Short review of the biomass market in Ukraine. Recent development and future outlook

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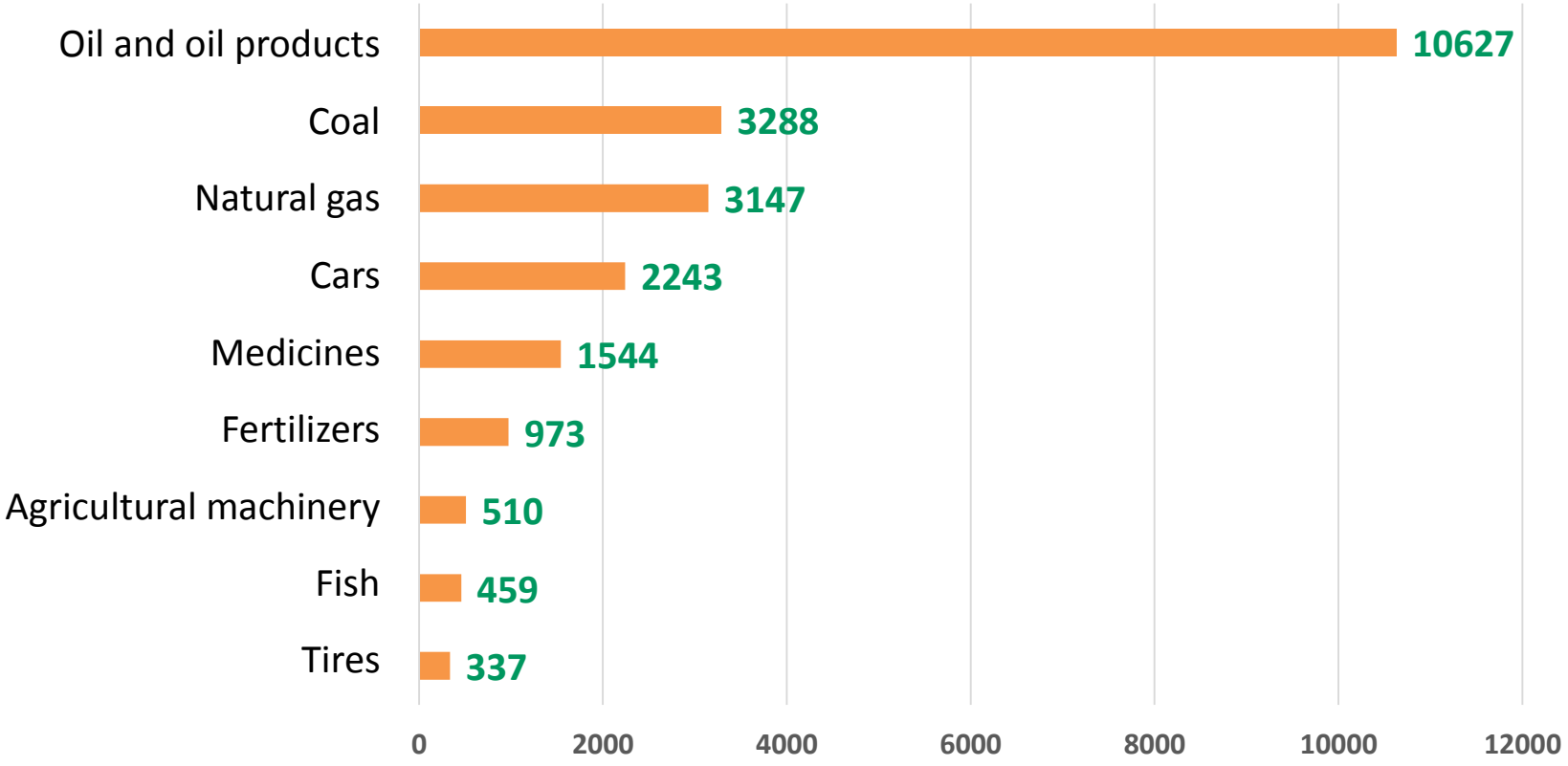
Seminar-presentation of project results/
Kyiv/05.02.2020

