Promoting Renewable Energy Investments for Climate Change Mitigation and Sustainable Development

Demonstration project of Rokytne sugar refinery as an example of prolific biogas use

Ukrainian Energy Sector Characteristics

Key challenges of energy sector:

- poor efficiency and high energy intensity (3 times higher than in OECD countries and 3-4 times higher than in the EU countries;
- one of the highest carbon intensities in the world;
- high dependence on energy import and declining domestic fossil fuel production;
- ineffective market regulatory framework and poor investment climate;
- low level of local energy security and risk of energy system collapse.

Import of natural gas decreases, as well as internal natural gas mining, oil output and coal mining. Bioethanol and biodiesel output are insignificant.

Shares of electricity produced in 2014 and 2015 by plant types

	2014	2015
Nuclear PP	48,6	55,7
CHP	37,6	31,5
TPP	3,6	3,6
Small HPP	4,5	3,3
Hydro Pump Storage P	0,5	1
Isolated PP	4,3	3,9
Renewables	0,9	0,9

Source: Markevych, K. Results of the energy sector of Ukraine. Razumkov Centre. 2015

Ukraine is dependent on imported natural gas, nuclear fuel and steam coal, primarily from Russian Federation.

Energy sector in 2015 provided 52% of all country's CO2 emissions.

Despite the share of renewables in electricity balance remains unchanged within last two years, its actual output in 2015 declined

Current Policy for renewable energy investments (I)

- The Treaty Establishing the Energy Community (signed by Ukraine is 2005); Association Agreement between Ukraine, on one hand, and the European Union, the European Atomic Energy Community and their Member States, on the other hand (2014); Energy Strategy of Ukraine until 2030 (2013); National Renewable Energy Action Plan (2014) and the Strategy for Sustainable Development of Ukraine until 2020 (2015).
- The Law of Ukraine "On combined heat and power (cogeneration) and waste energy potential".
- The Law of Ukraine "On Electric Power Industry" defines the feed-in tariff since 2009.
- Tax Code of Ukraine and subsequent laws presume that electricity generated by RES is not subject to excise duty; the supply of equipment, machinery and equipment - production and reconstruction of vehicles that are not produced in Ukraine and operate on biofuels, including agricultural machines is exempt from value added tax until 2019 in accordance with the Law of Ukraine "On alternative fuels".
- law “On Amendments to the Law of Ukraine “On electric energy industry” to promote electricity production from alternative energy sources” (2012), “On alternative types of fuels” (2000 with amendments); “On Amendments to several Laws of Ukraine regarding promotion of production and use of biologic types of fuels” (2009).
- In 2014-2015, all electricity generating plants with capacity of more than 200 kW were attributed to the objects of V category complexity (like nuclear power plants), and, thus, required licensing. Now this law provision is abolished, and biogas producers do not need license. However, heat output and transportation requires licensing.
- Order of the Cabinet of Ministers of Ukraine dated Oct-16-2014 №1014-r "On approval of a plan of short- and medium-term measures of natural gas consumption reduction until 2017".
- National Renewable Energy Action Plan: 11% of energy from RES by 2020.
- The system of financial incentives to promote RES use, other than FIT, include reduced taxes for renewable energy companies; income tax exempt; exempt from import duties when importing certain types of equipment for RES.

Current Policy for renewable energy investments (II)

- The Law of Ukraine “On Amendments to Certain Laws of Ukraine to ensure competitive conditions of electricity production using alternative energy sources” (2015):
  - FIT for electricity, produced from biomass (12.39 eurocents/kWh),
  - Elimination of previously existing local content requirement.
  - Remuneration in the form of surcharges for FIT for entities using Ukrainian components in the design and manufacture construction of energy objects.
- Law of Ukraine № 287-VIII "On animal by-products not intended for human consumption”: the disposal of animal origin waste is carried out exclusively by specialized companies for utilization of animal origin waste and may not be carried-out by companies that produce products of animal origin intended for human consumption. Dung/manure and uninfected animal residues belong to the 2nd class of side products of animal origin, and they have to be converted to organic fertilizer after treatment by compulsory sterilization under pressure; or composted or transformed into biogas after processing by sterilization under pressure.
- Processing capacities of animal origin by-products must be located separately from enterprises, which process food products or produce animal origin products; they should be provided with technical equipment, which guarantees processing. The companies involved in waste utilization are the market operators. Market operators who carry out disposal or removal of animal by-products and food processing are subjects to (insignificant) fine.
- Since April 2015, natural gas tariffs for households grew almost 6-fold Overall, natural gas tariffs’ increase for households during 2015 was 285%; heat tariff increased by 67%; hot water tariff increased by 60%. Utility growing bills make all possibilities to decrease bills for heat more attractive even for households.

