Development and Prospects of Bioenergy in Ukraine

Georgiy Geletukha, PhD

Head of the Board, Bioenergy Association of Ukraine (UABio)

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We are greening the energy!

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UABio members

LLC “Sceintific-Engineering Center “Biomass”

LLC «Salix Energy»

Agricultural company “Danosha”

NGO “Renewable Energy Agency”

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LLC “Boiler Plant Kriger”

LLC “Delta Engineering”

LLC “Kyiv Green Energy”

LLC “Volyn-Kalvis”

LLC “Smelaenergopromptans”

Physical persons: Maraykin R., Petrov Ya., Ilchuk M., Bereznitska M.

National RE Action Plan till 2020
(approved by the CMU Decree 01.10.14 No. 902-p)

Index	2009	2014	2015	2016	2017	2018	2019	2020
RES – heating, %	3,4	6,5	7,1	8,0	8,8	9,7	10,8	**12,2**
including biomass, k toe	*1433*	*2280*	*2700*	*3100*	*3580*	*4050*	*4525*	***5000***
RES – power generation, %	7,1	7,6	8,3	8,7	9,4	10,2	10,9	**11,5**
biomass, MW_e, including:	*0*	*40*	*250*	*380*	*520*	*650*	*780*	***950***
solid		*28*	*175*	*260*	*360*	*455*	*540*	***660***
biogas		*12*	*75*	*120*	*160*	*195*	*240*	***290***
RES – transport, %	1,5	4,1	5,0	6,5	7,5	8,2	9,0	**10,0**
including biomass, k toe	*0*	*110*	*150*	*220*	*265*	*300*	*340*	***390***
Total RES share in GFEC, %	3,8	6,1	6,8	7,5	8,2	9,0	9,9	**11,0**

5000 M toe = 6,25 billion m3 gas/year.
660 MWe, 90% in CHP regime, 1780 MW heat, substitution of 0,95 billion m3 gas/year.
6,25 + 0,95 = 7,2 billion m3 gas/year (goal for substitution till 2020 p).

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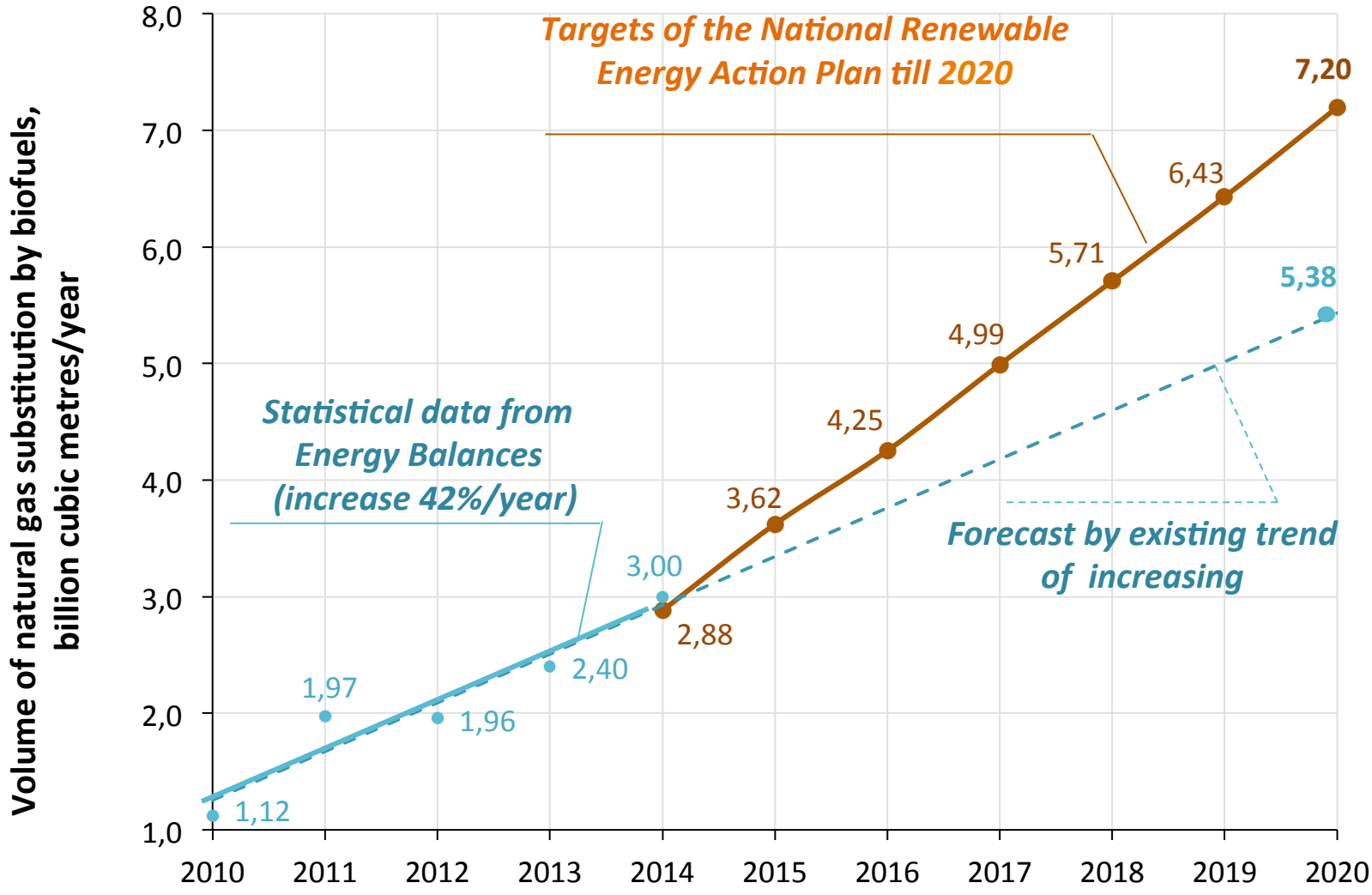