MINISTRY FOR FOREIGN AFFAIRS OF FINLAND

Ukraine imports $ 17 billion of energy curriers in 2018, up 27% of total value

Structure of Ukrainian import in 2018. Main components

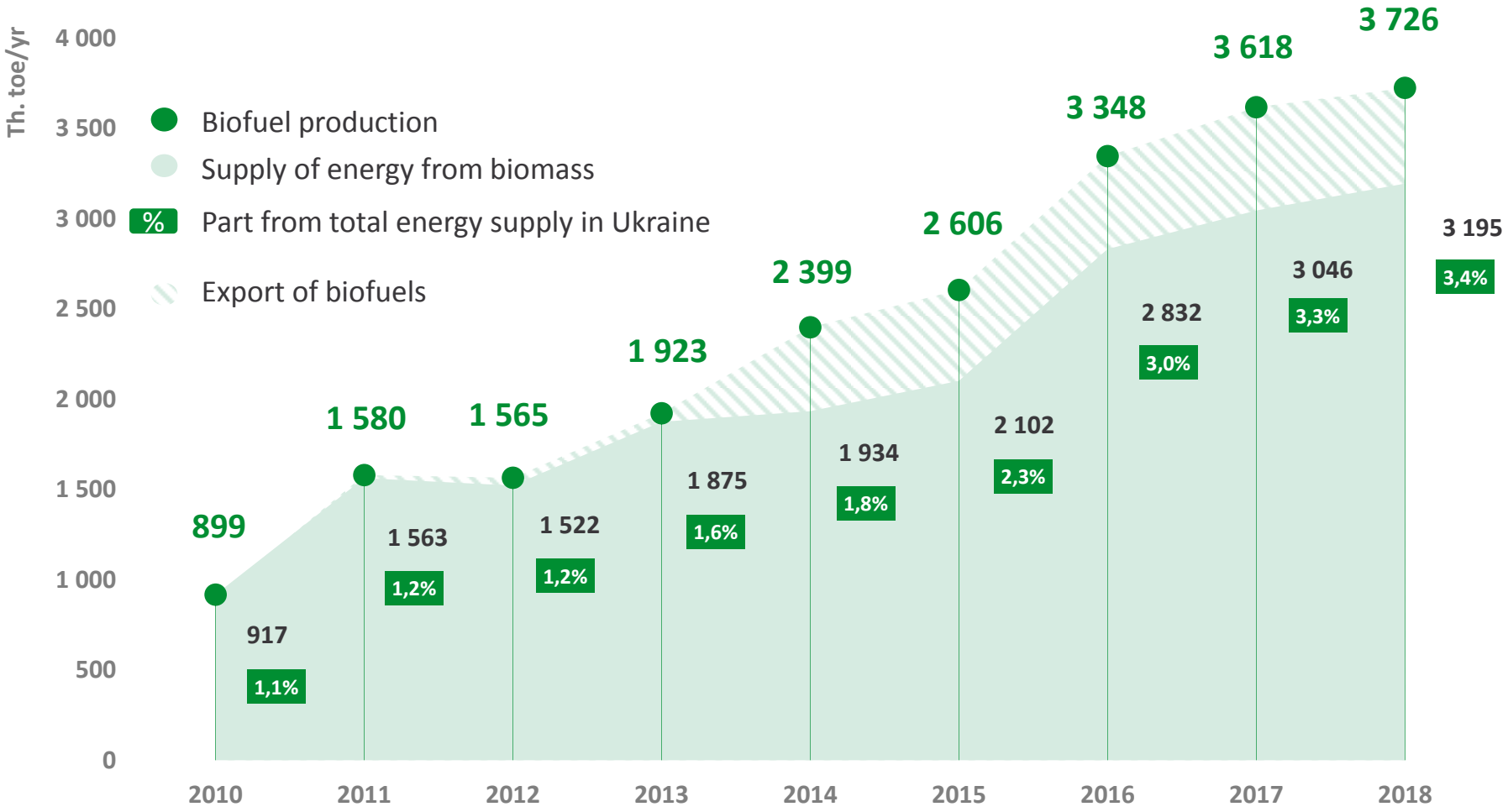


Source: State Statistics Service of Ukraine

Bioenergy grouth in Ukraine

31%

per annum



Source: State Statistics Service of Ukraine

Forecast of Bioenergy Development in Ukraine – growth in more than 5 times (2015 – 2035)

Structure of total primary energy supply according to the Energy Strategy of Ukraine until 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, Mtoe	90,1	82,3	87	91	96

Source:
http://mpe.kmu.gov.ua/minugol/control/uk/publish/article?art_id=245234085&cat_id=35109

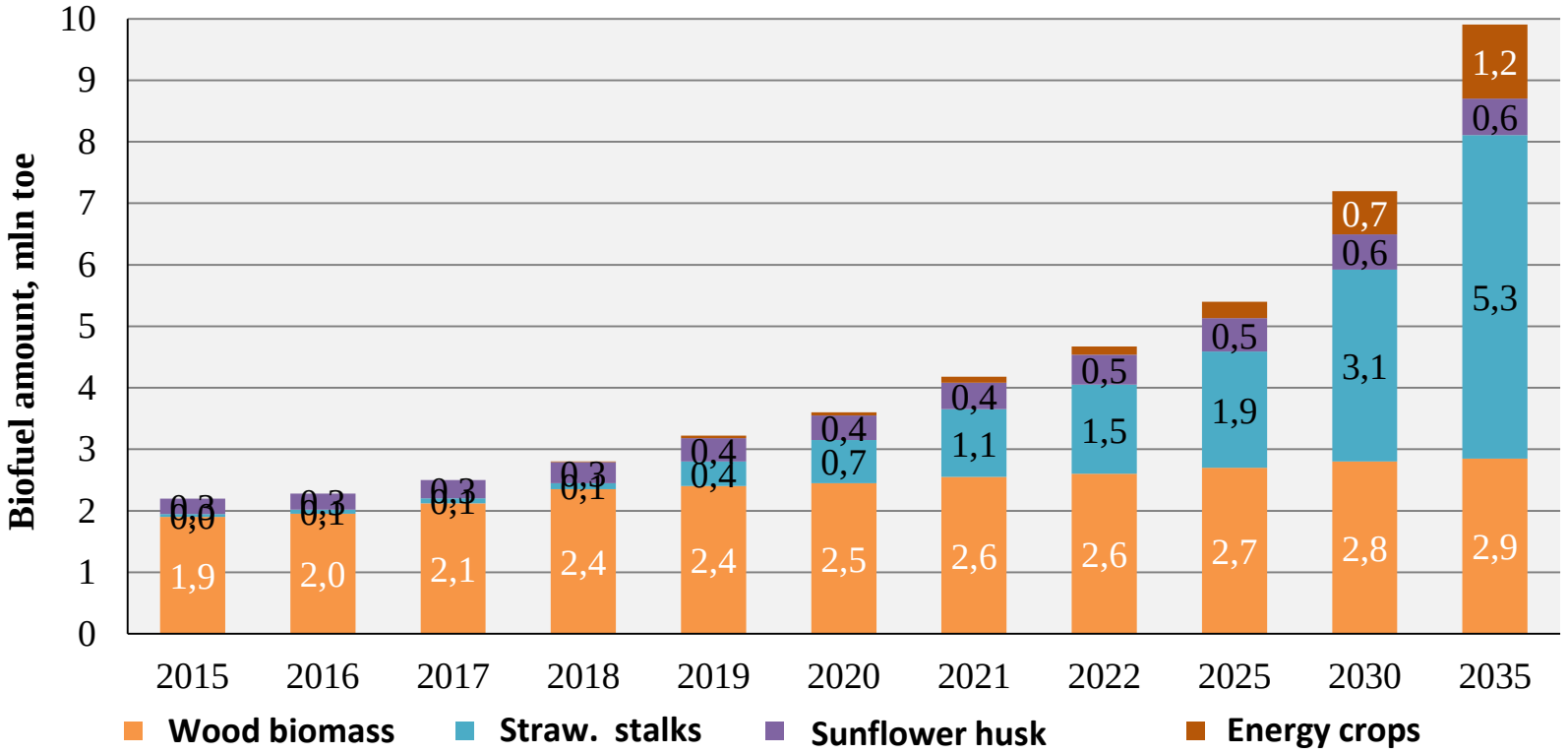
Energy Potential of Biomass in Ukraine exceeds 25 bln m^3 of natural gas/year (2017)