Estimated Biogas Potential

Company type	Main types of waste	Dry matter content, %	Number of companies	Total wastes generated, mln t/year	Potential for biogas production, mln m^3/year
Cattle farms	Manure	10 – 12 %	5,734	20,5	719
Pig farms	Manure	7 – 10 %	6,515	4,7	180
Poultry farms	Litter	25 – 30 %	861	2,9	326
Breweries	Spent grain	20 – 25 %	50	1,4	171
Sugar factories	Beet pulp	10 – 12 %	184	6,5	216
Ethanol plants	Distillery stillage	6 – 8 %	82	4,5	180
Milk processing / cheese production	Sewage Milk whey	6 – 7 %	300	0,9 2,5	90
Energy plantations	Corn silage	20 – 35 %	842 000 ha (18 % of available areas)		1610
Total				43,9	3492

Source: Possibilities of natural gas substitution in Ukraine by solid biomass and biogas (Gelebukha G.G., Open meeting of Q-club "Alternatives of problematic Russian gas: are they real in Ukraine" Kyiv, Ukrainian House, December 15, 2011)

- The most promising are the projects of co-generation and biomass-fired CHPs, especially those related to sugar-refineries, farms, and sunflower processing plants, where biogas is a result of methane digestion. Another important biogas sources are wastes landfills, but their processing is in its infantry.
- Biomass potential is far from been deployed. IRENA: less than 5% of agribusiness-derived biogas potential is used in Ukraine. In 2014, 49.5 mln m3 of biogas from agricultural wastes and 33 mln m3 of biogas from landfills were produced and used.

Assessment Methodology

- Computable general equilibrium (CGE) model, developed in the Institute for Economics and Forecasting, Ukrainian National Academy of Sciences.
- Key input data used for CGE model calibration is represented via Social Accounting Matrix – an extended version of input-output (IO) table that incorporates additional information regarding transfers between economic agents. Key input data for the SAM comes from 2013 and is updated to 2015 and based on the latest data from national accounts.

FAO: Growth originating in agriculture and in agriculture related industry is at least twice as effective in benefiting the poor as growth in non-agricultural sectors. In Ukraine, people living in rural areas and small towns are more poor than those residing in cities.

We advocate for biogas use for further electricity and heat production by agribusiness companies with further sell of heat to the neighboring households, as this option of biogas use is the most favorable in the existing economic and legislative conditions in Ukraine. *Our main policy proposal is to create more favorable conditions for the existing and new agribusiness companies to use biogas as one of waste management policies,* when organic wastes cannot be sent to landfills.

Demonstration project of Rokytne sugar refinery

- Biogas plant produces heat and electricity. Electricity will be used to satisfy refinery own needs, and would be sold to the greed against FIT. Heat would be used for inner needs, and sold to the neighboring boiler houses and to the community at the 5% lower prices than those offered by the centralized heating supplier.
- Capacity of the plant is expected to be 20 MW.
- 1st unit capacity (2015): 2.25 MW_h and 2.16 MW_{el}.
- 2nd unit is expected to be launched in late 2016.
- Yearly biogas output is 9.3 mln m3. Annual net electricity output is expected to be 16 900 MWh, and it would be sold against the feed-in tariff.
- 1st unit's annual electricity net output - 2.25 MWh, annual net heat output – 2.22 MWh.
- Feedstock: pressurized sugar beet bagasse (57 600 t/year), cow manure (35 040 t/year), chicken drop (14 053 t/year).
- The investments required - EUR 210 mln. The overall investments to build and launch the first unit are EUR 10 mln.

