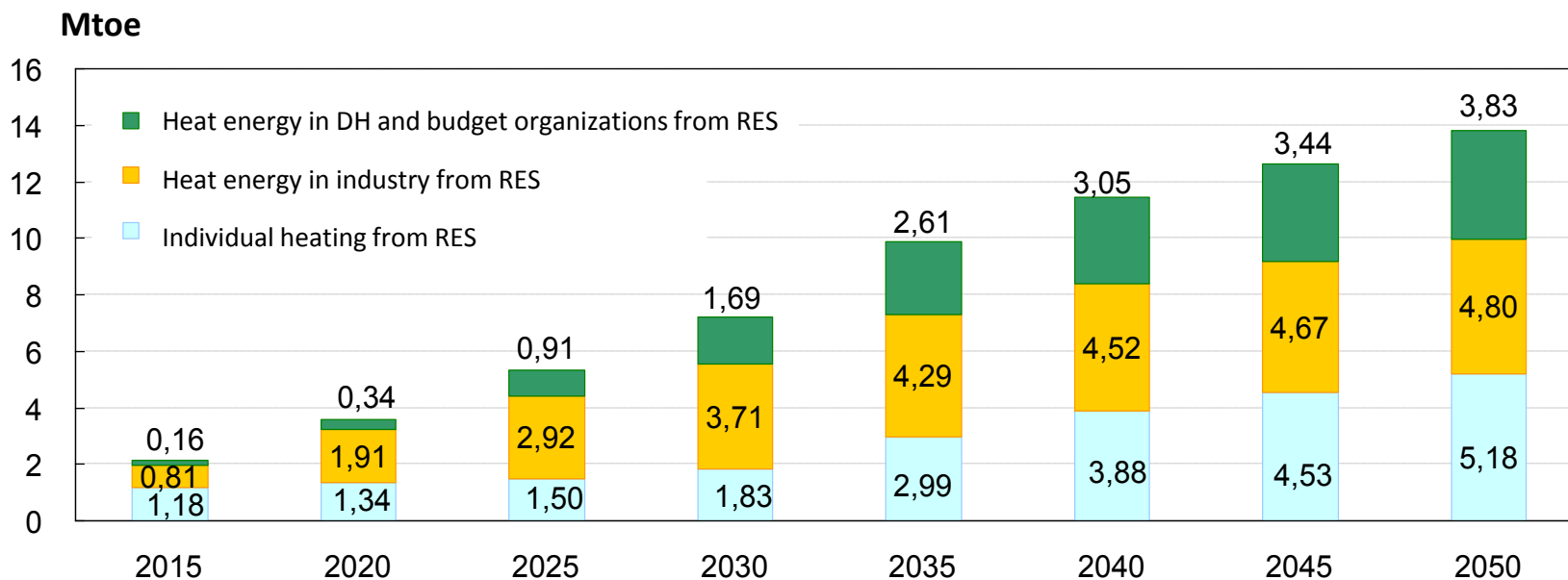
Type of energy source	2015 (fact)	2020 (forecast)	2025 (forecast)	2030 (forecast)	2035 (forecast)
Coal	27,3	18	14	13	12
Natural Gas	26,1	24,3	27	28	29
Oil Products	10,5	9,5	8	7,5	7
Nuclear Energy	23	24	28	27	24
Biomass, Biofuels and Wastes	2,1	4	6	8	11
Solar and Wind Energy	0,1	1	2	5	10
Hydro Energy	0,5	1	1	1	1
Thermal energy	0,5	0,5	1	1,5	2
TOTAL, <u>mill t o.e.</u>	90,1	82,3	87	91	96

Total Amount and Structure of Solid Biofuels in Ukraine (90% from all biofuels and wastes)