Type of biomass	Theoretical potential, Mt	Potential available for energy		
		Share of theoretical potential, %	Mtoe	
Straw of grain crops	35,6	30	3,65	43%
Straw of rape	3,9	40	0,54	
By-products of grain corn production (stalks, cobs)	32,1	40	2,45	
By-products of sunflower production (stalks, heads)	23,2	40	1,33	
Secondary agricultural residues (sunflower husk)	2,4	100	0,99	
Wood biomass (firewood, felling residues, wood processing waste)	6,6	94	1,54	
Wood biomass (dead wood, wood from shelterbelt forests, pruning)	8,8	44	1,01	
Biodiesel (rapeseed)	-	-	0,31	
Bioethanol (corn and sugar beet)	-	-	0,59	
Biogas from waste and by-products of agricultural sector	1,6 bln m^3 CH_4	50	0,68	
Landfill gas	0,6 bln m^3 CH_4	34	0,18	
Sewage gas (industrial and municipal wastewater)	1,0 bln m^3 CH_4	23	0,19	
Energy crops:				
- willow, poplar, miscanthus (1 mln ha*)	11,5	100	4,88	36%
- corn for biogas (1 mln ha*)	3,0 bln m^3 CH_4	100	2,58	
TOTAL	-	-	20,92	

* *In case of growing on 1 mln ha of unused agricultural land.*

Agrobiomass is a Future of Bioenergy in Ukraine

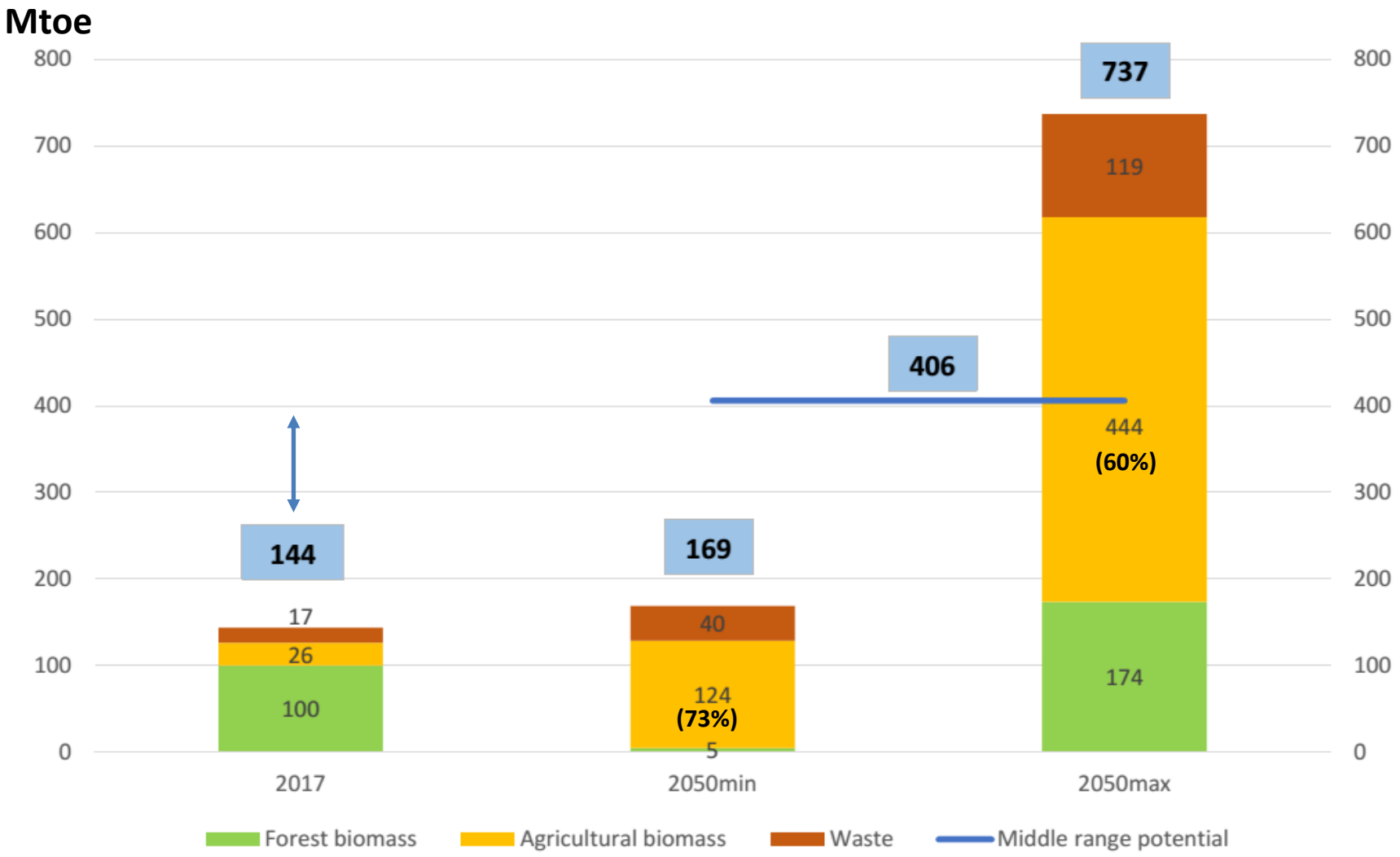
Forecast of total consumption and structure of solid biofuels in Ukraine (2015 – 2035)