Advantages of biogas plants:

- combination of wastes of seasonally operating companies (eg., sugar plants) with wastes of farms allows energy output within the entire year;
- new jobs or annual income possibilities for people employed at sugar plants (in Ukraine, sugar plants are mostly located in small towns, being town's major employer);
- utilization of very wide range of agricultural residues;
- production of organic fertilizers, that could be used for organic farming (another way to increase the competitiveness of Ukraine's agriculture);
- provides possibilities for proper manure management (which is good for odor reduction, soil renovation, saving of potential arable land that otherwise would be used for agricultural waste pits),
- possibility to produce energy close to the places where agricultural residues are originating (which does not require long-distance transportation of fuel);
- possibility to cover peak load in the network, and to fill in the gap of load, created by intermittent renewables.
- gradual transition toward the model of decentralized energy supply for the local community.
- Agriculture-derived emissions in Ukraine grow – in 2015 agriculture, forestry and fishing contributed 2.7% of overall GHG emissions. The level of emissions from agriculture, such as N2O and CH4, if measured, is not announced by official statistics. In the meantime, CH4 is mostly emitted by cattle manure. Thus, transforming it to energy is a good way to reduce CH4.

Assumptions of analysis:

- Modeling horizon from 2016 to 2030 because FIT is available until 2030. Investments can be distributed evenly among these years.
- Biogas made of a mixture of feedstock types (various animal wastes and corn) is used, with methane content about 60%. Heating value of the biogas is about 22 MJ / m3.
- For biogas output, only silage corn is used (i.e. both corn stalks and cobs are used for ensilage and further methanisation). If corn is planted on 421 thousand hectares (9% of vacant space). The average yield of silage is 33,000 kg / ha. Growing corn on 421 thousand hectares can produce 33,000 kg / ha * 421 000 ha = 13.9 million tons of silage.
- Biogas will be used at large farms, sugar factories, ethanol plants and dedicated corn plantations. In case of half of corn potential for biogas is used, we consider that totally we have 2687 mln m3 of biogas annually. The first unit of Rokytne biogas plant produces 9.3 mln m3 of biogas annually. If annual economically feasible potential of biogas is 2.687 billion m3, it equals 59,114 mln MJ of energy, or 2,452,863,000,000 t.o.e. (1 MJ = 0.0241 t.o.e.).
- The heating value of natural gas is 35 MJ / m3, of coal - 30 MJ / m3.
- Overall efficiency of biogas plants (with production of electricity and heat with available heat consumers) is 75-80%. The model of biogas output and processing, where different types of feedstock (sugar beet and animal residues in our case) are processed to obtain biogas, which further can be used for heat and electricity output, is a well-spread model for biogas plants all over the world.
- Average investments are 3111 EUR/kWh, or EUR 7 mln/2.25 MW. In order to employ 2687 mln m3 of biogas, about EUR 3.8 bln are needed.
- Only few agribusiness companies could run large biogas plants using only their own feedstock and residues. To achieve economy of scale and to use large biogas plants, smaller producers may want to use shared digestion of residues of several companies.

Modeling and evaluation of socio-economic effects of biogas projects implementation in Ukraine

- We assume that potential will be entirely implemented by 2029. There will be a replacement 712,3 mln. toe of natural gas, provided that the full potential is achieved in 2029. Coal would be partially substituted for the electricity production (712.3 million toe of coal would be replaced). Thus during 2016-2029 in case of heat and electricity generation, 9972,5 mln toe of energy would be substituted.
- We assume that natural gas and coal will be substituted with mainly animal wastes that are other industries side products and therefore no growth of intermediate consumption in the production process will happen.
- Additional consumption of corn silage could reach 13.9 million tons.
- To implement the above-mentioned projects in electricity and heat production industry, EUR3.8 bln need to be invested. Investments are assumed to be evenly distributed between heat and electricity output (EUR 1.9 billion for each), and the volume of investments will increase in proportion to the GDP growth rate in 2016-2029.
- In the short and medium-term prospects growth will be in light industry, food and pharmaceutical industries. One can expect recovery of positive dynamics in the production of building materials. In machine building positive dynamics will be demonstrated by computer, electronic and optical products production. With favorable weather conditions, agricultural sector might expect recovery of positive dynamics. Recovery of the overall positive dynamics in economy of Ukraine can be expected starting 2017.
- In 2020-2025, Ukraine's economy will grow quite rapidly. Extractive industry will concede the growth rate to the processing industry and metallurgical industry gradually will be reducing its share in GDP. This trend is likely to continue in the future until 2030. Overall, average rate of real GDP growth during the analyzed period will be about 4%.