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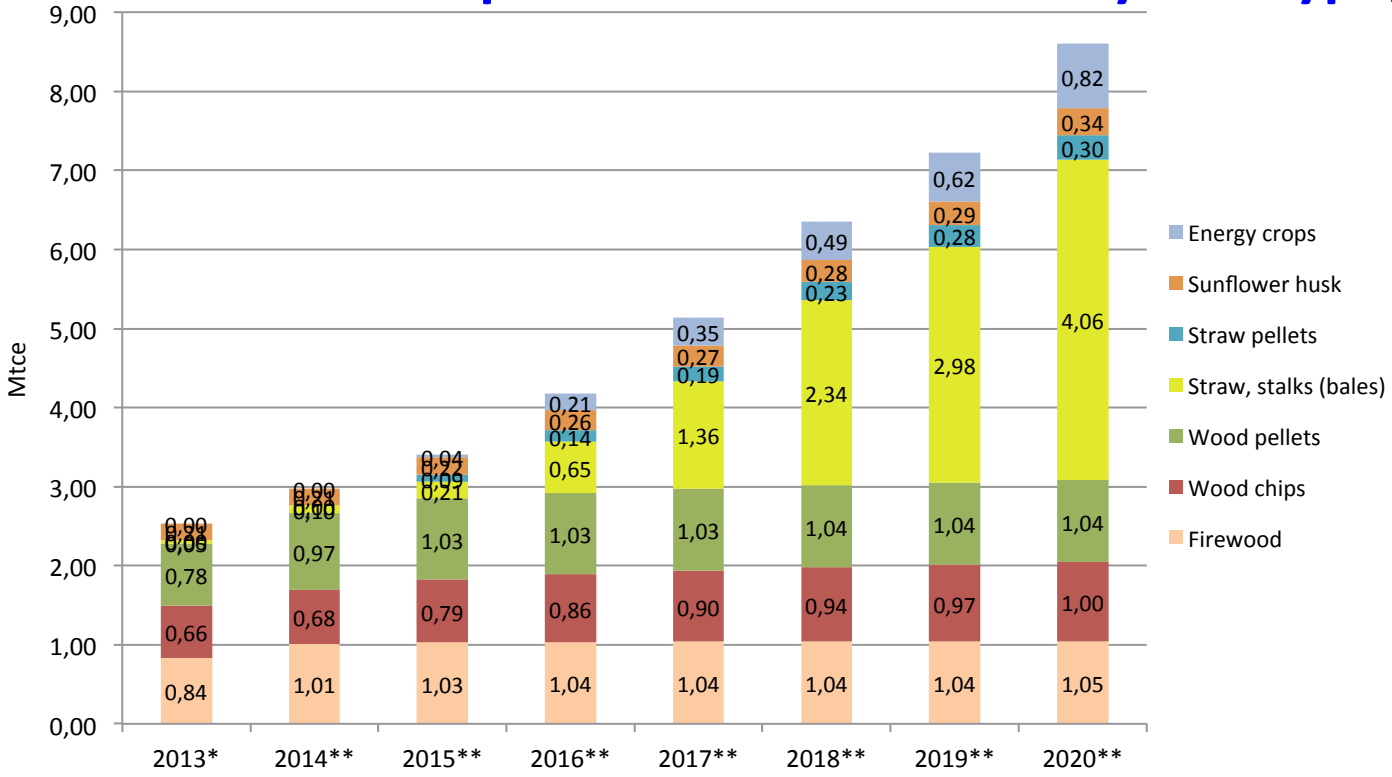
Biofuels for heat production in Ukraine by fuel type, Mtce