Biomass type	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, Mtoe	**2,20**	**2,28**	**2,50**	**2,80**	**3,22**	**3,60**	**4,18**	**4,67**	**5,40**	**7,20**	**9,90**

Agrobiomass is a Future of Bioenergy in Ukraine

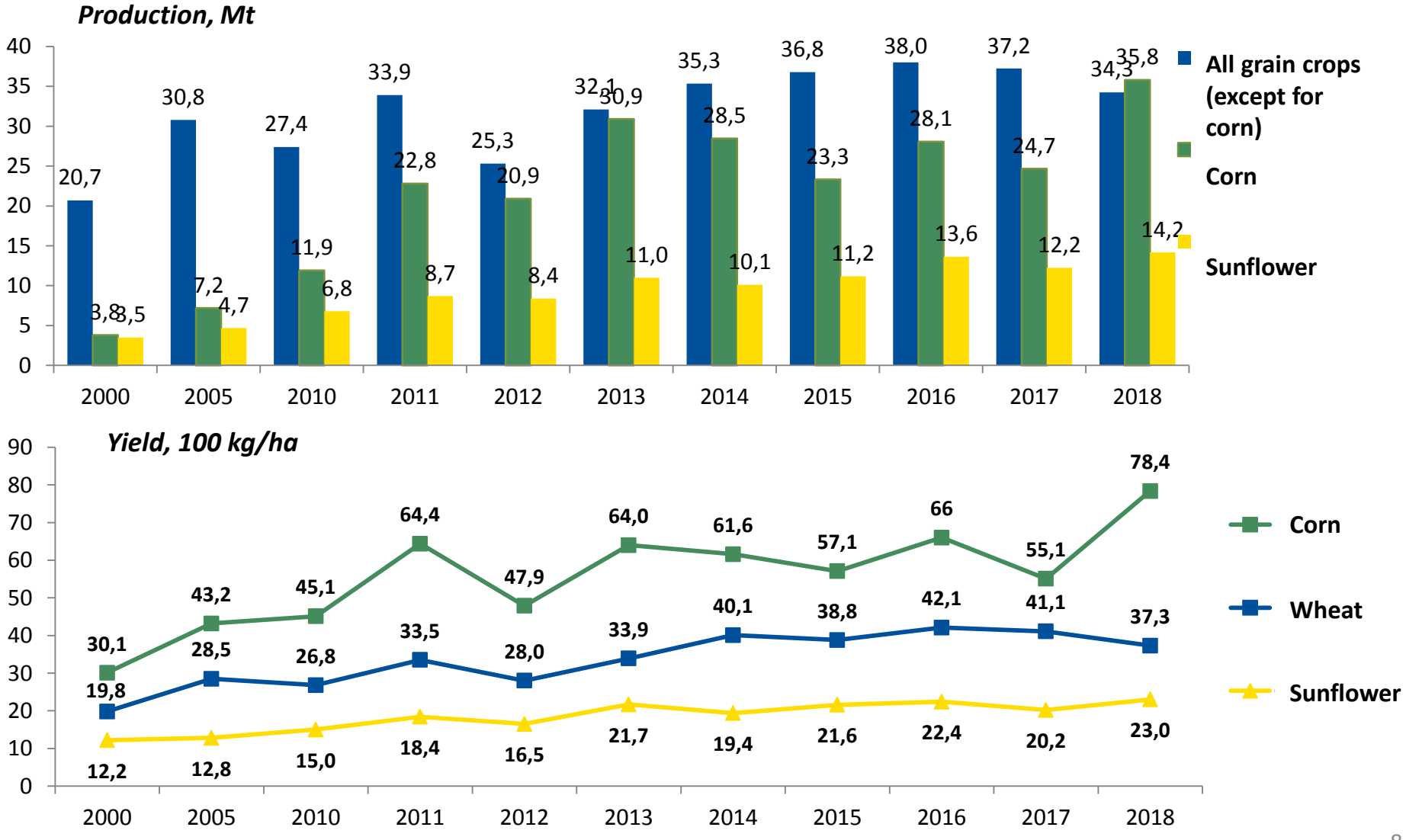
Gross inland energy consumption of biomass in 2017 and potential in 2050 for the EU-28



Source: Statistical Report. Biomass supply, Bioenergy Europe, 2019
https://bioenergyeurope.org/statistical-report-2019/

Corn is a bioenergy perspective for Ukraine

Dynamics of production of main agricultural crops in Ukraine



Corn is a bioenergy perspective for Ukraine

Chemical composition and properties of different types of biomass

Parameters	Yellow straw	Grey straw	Straw of winter wheat	Corn stalks*	Sunflower stalks*	Wood chips
Moisture, %	10-20	10-20	11.2	45-60 (after harvesting) 15-18 (air dried)	60-70% (after harvesting) ~20 (air dried)	40
Lower heating value, MJ/kg	14.4	15	14.96	16.7 (c.p.) 5-8 (W 45-60%) 15-17 (W 15-18%)	16 (W<16%)	10.4
Volatile components, %	>70	>70	80.2	67	73	>70
Ash, %	4	3	6.59	6-9	10-12	0.6-1.5
Elementary composition, %:						
carbon	42	43	45.64	45.5	44,1	50
hydrogen	5	5.2	5.97	5.5	5.0	6
oxygen	37	38	41.36	41.5	39.4	43
chlorine	0.75	0.2	0.392	0.2	0.7-0.8	0.02
potassium (alkali metal)	1.18	0.22	–	cobs: 6.1 mg/kg d.m.	5.0	0.13-0.35
nitrogen	0.35	0.41	0.37	0.69; 0.3	0.7	0.3
sulphur	0.16	0.13	0.08	0.04	0.1	0.05
Ash melting temperature, °C	800-1000	950-1100	1150	1050-1200	800-1270	1000-1400

d.m. – dry matter; W – moisture.