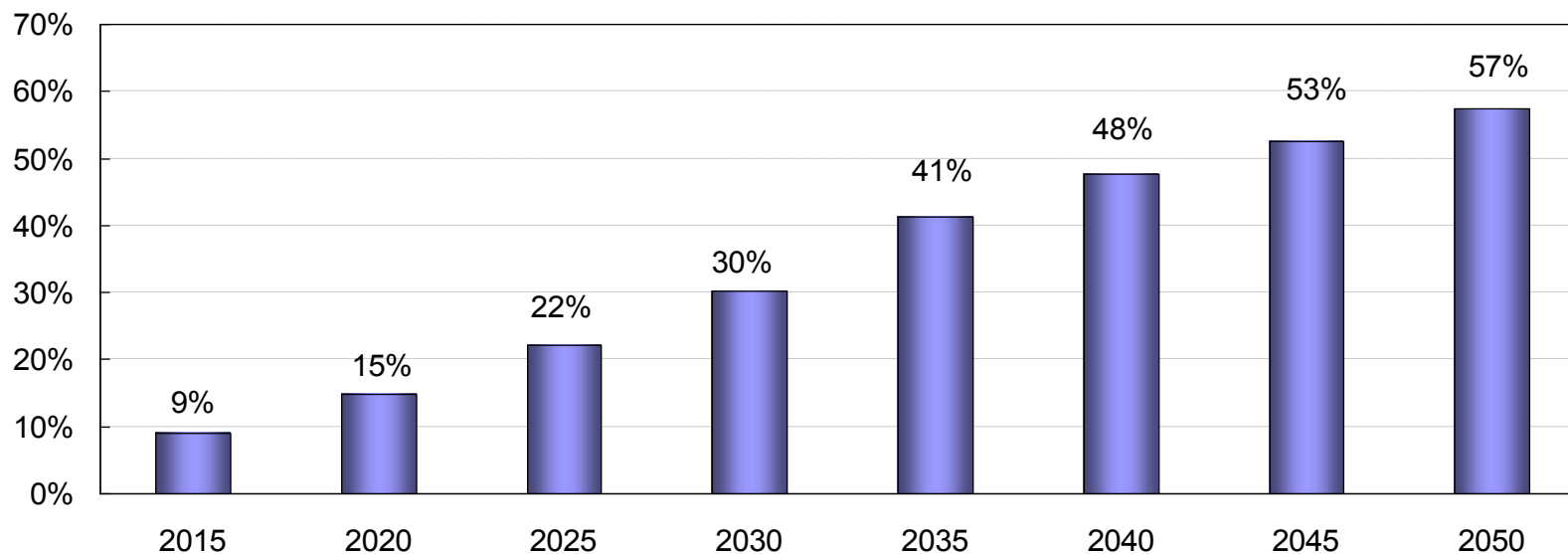


Type of biomass	2015	2016	2017	2018	2019	2020	2021	2022	2025	2030	2035
Wood fuels	1,90	1,95	2,12	2,35	2,40	2,45	2,55	2,60	2,70	2,80	2,85
Straw, stalks	0,05	0,07	0,08	0,10	0,40	0,70	1,10	1,45	1,89	3,12	5,26
Sunflower husk	0,25	0,26	0,30	0,34	0,38	0,40	0,43	0,49	0,54	0,58	0,59
Energy crops	0,00	0,00	0,00	0,01	0,04	0,05	0,10	0,13	0,27	0,70	1,20
TOTAL, mill. t o.e.	2,20	2,28	2,50	2,80	3,22	3,60	4,18	4,67	5,40	7,20	9,90

Total heat energy production from RES, 2015-2050



Share of heat energy from RES, %



Biomass Potential Utilization

Type of biomass	Potential, available for energy, Mtoe		Usage of potential for energy production, Mtoe		Share of the usage of potential, %	
	2015	2050	2015	2050	2015	2050
Grain straw	3,65	5,48	0,3	2,99	6,8%	49%
Rape straw	0,43	0,65	* Included to the previous one			
Primary corn residues (stalks, cobs)	2,32	3,48	0,033	2,27	1,2%	65%
Primary sunflower residues (stalks, heads)	1,22	1,22	0,132	0,98	11%	80%
Secondary agro residues (sunflower husk)	0,5	0,5	0,178	0,49	36%	100%
Woody biomass (firewood, felling residues, wood processing wastes)	1,39	2,08	1,304	2,173	94%	100%
Woody biomass (dry wood, wood from the reconstruction of forest belts, wastes from fruit trees)	1,03	1,03	0,62	1,14	59%	100%
Biogas from agro industrial wastes	0,68	2,38	0,003	0,194	0,5%	8%
Landfill Biogas	0,18	0,6	-	0,087	0%	14,5%
Energy crops						
- Willow, poplar, miskanthus (1,5 million hectares in 2015, 3 million hectares in 2050)	6,58	19,74	0,02	2,50	0,2%	13%
- Maize for silage (0,5 million hectares in 2015, 1 million hectares in 2050)	1,29	5,15	0,003	0,194	0,2%	3,8%
<u>TOTAL</u>	20,19	43,42	2,1	13,02	10%	30%

General prediction of RES development in the heating sector of Ukraine, 2015-2050

Year	MW, heat	MWe	Mtoe	NG replacement, billion m3	Share of RES	CO2 reduction, MtCO2/y	Investments, million Euro	Working places
2015	4 943	45	2,14	2,6	9,3%	6,17	1 006	12 931
2020	7 080	255	3,59	4,41	14,9%	8,64	1 857	21 918
2025	11 255	820	5,33	6,57	22,2%	12,87	3 809	41 560
2030	16 218	1265	7,23	8,94	30,2%	17,51	5 706	64 425
2035	24 035	1780	9,89	12,22	41,3%	23,95	8 073	96 768
2040	28 748	2085	11,45	14,13	47,7%	27,70	9 421	115 933
2045	32 355	2335	12,64	15,58	52,6%	30,54	10 486	130 690
2050	35 953	2580	13,81	16,98	57,4%	33,29	11 534	145 420

Without the involvement of agro biomass usage in heating sector, it is impossible to reach the goals of the new Energy strategy of Ukraine till 2035 and to ensure the sustainable development of bioenergy after 2035.