Macroeconomic consequences

- Implementation of biogas projects development in Ukraine leads to positive macroeconomic effects starting 2018-2019.
- In 2025-2029 the additional GDP growth and production may reach 0.3%.
- Own funds of enterprises were assumed as the key source of investment resources. The observed nature of economic effects is also caused by the intensive growth of production costs in the first investment years comparing to subsequent periods when costs rising of implementation of biogas projects is overlapped by saving energy consumption and energy resources replacement.

The consequences for households

Although households are not directly involved in the investing processes, the overall economic effects associated with a general increase of the efficiency of electricity and heat energy production, with the substitution of some resources with other ones, and with investment processes intensification indirectly influence on the level of real household income.

For households, moderate negative consequences of implementation of studied measures in the short term are observed.

However, at the aggregate level these effects are not significant and represent less than 0.1% of total income of residential customers.

Overall, in the medium and long term, all household groups will experience a moderate positive impact on real income level.

The impact of the biogas projects implementation on household income, real income deviation from baseline scenario (%)

Indicator \ scenario	Target energy industry development scenario						
	2016	2017	2018	2019	2020	2025	2029
Aggregate income	0.0	-0.1	-0.1	0.0	0.0	0.3	0.2
I decile group	0.0	-0.1	-0.1	0.0	0.0	0.3	0.3
II	0.0	-0.1	-0.1	0.0	0.0	0.3	0.3
III	0.0	-0.1	-0.1	0.0	0.0	0.3	0.3
IV	0.0	-0.1	-0.1	0.0	0.0	0.3	0.3
V	0.0	-0.1	-0.1	0.0	0.0	0.3	0.3
VI	0.0	-0.1	-0.1	0.0	0.0	0.3	0.3
VII	0.0	-0.1	-0.1	0.0	0.0	0.3	0.3
VIII	0.0	-0.1	-0.1	0.0	0.0	0.3	0.3
IX	0.0	-0.1	0.0	0.0	0.0	0.3	0.3
X (the highest group)	0.0	-0.1	-0.1	0.0	0.0	0.1	0.1

Households are divided into decile groups in terms of average per capita income.

Sectoral effects

- Biogas projects in Ukraine will lead to moderate structural changes. In 2017 the number of industries with moderate slowdown in output growth rate is eleven, in 2029 there are only three such industries.
- Moderate growth in demand for investment products is accompanied by an increase in volumes of investments in aimed industries including engineering and construction. The biggest slowdown in growth observed in the case of coal, the demand for which is declining due to substitution by solid and gaseous biofuels. In general, the main impact of the biogas projects implementation is in the field of real sector of Ukraine economy, while structural changes in the services sector almost do not happen.
- As mentioned earlier, Ukraine has a good potential of biogas technologies and extended capacity to estimate the existing feedstock flows, to make the feedstock grow by means of increasing livestock breeding and plants processing in case of growing demand for agricultural commodities in domestic and international markets.
- By April 2017, natural gas prices for all types of consumers would become equal. Since April 2016 natural gas price for centralized heat producers (teplocomunenergo) is 75% of its commercial price (UAH 5500/1000 m3). Heat produced from natural gas costs more than UAH 1200/Gkal (twice more than before). If biogas or biomass-derived heat is even 10% cheaper for households, these biogas projects become price competitive, making biogas projects payback time smaller. Households pay less for heat; Ukraine purchases less natural gas from abroad, paying instead to local enterprises, which makes win-win situation for households (cheaper energy), enterprises (jobs, lower payback time) and country (taxes, less natural gas to import, wastes management, reduction of methane).

Sectoral effects of biogas projects development in Ukraine (%)