** Volatile components, ash, and elementary composition are given as d.m. mass %.*

Technological schemes for corn stover harvesting

- **Combine + tractor with stalk-chopping windrower + tractor with baler**



SC1 (20-35 t/hour)

SC2 (8-10 t/hour)

- **Forage harvester system: combine +tractor with stalk-chopping windrower + forage harvester + tractor with trailer.**




SC3 (20-40 t/hour)

Forage loader wagon system: combine + tractor with stalk-chopping windrower + tractor with forage loader wagon.



SC4 (10-20 t/hour)

Potential of energy crops is equivalent to 8.9 billion m^3 of natural gas per year (for 2 million ha)

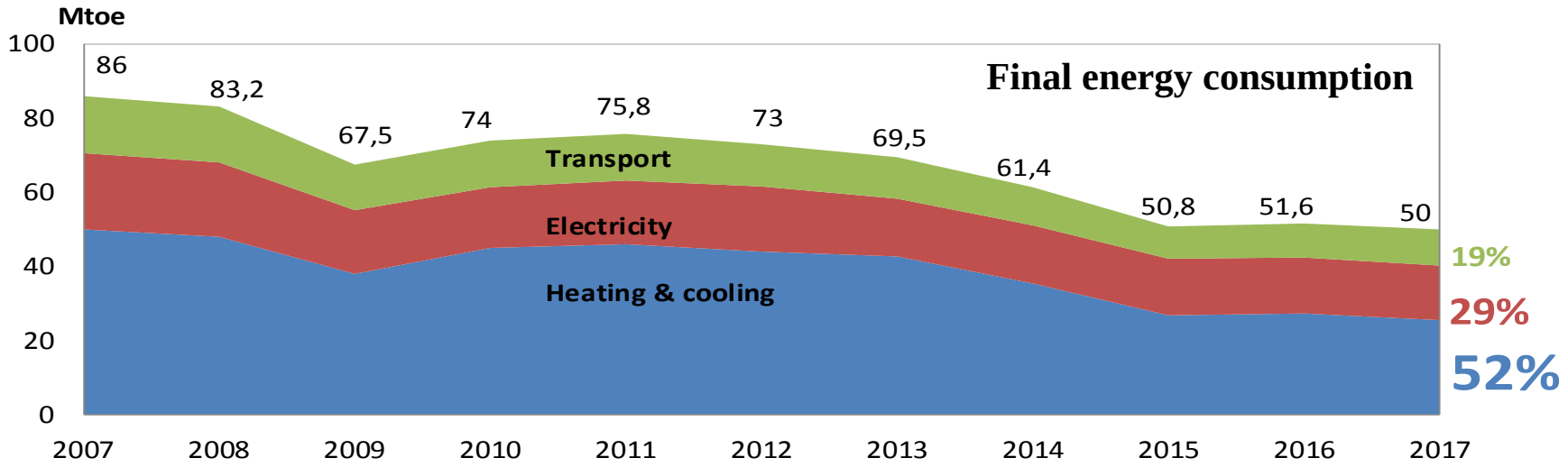
Type of biomass	Theoretical potential, Mt	Potential available for energy, Mtoe
Willow, poplar, miscanthus (for 1 Mha)	11.5	4.88
Corn for biogas (for 1 Mha)	3.0 bln m^3 CH_4	2.58
TOTAL		7.46

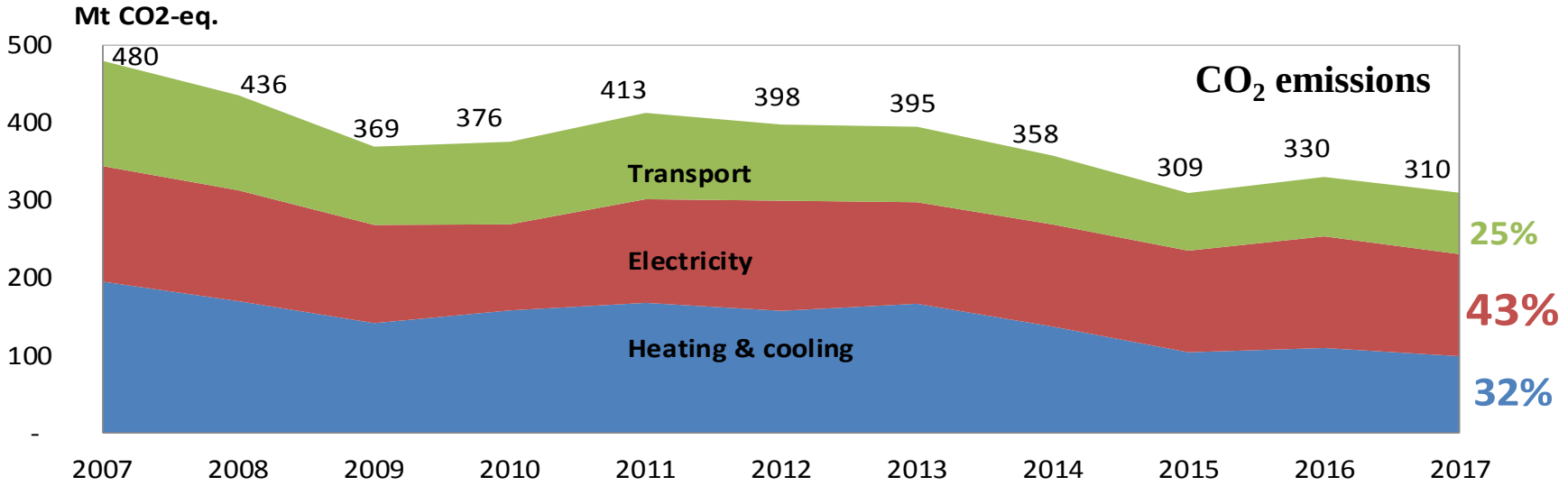
Economic indexes for energy crop production