Biomass type	2013*	2014**	2015**	2016**	2017**	2018**	2019**	2020**
Firewood	0,84	1,01	1,03	1,04	1,04	1,04	1,04	1,05
Chips	0,66	0,68	0,79	0,86	0,90	0,94	0,97	1,00
Wood pellets	0,78	0,97	1,03	1,03	1,03	1,04	1,04	1,04
Straw, stems (bales)	0,05	0,10	0,21	0,65	1,36	2,34	2,98	4,06
Straw pellets	0,00	0,00	0,09	0,14	0,19	0,23	0,28	0,30
Sunflower husk	0,21	0,21	0,22	0,26	0,27	0,28	0,29	0,34
Energy crops	0,00	0,00	0,04	0,21	0,35	0,49	0,62	0,82
Total, M tce	**2,54**	**2,98**	**3,41**	**4,17**	**5,14**	**6,35**	**7,23**	**8,60**

** Assessment according to Energy balance of Ukraine*
*** Forecast according to REAP and UABio assumptions*

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Potential of biomass available for energy in Ukraine (2014)

Type of biomass	Theoretical potential, mln. t	Share, available for energy, %	Economic potential, Mtoe	
Straw of grain crops	33.5	30	3.49	8 Mtoe (38%)
Straw of rape	4.0	40	0.55	
By-products of grain corn production (stalks, cobs)	37.0	40	2.83	
By-products of sunflower production (stalks, heads)	19.1	40	1.10	
Secondary agricultural residues (husk, bagasse)	8.8	80	0.84	
Wood biomass (firewood, felling residues, wood processing waste)	6.0	97	1.45	
Wood biomass (dead wood, wood from shelterbelt forests)	*10.6*	*57*	*1.72*	
Biodiesel (rapeseed)	-	-	0.25	
Bioethanol (corn and sugar beet)	-	-	0.68	
Biogas from waste and by-products of agriculture	1.6 billion m^3 CH_4	50	0.68	
Landfill gas	0.6 billion m^3 CH_4	34	0.18	
Sewage gas (industrial and municipal wastewater)	1.0 billion m^3 CH_4	23	0.19	
Energy crops:				
- willow, poplar, miscanthus (from 1 mill ha)	11.5	90	4.40	7 Mtoe (33%)
- corn for biogas (from 1 mill ha)	3.3 billion m^3 CH_4	90	2.58	
Peat	-	-	0.28	
TOTAL	-	-	21.20	

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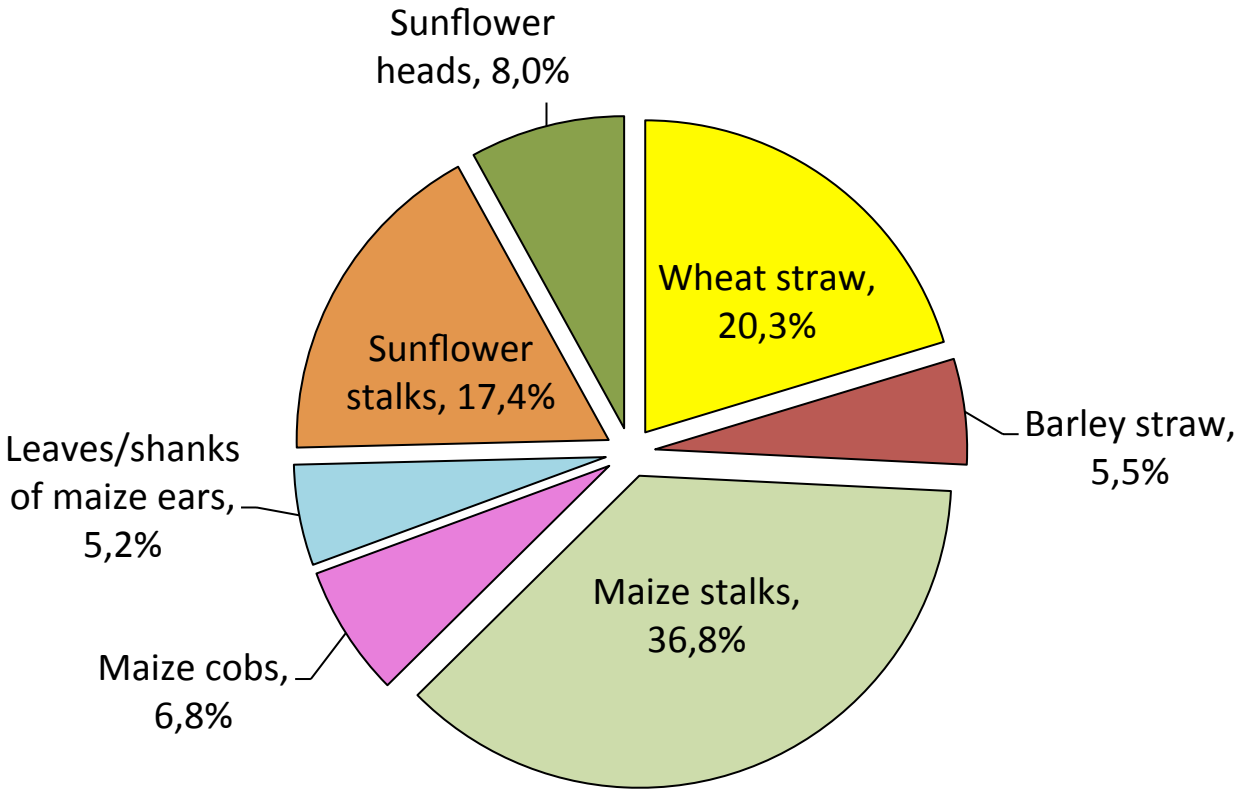
Structure of the energy potential of major primary agricultural residues in Ukraine (2013)

