



Opportunities for utilisation of biomass residues in the renewable sector in Ukraine

Project outline

This project explored new opportunities for producing renewable energy from biomass residues in Ukraine. Its goal was to conduct a study to identify the optimal concepts for the supply, logistics and final utilisation of biomass for energy. The study was implemented by outlining the KPI¹ benchmarks of 8 case studies from Finland and Ukraine using various biomass types, such as agricultural crop and forestry residues, and livestock residues and industrial organic by-products. These case studies centred on converting wood residues into woodchips and pellet fuel as well as biodegradable feedstock into biogas and digestate, which can further be used as fertilizer. The findings of the project include a gap analysis of the biomass value chain from the initial feedstock supply and logistics to the final utilisation. This gap analysis has been used to prepare a roadmap for sector development which identifies technical and policy gaps, and proposes possibilities to boost the growth of the biomass-to-energy market in Ukraine.

Current situation

Official* projected distribution of fuel and energy resources from 2020 - 2035

Figure 1

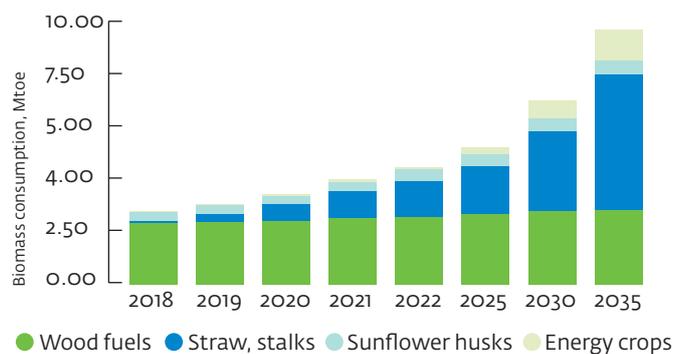
| Consumption, Mtoe | 2020 | 2025 | 2030 | 2035 |
|-------------------------|--------------|--------------|--------------|--------------|
| Coal | 18.00 | 14.00 | 13.00 | 12.00 |
| Natural Gas | 24.30 | 27.00 | 28.00 | 29.00 |
| Oil Products | 9.50 | 8.00 | 7.50 | 7.00 |
| Nuclear Power | 24.00 | 28.00 | 27.00 | 24.00 |
| Biomass, biofuel, waste | 4.00 | 6.00 | 8.00 | 11.00 |
| Solar and wind energy | 1.00 | 2.00 | 5.00 | 10.00 |
| Hydro | 1.00 | 1.00 | 1.00 | 1.00 |
| Ambient power | 0.50 | 1.00 | 1.50 | 2.00 |
| Total | 82,30 | 87,00 | 91,00 | 96,00 |

* approved by Cabinet of Ministers of Ukraine in 2017

The Energy Strategy of Ukraine until 2035, approved by the Cabinet of Ministers of Ukraine in 2017, projected that RES fuel sources will cover on average a 15% share of the total fuel balance, and RES bioenergy in 2020-2035 will cover on average 45% of consumption of energy resources as can be summarized from Figure 1. Thus, bioenergy will be the major contributor to the renewable energy targets.

Forecast of total consumption and structure of solid biomass in Ukraine from 2018 - 2035

Figure 2*



| Biomass type | 2018 | 2019 | 2020 | 2021 | 2022 | 2025 | 2030 | 2035 |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Wood fuels | 2.35 | 2.40 | 2.45 | 2.55 | 2.60 | 2.70 | 2.80 | 2.85 |
| Straw, stalks | 0.10 | 0.40 | 0.70 | 1.10 | 1.45 | 1.89 | 3.12 | 5.26 |
| Sunflower husks | 0.34 | 0.38 | 0.40 | 0.43 | 0.49 | 0.54 | 0.58 | 0.59 |
| Energy crops | 0.01 | 0.04 | 0.05 | 0.10 | 0.11 | 0.27 | 0.70 | 1.20 |
| Total | 2.80 | 3.22 | 3.60 | 4.18 | 4.65 | 5.40 | 7.20 | 9.90 |

*This biomass covers only woody and agricultural solid biomass. Source: SECB expert projections

The main constituents of the biomass potential in Ukraine are agricultural biomass, such as agro residues and by-products of crop production, as well as energy crops (e.g., willow and miscanthus), while the available resources of woody biomass for energy are rather limited and are not expected to increase as shown in Figure 2.