Name	Unit	Poplar		Willow		Miscanthus	
		No subsidy	Subsidy: 20 000 UAH (649 EUR)	No subsidy	Subsidy: 21 000 UAH (681 EUR)	No subsidy	Subsidy: 24 000 UAH (778 EUR)
Capital costs	EUR/ha	1192	541	1282	599	4021	3240
Subsidy as a share of capital costs	%		55		53		19
Operating costs	EUR/ha	176	176	45	45	45	45
Profit	EUR/ha	396	396	310	310	854	854
Credit share (8 years; 8%/yr)	%	60	60	60	60	60	60
NPV	EUR	557	1085	715	1250	3684	4334
IRR	%	11.3	21.7	11,9	21.4	17.0	21.5
Simple payback period	EUR	8.4	5.0	8.2	5.3	6.0	4.7

«Energy» is not equal «Electric Energy»

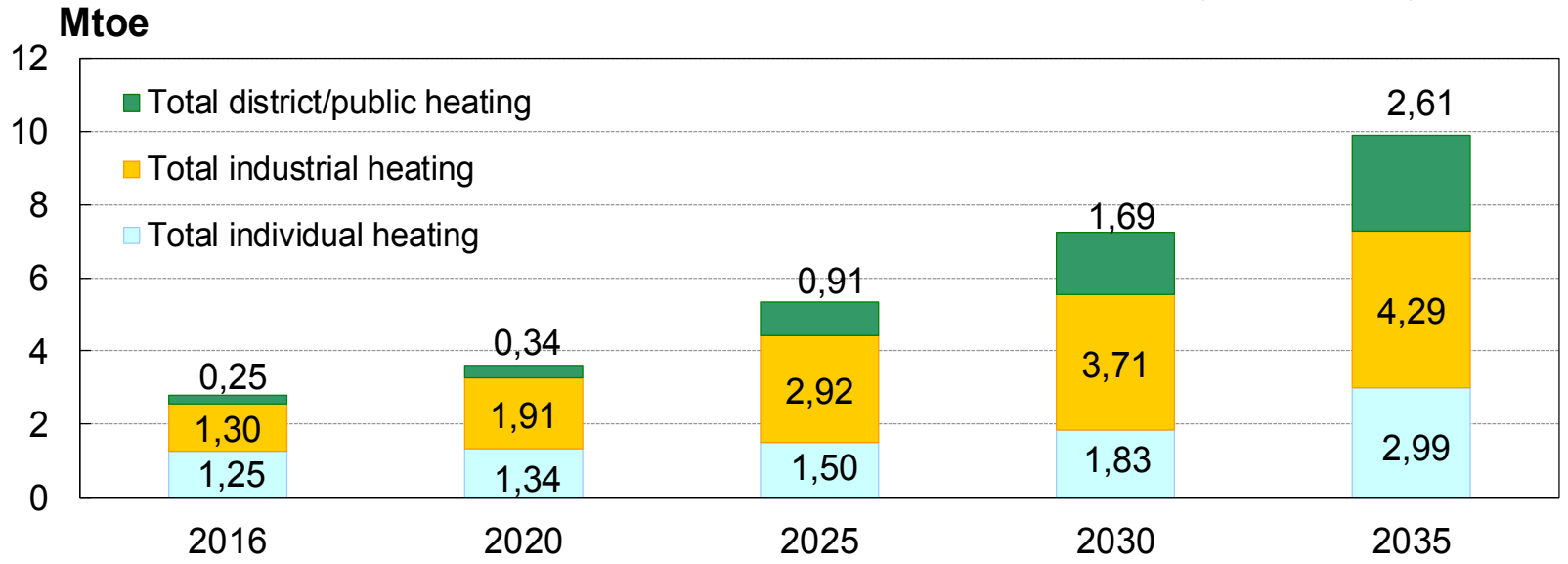
Structure of final energy consumption of Ukraine and CO_2 emissions, 2007-2017