Industry	Period					
	2017	2018	2019	2020	2025	2029
Agriculture, hunting and related service activities; Forestry, logging and related service activities; Fishing, fish farming and related service activities	0.0	0.0	0.0	0.0	0.2	0.3
Mining of coal, lignite and peat; Mining of uranium and thorium ores	-0.6	-0.9	-1.2	-1.5	-3.2	-4.7
Extraction of crude petroleum and natural gas and related service activities	-0.1	-0.1	-0.1	-0.1	0.0	-0.1
Other mining and quarrying (except for fossil fuels)	0.0	0.1	0.1	0.1	0.4	0.4
Manufacture of food products; beverages and tobacco products	-0.1	-0.1	0.0	0.0	0.2	0.1
Manufacture of textiles, wearing apparel, leather and related products	0.0	0.0	0.0	-0.1	0.0	0.0
Manufacture of wood, paper, printing and reproduction	0.0	0.0	0.0	0.0	0.2	0.1
Manufacture of coke	0.1	0.1	0.2	0.2	0.4	0.4
Manufacture of refined petroleum products	0.0	0.0	0.0	0.0	0.1	0.1
Manufacture of chemicals and chemical products	0.0	0.1	0.1	0.1	0.4	0.5
Manufacture of basic pharmaceutical products and pharmaceutical preparations	-0.1	-0.1	-0.1	-0.1	0.0	0.0
Manufacture of rubber and plastic products; Manufacture of other nonmetallic mineral products	0.2	0.2	0.2	0.2	0.4	0.4
Manufacture of basic metals; Manufacture of fabricated metal products, except machinery and equipment	0.1	0.2	0.3	0.4	0.8	1.0
Manufacture of computer, electronic and optical products	0.3	0.3	0.2	0.2	0.1	0.0
Manufacture of electrical equipment	0.2	0.2	0.2	0.3	0.3	0.4
Manufacture of machinery and equipment n.e.c.	0.5	0.5	0.5	0.5	0.5	0.6
Manufacture of motor vehicles, trailers and semi-trailers Manufacture of other transport equipment	0.3	0.3	0.3	0.3	0.2	0.3
Manufacture of furniture; jewelry, musical instruments, toys; repair and installation of machinery and equipment	0.0	0.0	0.0	0.0	0.1	0.1
Production and distribution of electricity	-0.3	0.1	0.4	0.7	1.8	2.2
Production and distribution of gas	0.0	0.2	0.3	0.5	1.5	1.9
Steam and hot water supply	-1.3	-1.0	-0.8	-0.7	-0.1	-0.4
Water supply; sewerage, waste management and remediation activities	-0.1	-0.1	0.0	0.1	0.4	0.5
Construction	0.9	0.9	0.9	0.9	0.9	0.9
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.0	0.0	0.0	0.0	0.2	0.2
Transport, warehousing Postal and courier activities	0.0	0.0	0.0	0.1	0.2	0.2
Accommodation and food service activities	0.0	0.0	0.0	0.0	0.1	0.1
Publishing, motion picture, video, television programs production; sound recording, programming and broadcasting activities	0.0	0.0	0.0	0.0	0.1	0.1
Telecommunications	0.0	0.0	0.0	0.0	0.2	0.2
Computer programming, consultancy, and information service activities	0.1	0.0	0.0	0.0	0.0	0.0
Financial and insurance activities	0.0	0.0	0.0	0.0	0.1	0.1
Real estate activities	0.0	0.0	0.0	0.0	0.3	0.3
Legal and accounting activities; activities of head offices; management consultancy activities; architectural and engineering activities; technical testing and research	0.1	0.1	0.1	0.1	0.1	0.1
Scientific research and development	0.2	0.2	0.2	0.2	0.2	0.2
Advertising and market research; other professional, scientific and technical activities; veterinary activities	0.0	0.0	0.0	0.0	0.1	0.1
Administrative and support service activities	0.0	0.0	0.1	0.1	0.2	0.2
Public administration and defense; compulsory social security	-0.1	-0.1	-0.1	-0.1	0.1	0.1
Education	-0.2	-0.2	-0.1	-0.1	0.1	0.0
Human health activities, residential care activities and social work activities without accommodation	-0.2	-0.1	-0.1	-0.1	0.1	0.1
Arts, entertainment and recreation	-0.1	-0.1	-0.1	0.0	0.1	0.1
Other service activities	0.0	0.0	0.0	0.0	0.1	0.1