*in total, available for energy: **32.9** Mt*



This potential has been estimated as :

up to 30% *of the theoretical potential of grain crop straw and*

up to 40% *of the theoretical potential of maize and sunflower production residues*

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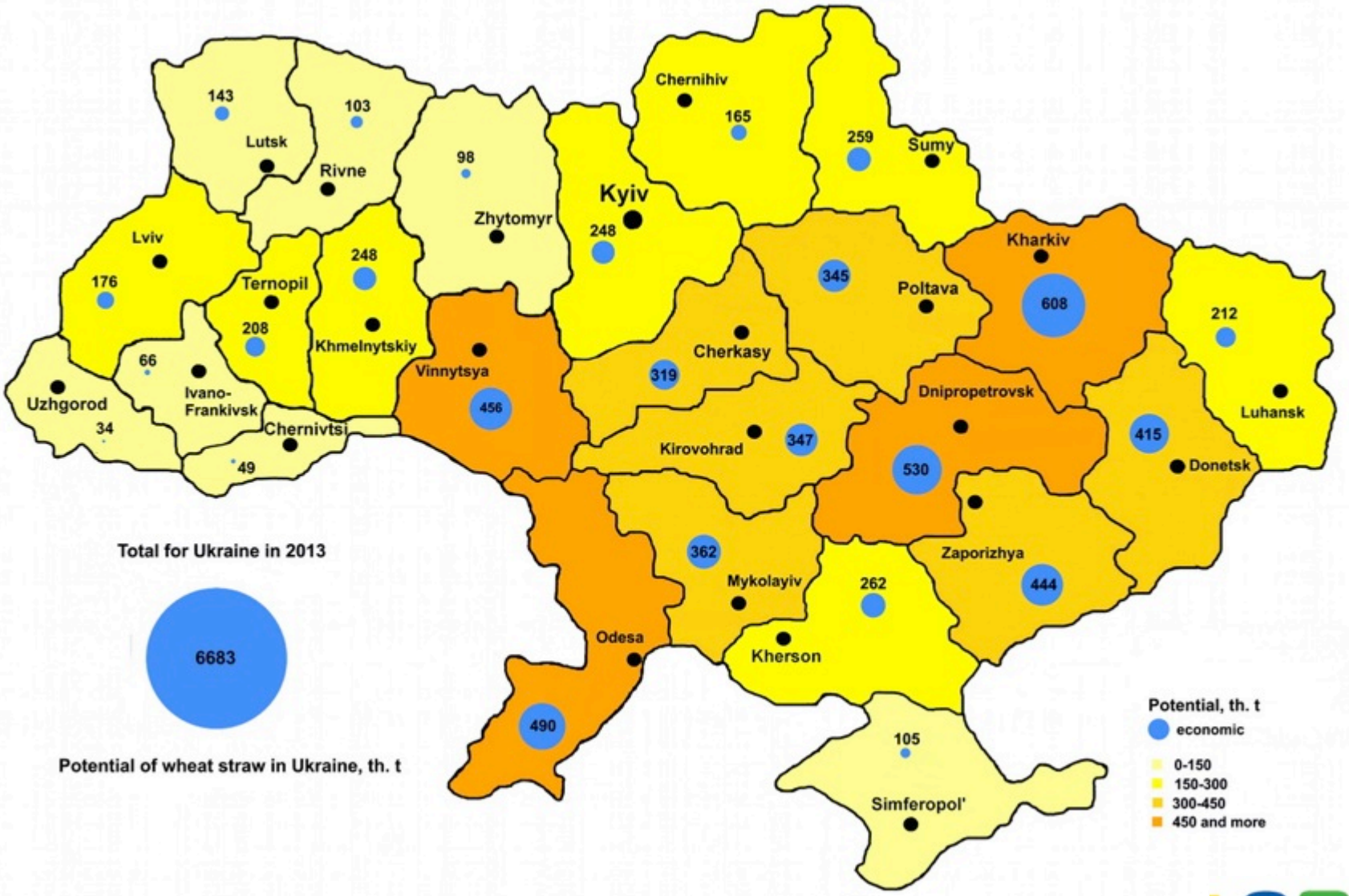
Potential of wheat straw in Ukraine (2013)