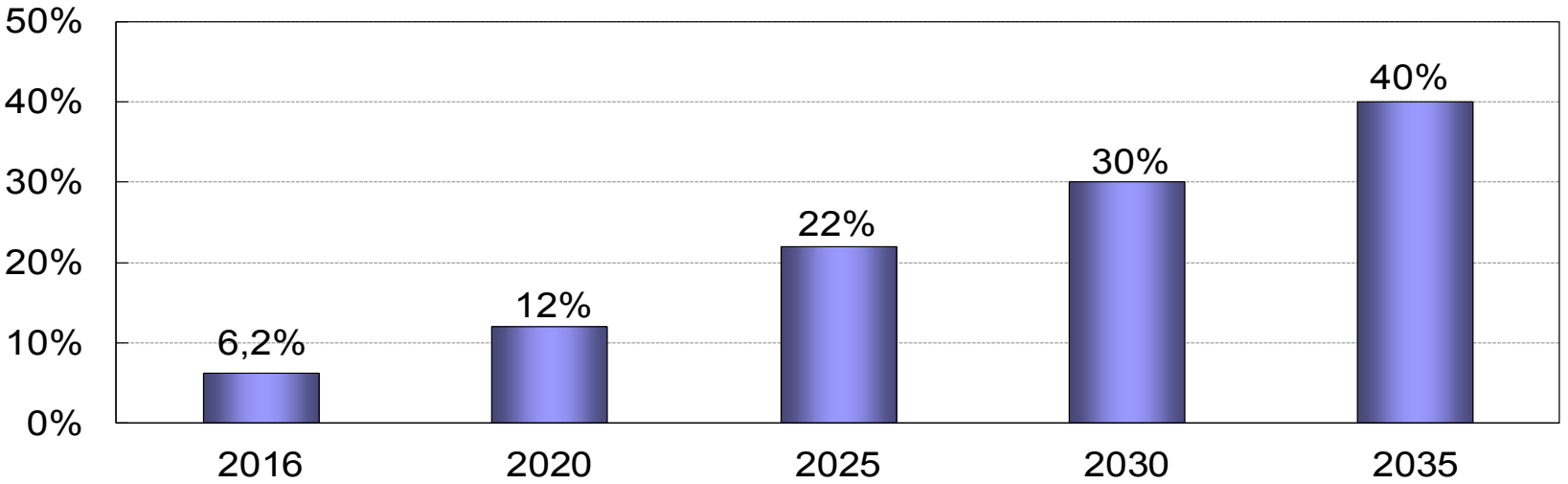


Moving to 40% of Renewable Heat in Ukraine

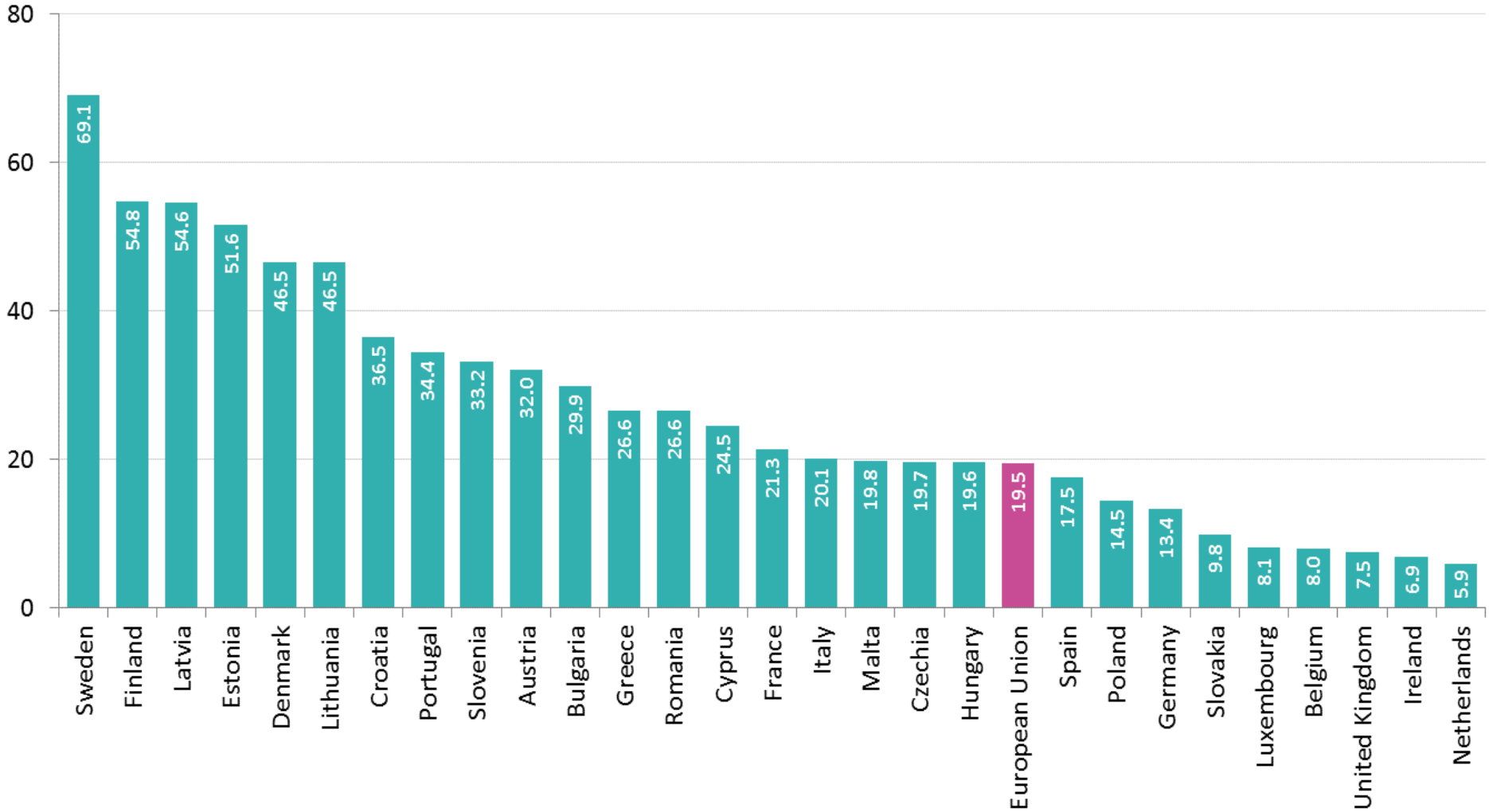
Forecast of Renewable Heat Production in Ukraine (2016-2035)