¹ Key Performance Indicators (process efficiency, load factor, specific energy consumption, energy losses, specific investment cost, specific operational and maintenance cost, etc.)

Key figures for woody and agricultural residue biomass market development in Ukraine from 2019–2035



The total demand for biomass in 2035 is expected to triple compared to the 2019 figures.



Predicted high growth in biomass demand for the upcoming years, on average 13 % p.a.



Significant growth in agricultural biomass, on average 47% p.a.



In comparison, woody biomass growth is severely limited at less than 1.2% p.a., mainly due to forest cleaning.



Project background

The project was financed by the Finland Ukraine Trust Fund, which provides grant financing to promote cooperation in the fields of energy efficiency, renewable energy and alternative types of energy sources in power and heat generation and district heating networks. The Fund is financed by the Ministry for Foreign Affairs of Finland and managed by NEFCO. The local coordinator is the State Agency on Energy Efficiency and Energy Saving of Ukraine (SAEE). For more information please visit www.nefco.org/finland-ukraine.

Project contribution to the Agenda 2030 and the Sustainable Development Goals



NEFCO contact info and link to additional materials

During the implementation of the project, a two-day seminar was organised in Kyiv in February 2020 for market stakeholders together with experience transfer between Ukrainian and Finnish companies in the bioenergy sector. The materials presented during the seminar can be found at www.nefco.org/finland-ukraine.

Identified key gaps and recommendations

| Identified key technical gaps | Recommendations |
|---|--|
| Key gaps for overall solid biomass resources, and the supply and harvesting chain | |
| <ul style="list-style-type: none"> • Low quality control and lack of standardization for biomass fuels • Lack of available bioenergy feedstock from agriculture, industrial organic by-products and forestry residues • Lack of residue harvesting from logging sites (an important potential source for low quality wood fuel) • Complicated road access to logging residues • Absence of record keeping for the logging residues; absence of data on the amount of residues in felling areas | <ul style="list-style-type: none"> • Introduction of a bioenergy exchange market for solid fuels and feedstock for biogas facilities • Introduction of a fuel and feedstock certification standard and confirmation procedures for the quality of raw materials • Establishment of certified laboratories specialising in the quality of raw materials • Increasing the efficiency of lumbering activities and introducing modern technologies for logging • Dissemination of information on harvesting and the volume of harvesting residues; obligating the forestry industry to collect residues and set targets for their use |
| <ul style="list-style-type: none"> • Lack of special high-productivity equipment for chipping wood residues to provide large quantities of raw materials for energy utilities • Lack of specialised machinery for forestry operations, especially for accessing and harvesting wood fuel | <ul style="list-style-type: none"> • Increasing financing for state forest enterprises and facilitating the updating of their machinery and technical handling basis • Encouraging the creation of small and medium-size enterprises supplying specialised machinery, creating leasing programmes and credit systems for acquiring specialised machinery |
| <ul style="list-style-type: none"> • Lack of forest roads hampers access to forest resources | <ul style="list-style-type: none"> • Imposing an obligation on state forest enterprises to transport 80% of felling residues to the nearest roads to be gathered for solid biofuel production |
| Key gaps for biomass utilisation for energy | |
| <ul style="list-style-type: none"> • Lack and high cost of equipment capable of burning wet fuel, bark and wood waste | <ul style="list-style-type: none"> • Increasing the demand for and encouraging businesses to acquire boilers capable of burning high humidity fuel and promoting widespread development of technology and equipment |
| <ul style="list-style-type: none"> • Limited access to heat and power networks | <ul style="list-style-type: none"> • Development of a competitive heating market in which independent producers can connect to the district heating network |
| <ul style="list-style-type: none"> • Price of the heat from biogas facilities is not competitive with price of the heat from natural gas • Lack of support for biomethane production and use as a substitute for natural gas • Low-efficiency of energy conversion into power; thermal energy losses | <ul style="list-style-type: none"> • Establishment of strategic targets and a subsidy or support mechanism for biomethane production and use as a substitute for natural gas |
| <ul style="list-style-type: none"> • Lack of experience, in particular with lignocellulosic materials (straw); underdeveloped biofuel market | <ul style="list-style-type: none"> • Introduction of information and research campaigns • Development of pilot demonstration projects for the production of biogas based on lignocellulosic raw materials |
| <ul style="list-style-type: none"> • Lack of certification for organic fertiliser and farming • Lack of machinery for digestate handling | <ul style="list-style-type: none"> • Development of a fertiliser market |
| Key institutional, economic and commercial gaps | |
| <ul style="list-style-type: none"> • The high price of solid biomass (wood chips, pellets and briquettes) | <ul style="list-style-type: none"> • Increasing fuel efficiency and reducing costs • Development of incentives and benefits for biomass producers in the domestic market and considering export restrictions |
| <ul style="list-style-type: none"> • The high price of wood chips from firewood resulting in the production of thermal energy that cannot be priced competitively against traditional fuels (natural gas) | <ul style="list-style-type: none"> • Prioritising low-quality and low-cost fuel, waste and industrial organic by-product use in medium and high capacity plants in district heating |
| <ul style="list-style-type: none"> • High transportation costs | <ul style="list-style-type: none"> • Optimisation of logistics; promoting biofuel logistics centres and depots |
| <ul style="list-style-type: none"> • Complicated procedure of project development in parallel with high degree of institutional challenges | <ul style="list-style-type: none"> • Preparation of well-thought-out projects based on a strong project team in order to ensure smooth project development and minimize institutional challenges and risks |
| <ul style="list-style-type: none"> • Practical problems and lack of experience using agricultural biomass as fuel or raw material | <ul style="list-style-type: none"> • Use of agricultural waste mainly for boiler plants with the application of modern specialised boilers; following fuel requirements and maintaining optimal operating modes |
| <ul style="list-style-type: none"> • Lack of dissemination of information about successful cases on energy production from agro-biomass | <ul style="list-style-type: none"> • Promoting successful cases of agro-biomass energy production, increasing the reach of information |