*in total, available for energy: **6.7** Mt*



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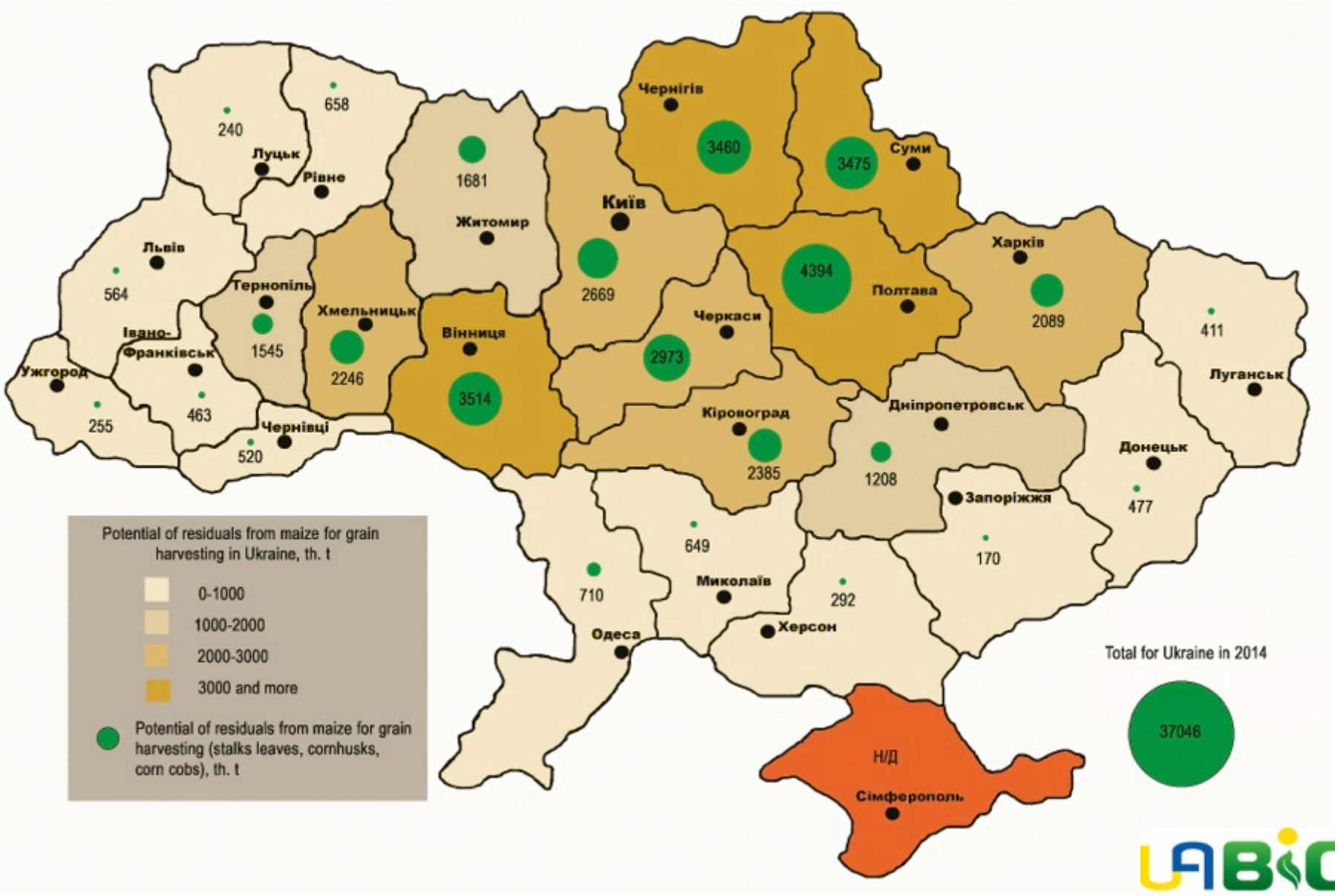
Potential of maize residues for grain harvesting in Ukraine