Forecast of RES share in heat production (2016-2035), %



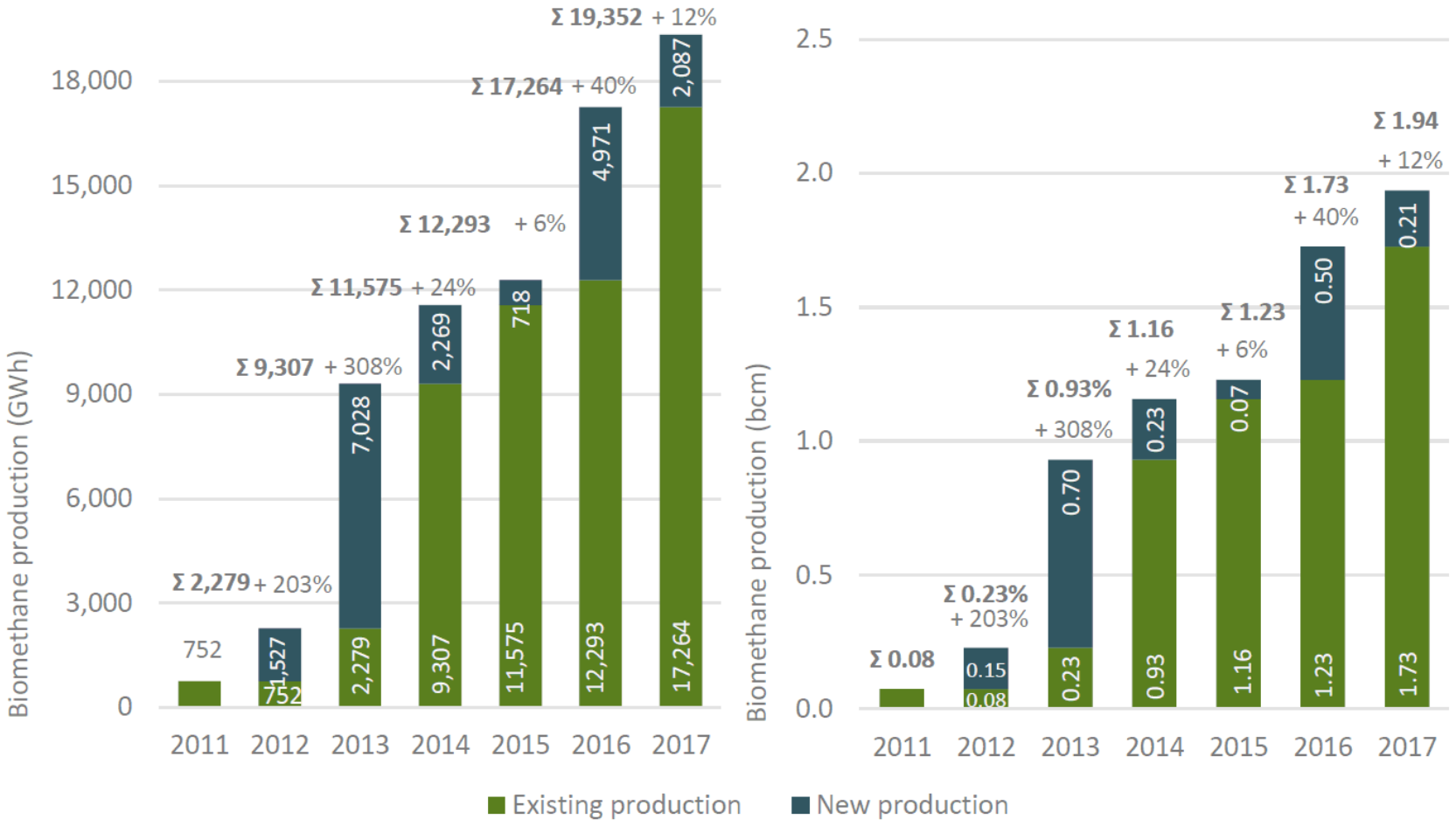
RES share in heat and cold production in the EU in 2017 (%)



Source: ec.europa.eu/eurostat

Biomethane – Future of Biogas

Biomethane production in European countries (2011-2017)

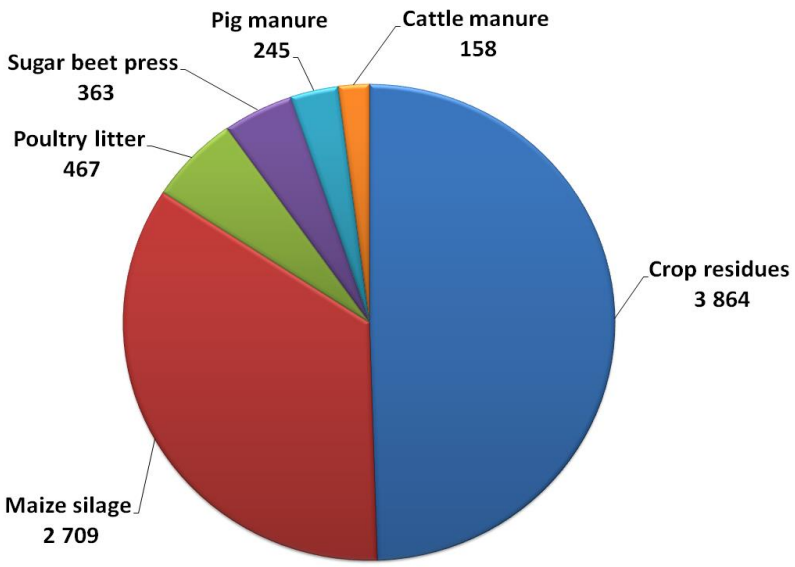


GWh

bcm (billions m^3 of CH_4)

Source: EBA Statistical Report 2018

Biomethane – Future of Biogas



Biomethane potential in Ukraine in 1000 $_{N}m^3$ -
7.8 bln m^3 CH_4 or
25% of NG consumption (2018)

Necessary amendments to the Law of Ukraine "On alternative energy sources"

Energy unit category	«Green» tariff, EUR/kWh w/o VAT
Electricity from biomethane	0,123

Priorities for improving normative and legal basis of bioenergy

Lobbying the **required level of state support quotas** for biomass / biogas projects.

Improvement of the stimulation mechanism for **biomethane** production and consumption.

Improvement of the of stimulation mechanism for power generating capacities on biomass, biogas and biomethane for operation in the **balancing capacities market**.

Introducing of the stimulating mechanism for **energy crops cultivation and use** in Ukraine.

Support for implementation of e-commerce system for solid biofuels.

Support the introduction of competition in district heating systems.

Support of the developed mechanism for stimulating the production and use of **liquid biofuels and biogas for transportation.**

Promoting the need to abolish the **tax on CO_2 emissions** from boiler houses, TPPs / CHPs on biomass and biogas.

We are making the green future

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