Biomass Utilization for Energy Production in Ukraine (by sectors)

	<u>2016</u>	<u>2020</u>	<u>2035</u>	<u>2050</u>
 	12%	15%	35%	60%
 	2,5%	6%	40%	55%
 	9%	20%	50%	56%
 	0,1%	1%	8%	12%

Feasibility study for biomass boiler and CHP plant running on wood chips / baled maize stalks in district heating

Indicator	Boiler plant, 10 MW	CHP plant (condensing turbine with steam extraction), 6 MW _e + 18 MW _{th}	TPP, 6 MW _e
Price of wood chips/baled maize stalks with delivery, EUR/t without VAT	25	25	25
Fuel consumption, kt/year	14.1	80.9	61.8
Economic indicators:			
Gas saving in heat production, million m ³ /year	5.2	9.60	-
Total investment, million EUR	2.2	16.2	15.9
Implementation by own funds:			
IRR, %	28	23	13
Simple payback period, years (tariff for heat production: 950 UAH/Gcal without VAT *)	3.4	4.1	6.0
Implementation by own and credit funds: <i>(credit is 60% of capital costs by 8% per annum for 8 years with deferred capital repayments for 1 year)</i>			
IRR, %	25	20	10
Simple payback period, years	3.9	4.8	7.2

* Tariff rate is 0.9 of the natural gas heat tariff, it is assessed according to the Law of Ukraine N 1959-VIII of 21.03.2017
<http://zakon3.rada.gov.ua/laws/show/1959-19>

Feasibility study for biomass boiler and CHP plant running on straw bales in district heating

Indicator	Boiler plant, 10 MW	CHP plant (condensing turbine with steam extraction), 6 MW _e + 18 MW _{th}	TPP, 6 MW _e
Price of straw bales with delivery, EUR/t without VAT	25	25	25
Fuel consumption, kt/year	13.5	77.1	59.6
Economic indicators:			
Gas saving in heat production, million m ³ /year	5.2	9.60	-
Total investment, million EUR	2.5	23.1	19.8
Implementation by own funds:			
IRR, %	25	15	9
Simple payback period , years (tariff for heat production: 950 UAH/Gcal without VAT *)	3.9	5.6	7.3
Implementation by own and credit funds: <i>(credit is 60% of capital costs by 8% per annum for 8 years with deferred capital repayments for 1 year)</i>			
IRR, %	22	12	6
Simple payback period , years	4.4	6.7	8.7

* Tariff rate is 0.9 of the natural gas heat tariff; it is assessed according to the Law of Ukraine N 1959-VIII of 21.03.2017

<http://zakon3.rada.gov.ua/laws/show/1959-19>

Feasibility study for biomass boiler and CHP plant running on sunflower husk pellets in district heating

Indicator	Boiler plant, 10 MW	CHP plant (condensing turbine with steam extraction), 6 MW _e + 18 MW _{th}	TPP, 6 MW _e
Price of sunflower husk pellets with delivery, EUR/t without VAT	48	48	48
Fuel consumption, kt/year	10.2	61.5	47.0
Economic indicators:			
Gas saving in heat production, million m ³ /year	5.2	9.6	-
Total investment, million EUR	1.4	16.2	15.9
Implementation by own funds:			
IRR, %	40	17	7
Simple payback period , years (tariff for heat production: 950 UAH/Gcal without VAT *)	2.5	5.1	7.8
Implementation by own and credit funds: (credit is 60% of capital costs by 8% per annum for 8 years with deferred capital repayments for 1 year)			
IRR, %	37	14	4
Simple payback period , years	2.7	6.0	9.3

* Tariff rate is 0.9 of the natural gas heat tariff, it is assessed according to the Law of Ukraine N 1959-VIII of 21.03.2017

<http://zakon3.rada.gov.ua/laws/show/1959-19>

Main barriers for bioenergy development and ways of their overcoming

1. Lack of biofuel market development.

It is necessary: *to develop a competitive biofuel market (to overcome barriers of access to raw materials for biofuel production, to create a Biofuel Exchange). Improvement is under discussion.*

2. The state covers costs of heat energy in non-monetary form (clearing calculations) - non-monetary subsidies.

It is necessary: *monetization of subsidies at the level of population, or DH companies. Monetization of subsidies at the level DH companies is starting from 1.01.2018.*

3. Existence of accounts with a special regime of use for payments for heat energy that discriminate heat producers from alternative energy sources.

It is necessary: *to amend Resolution of Cabinet Ministers of Ukraine № 217. Improvement is in the progress.*

4. Imperfect model of DH supply (monopoly position of DH companies, problem with heating network connection for independent producers of heat).

It is necessary: *To establish competitive heat energy market. Improvement is under discussion.*

Thank you for attention!

Welcome to Ukraine and to UABio!

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