Obstacles to the proposed biogas reform implementation

- despite the FIT size is set until 2030, due to upcoming legislation changes its future is uncertain. By the draft Law of Ukraine "On Electricity Market", purchase of electricity produced from RES is expected through the mechanism of public service obligations (PSO), although the amounts and sources of funding are not clearly defined. A scheme of imposing a special duty on transmission system Operator to pay for Guaranteed buyer compensatory payment (payment covers the difference between the "green" tariff and the cost of electricity prevailing in the market a day ahead, and also the cost of settling imbalances), the size of which is determined by the Regulator, creates additional risks for the market organizational structure, which in turn reduces the investment attractiveness of the sector.
- Land allocation and acquisition for renewable energy facilities need further simplification, namely to place such facilities on the land plots of all categories without changing their purpose. Now, all potential biogas projects are required to be included in the detailed plan of territory development, but these plans are not always existing and available.
- Lists of items of equipment specified in Article 17-3 of the Law of Ukraine "On Electric Power Industry" do not match the names of the Ukrainian Classification of Goods for Foreign Economic Activity, which can significantly complicate the process of obtaining certificates of origin, required for surcharges receiving.
- monopoly of JSC “Naftogaz of Ukraine” as natural gas supplier and local heat suppliers (teplokomunenergo), who do not have financial incentives to employ renewables, to use less natural gas and the households cannot choose heat supplier. One of the significant drivers to decrease natural gas consumption for heating purposes is its high price. As utilities bills are growing, payment discipline is worsening. Government of Ukraine has launched UAH 24 billion subsidy program, aimed at 5.2 million households. By the end of 2015, only UAH 2 billion were spent, and the remainder money were used to subsidize JSC “Naftogaz of Ukraine” and teplokomunenergo.
- insufficient infrastructure to supply feedstock for bioenergy projects; derelict attitude to biomass residues; domestically produced biogas plants are of low capacity; imported equipment is expensive due to inflation and currency depreciation.

Other Barriers and Policy Design Considerations

- *high upfront investment costs* => international financial organizations (International Financial Corporation, EBRD).
- *high cost of capital*; high interest on bank loans (10% in USD); lack of working capital and investments; Ukrainian currency depreciation (43.3% in 2015), which makes imported equipment even more expensive; non-transparent conditions and practices of doing business in Ukraine, such as informal payments in order to facilitate local authorities decisions.
- *low information spread* and lack of nation-wide information campaigns regarding use of renewables in Ukrainian agrifood sector. The new appearing agricultural holdings are looking for the ways of being more competitive energy-wise.
- *frequent changes of the rules* and regulation provisions for the RES market (draft Law of Ukraine "On electric energy market". As for biogas potential implementation, main changes include return to the local content requirement (hereinafter LCR) and decrease of FIT. Even before the outbreak of hostilities in the East of Ukraine and local currency depreciation small investors were difficult to enter the market because of strict LCR.

- In order to make biogas projects affordable for smaller and medium business in Ukraine, further mechanisms need to be elaborated and implemented, such as *government guarantees of loans; interest rates for loans should be lowered via cooperation of Ukrainian banks with international financial institutions*.
- For biogas projects, we suggest *prioritized grid connection*.
- Smaller biogas plants (with capacity up to 500 kW) should not require authorization documents.
- Current land use and land ownership issues and the existing legislation on the subject require further improvements. Large agribusiness have extended possibilities to ensure long-term use of land, whereas this can be an issue for small business. After Soviet Union collapse and consequent land reform agricultural lands were distributed between people formerly employed in kolkhoz or their relatives. Afterwards, the land plots were let by owners, allowing formation of agricultural holdings.

- Increased use of biogas and electricity output requires transport infrastructure changes, such as new roads for delivering the feedstock (cattle manure or vegetable residues etc). Long-term contracts between feedstock suppliers and processors are needed in case of small and medium size projects, when different types of feedstock are provided by different producers.
- One of the medium-term and mediate implications of wide spread of agriculture-derived biogas projects can be a potentially growing interest to the landfill gas utilization projects.
- Expanned use of biogas projects with locally consumed heat and selling electricity to the grid would require significant modernization of the existing energy grids and infrastructure.
- Another important implication of new regulatory policy is potential production of large-capacity biogas digesters in Ukraine, with new jobs in manufacturing, engineering and education.
- Law provision regarding animal residues/dung sterilization under pressure should be abolished in case of biogas output. The existing fines for improper agricultural waste management should be raised.
- Further policy proposal, that can be adopted only in the long run, is *mandatory use of biogas (*by means of introduction of new national construction standards when construction of new agribusiness companies dealing with wastes).

Conclusions and Recommendations for future policy development nationally and implications for adoption of a similar approach in neighbouring countries

- Mostly all neighboring countries around Ukraine have chosen their own paths in terms of renewable energy potential deployment and have already developed extensive set of policies and legislative measures.
- S*trict environmental policy* coupled with renewable *electricity and heat obligations* offer good prospects to biogas projects in many countries, potentially including Ukraine.

Thank you for your attention!

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