in total, available for energy: ***14.8*** *Mt*



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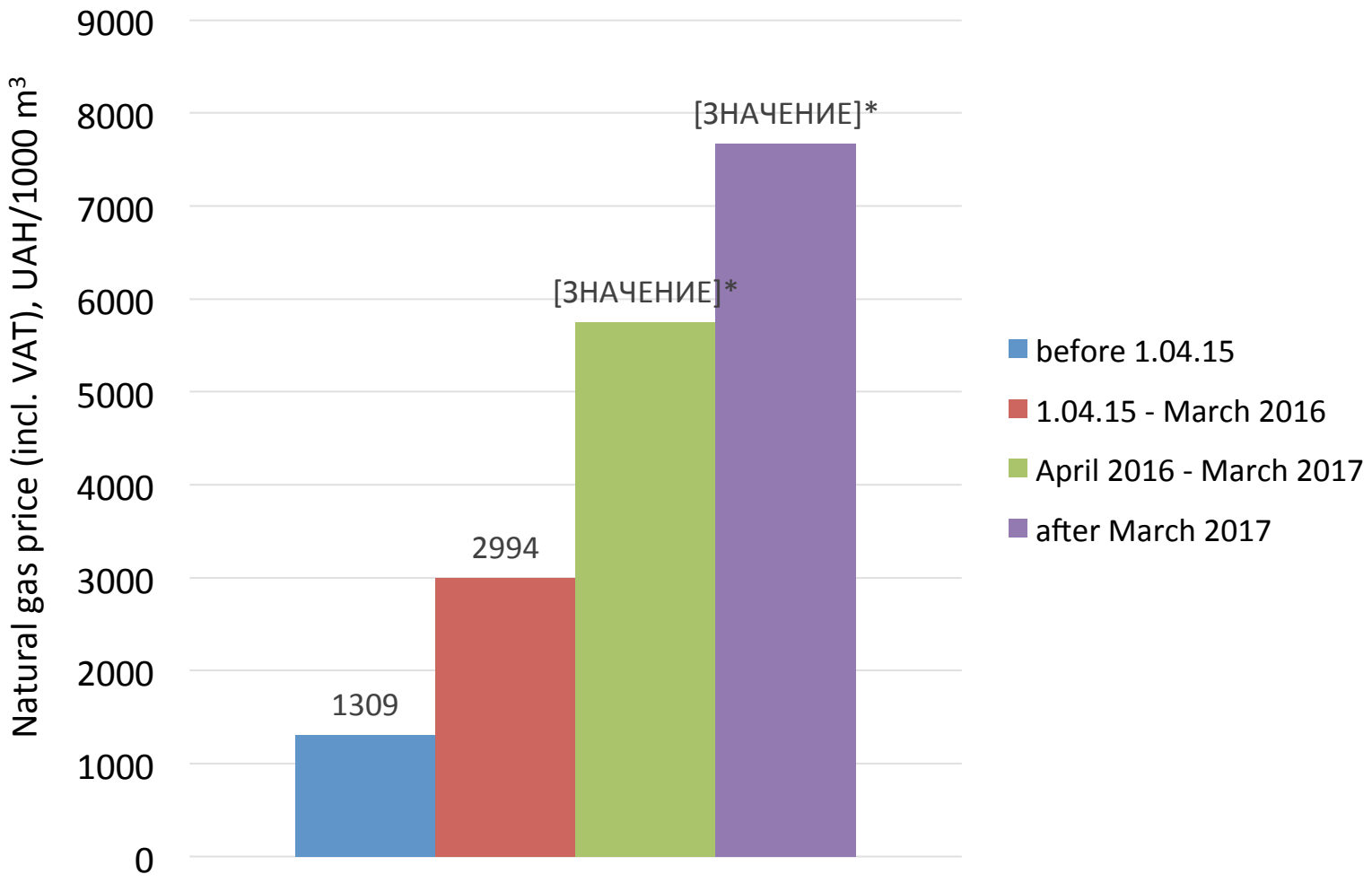
Natural gas prices for DH utilities providing heat for population



*On the assumption that Ukraine will meet requirements of the International Monetary Fund on retail gas heating prices (https://www.imf.org/external/pubs/ft/scr/2015/cr1569.pdf, p. 99) and the price of the imported gas will be 300 USD/1000 m^3 (excl. VAT)