Identified key policy and regulatory gaps and barriers for overall sector

- Underdeveloped biofuel/biomass market, short-term contracts for fuel/raw materials supply
- Fuel quality assurance
- Low attractiveness of biomass/biogas projects due to low green tariffs, high discount rates, limited third-party access to heat networks
- Difficulties raising funds for agricultural bioenergy projects
- Difficulties arranging agricultural biomass collection supply chains
- Underdeveloped state policy on the use of agricultural biomass for energy
- Lack of support for biomethane production and use as an alternative gas substitution
- Low level of engagement of small/medium farms for biogas production
- Lack of support for biomethane; lack of legislation for biomethane production and use in transportation and households
- Underdeveloped organic farming and digestate applications
- Low market demand for digestate-based fertiliser products
- High level of state regulation of heat and electricity production and limited level of project profitability
- Problems with grid connection; seasonal variation in thermal energy demand; lack of clear state policy and support for waste and renewable energy production

Recommendations for Ukraine based on the European experience

- **Introduction of a biomass exchange similar to Baltpool in the Baltic states or Finbex in Finland and the introduction of biomass quality assurance**
- Formation and implementation of state policy in the field of production and use of biomass
- **Extension of feed-in tariff (FIT) for electricity produced from biomass/biogas; implementation of a special tariff for small-scale projects and extending the FIT validity period; ensuring access to DH networks for biomass-to-heat producers**
- **Introduction of targeted state support for harvesting/collection of certain types of agricultural biomass for energy**
- Encouraging the application of the best international and national experience and practice in agricultural biomass collection supply chains
- **Development and promulgation of the state strategy for the use of agricultural biomass for energy**
- **Adaptation of a legal framework for biomethane production and consumption support**
- Establishment of strategic targets for biomethane production and use as engine fuels, i.e. a green vehicle premium, support for filling stations, investment grants or introduction of subsidies for biomethane transport infrastructure development
- Green tariff differentiation; implementation of a special tariff for small-scale projects; extending the FIT validity period
- **Development of legislative and regulatory policy to support the market of digestates and introduction of the certification and standardisation of their quality**
- Awareness-raising of digestate products
- **Development of the organic fertiliser market;** accelerated implementation of new law No. 2496-VIII 'On the basic principles and requirements for organic production, circulation and labelling of organic products'
- Encouraging competition in heat and electricity production
- Creation of simplified rules and incentives, especially for small-scale biogas and biomass projects