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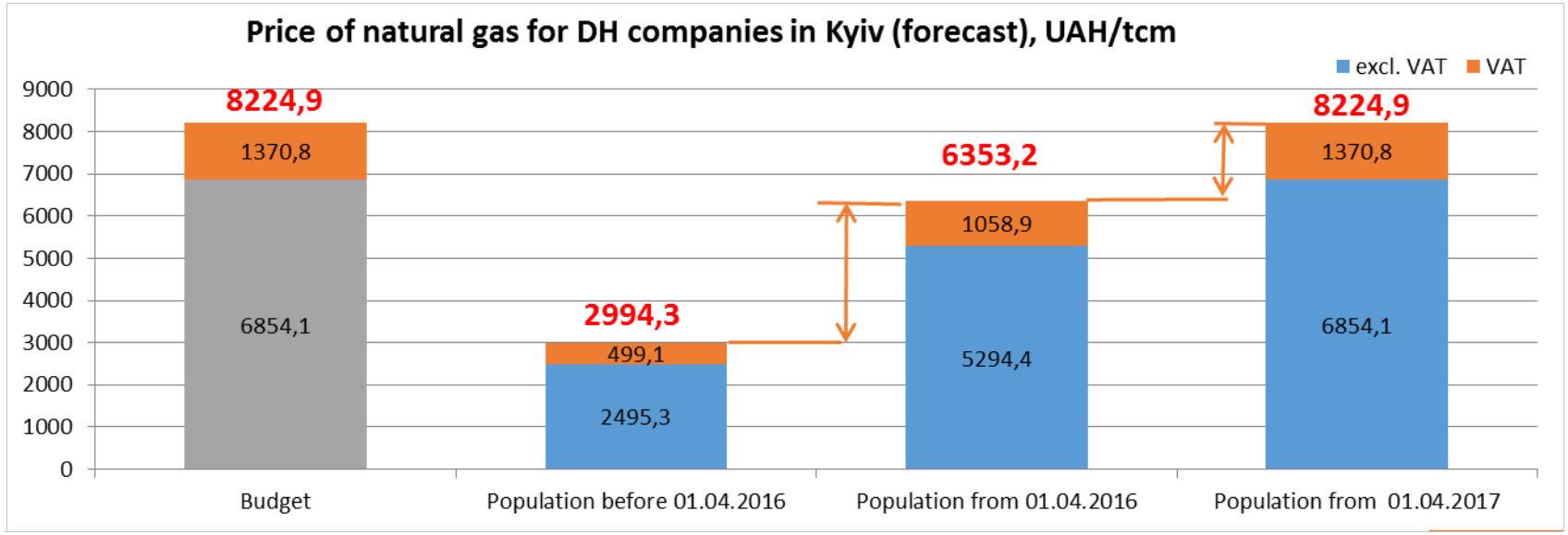
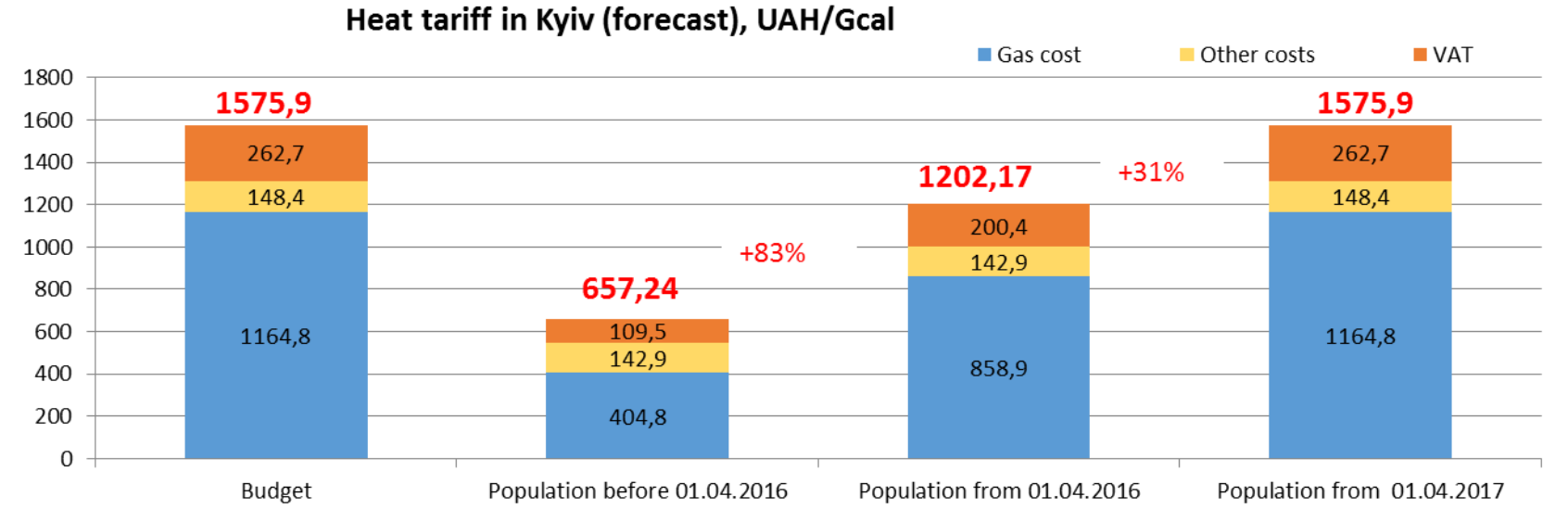
Natural gas prices and thermal energy tariffs





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Techno-economic indicators for biomass boiler and CHP (wood chips) for heating and hot water supply of population

Indicator	Wood chips boiler 10 MW	Wood chips CHP 6 MW_e + 35 MW_{th}
Price of biomass fuel with delivery, UAH/t without VAT	800	800
Fuel consumption, ths. t/year	35	98
Economical indicators:		
- gas saving, million m^3/year	9,5	21,3
Total investment, million Euro	**1,4**	**21,0**
Discounted payback period (discount rate is 10%), **years**		
- tariff 902 UAH/Gcal without VAT from 1.04.2016 *	3,5	11,7
- tariff 1182 UAH/Gcal without VAT from 1.04.2017 *	**1,5**	**7,3**

* tariff rate of 0.9 in comparison with natural gas

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Techno-economic indicators for biomass boiler and CHP (straw) for heating and hot water supply of population

Indicator	Straw boiler 10 MW	Straw CHP 6 MW_e + 35 MW_{th}
Price of biomass fuel with delivery, UAH/t without VAT	**750**	**750**
Fuel consumption, ths. t/year	25	70,3
Economical indicators:		
- gas saving, million m^3/year	9,5	21,3
Total investment, million Euro	**3,6**	**27,3**
Discounted payback period (discount rate is 10%), **years**		
- tariff 902 UAH/Gcal without VAT from 1.04.2016 *	5,7	13,6
- tariff 1182 UAH/Gcal without VAT from 1.04.2017 *	**2,9**	**8,7**

* tariff rate of 0.9 in comparison with natural gas

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Practice of animal husbandry residues handling and logistic

Where constructed	Year of start-up	Live-stock	Substrates	Loadingtons/ day	Total reactors volume, m^3	Installed electric capacity of CHP, kW	Technology supplier
Pig farm of «Zaporozhstal», Zaporizhza	1993	8000-12000	Pig manure	20…22	595	-	Bigadan Ltd", Denmark
Pig farm of «Agro-Oven», Dnipropetrovsk reg.	2003	15000	Pig manure	80	2 x 1000	180	BTG, Netherlands
Cattle farm of «Elita», Kyiv reg.	2009	1000	Cattle (90%) + Pig manure (10%)	60	1500	250	LIPP, Germany
Cattle farm of «Ukrainian milk company», Kyiv reg.	2009	4000 + 2000	Cattle manure	400	3 x 2400 + 1000	625	Zorg, Ukraine
Pig farm "Danosha", Ivano-Frankivsk reg.	2013	55 th. pigs	Pig manure	245 t/d		1064	Poldanor
Poultry farm "Oril' Lider" of "Myronivskyi khliboproduct", Dnipropetrovsk reg.	2012	30 mln. heads per year	Litter + maize sillage	140 t litter + 80 ts maize silage	10 x 3500	5000	NVT, Netherlands





Existing barriers for energy production from biomass

- Subsidized internal prices of natural gas for population and DH sector
- Underdeveloped market of biomass as fuel
- Lack of financial incentives for the implementation of bioenergy projects
- Imperfect tariff system for the heat production from biomass (self cost + 6%)
- No market of organic fertilizers
- Lack of legislation for the production of biomethane
- Complicated procedure for allocating land for bioenergy plants

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Legal and regulatory incentives

- Draft law 2010-d dated 19.05.2015 «On amendments to some laws of Ukraine to provide competitive conditions for the production of electricity from alternative energy sources». Was adopted as the law of Ukraine 514-VIII dated 04.06.2015.
  - deleted requirement of local content, corrected term "biomass", increased Green Tariff for biomass and biogas by 10% (12,39 Eurocents/kW*h without VAT).

- Draft law 2529a dated 26.08.2015 «On amendments to some legislative acts of Ukraine on simplification of procedures for land allocation for construction of objects for the production of heat and/or electricity from renewable energy sources and/or biofuels». Was supported by the Committee of Fuel and Energy Complex and the profile Committee of Land Relations and Agricultural Policy.

- Draft law 4334 dated 30.03.2016 «On amendments to Law of Ukraine "On Heat Supply" on stimulation of heat energy production from alternative energy sources".

- Started work on establishment of competitive market of heat.

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Conclusions

- Bioenergy sector actually replaces 3.0 billion m^3/year of natural gas in Ukraine. About 5000 MW thermal on biomass is operated, including 2500 MW in private houses, 500 MW in public sector, 2000 MW in industry.

- National Action Plan on RE up to 2020, sets the task to achieve total gas replacement by biomass on 7.2 billion m^3/year in 2020.

- This requires significant increase of biomass heat generating equipment: from 5000 MW th in 2015 to 16000 MW th in 2020 and will reflect an actual capacity increase in 3.2 times.

- This requires significant increase of agricultural by-products and energy crops consumption. Capacity of boilers working on agricultural by-products and energy crops should be increased from about 500 MW th (10%) in 2015 up to 11000 MW th (70%) in 2020.

- Law 514-VIII (in force from July 2015) has removed most of barriers for development of RE power projects and settings of “green tariffs” for them.

- Market is open and projects are mostly feasible in the next sectors:
  - heat production from biomass for private buildings;
  - heat production from biomass for public, industrial and commercial consumers;
  - power production from biomass (CHP is more feasible option);
  - large scale biogas projects with existing heat consumption.

- It is expected feasibility of biomass boilers and CHP in DH sector in 2016 (after planned increase of gas prices for DH companies).

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HOW TO PREPARE AN ABSTRACT

The abstract, single spaced in English (11 size Times New Roman font), should include:
Applicable subject number (1 to 5 above)
Full title
Full name and address of one author for all correspondence
For each author and co-authors, full na me, affiliation, address, phone/fax/e-mail
Purpose of the work
Approach
Scientific innovation and relevance
Results
Conclusions
An abstract should not exceed 1 page of A4 format (210 x 297 mm).

Deadline for receipt of abstracts:
1 August 2016

The Proceedings of the Conference in English and Ukrainian/Russian and presentation materials will be provided to all the participants after the Conference.

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Organizing committee:
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September 20-21, 2016
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Thank you for attention!

Welcome to Ukraine and to UABio!

Georgiy Geletukha

tel./fax: +380 44 332 9140
E-mail: geletukha@uabio.org
www.uabio.org

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