



Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine



Project Progress Report 2016

Kyiv 2016

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Annotation

Project Title	Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine
Country	Ukraine
UNDP PIMS ID: GEF Project ID:	2921 4377
Reporting Period	January – December 2016 (12 months)
Donor	The Global Environment Facility (GEF)
Funding Source	GEF Trust Fund
Responsible Party	United Nations Development Programme
Implementing Partner(s)	United Nations Development Programme
Project ID (Atlas): Outputs ID (Atlas):	00074537 00086891
Project Start Date	24 June 2014
Project End Date	31 March 2018
GEF grant	4,700,000.00 USD
Co-financing	30,057,500.00 USD
2016 Annual Work Plan Budget	1,702,500.00 USD
2016 Annual Delivery	1,589,328.00 USD
Total project expenditures as of 31.12.2016 since the project start	2,852,140.08 USD
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Purpose of the Report

This report represents a narrative Annual Status Report of the project “Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine”. This report is not mandatory within the UNDP-GEF project implementation framework, given the Annual Project Review/Project Implementation Reports (APR/PIR) combining both UNDP and GEF reporting formats is a key report under monitoring and evaluation requirements for this project prepared annually to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July).

Being supplementary progress report, it is aimed at providing more detailed description and analysis of the project implementation progress, results achieved, challenges encountered, lessons learned and outlook for the future. This report is structured using the donor reporting template applicable to projects that receive non-core resource contributions through third party cost sharing agreements.

Acronyms

ATLAS	Corporate business platform of UNDP
AWP	Annual Work Plan
CO	Country Office
EE	Energy efficiency
FSM	Financial Support Mechanism
GCal/h	gigacalories per hour
GEF	Global Environment Facility
NGO	Non-Governmental Organization
NENC	National Ecology and Nature Centre
NEURC	National Energy and Utilities Regulatory Commission (of Ukraine)
Mtoe	Million Tonnes of Oil Equivalent
MTR	Mid-term Review
tbd	to be determined
PIR	Project Implementation Report
PIU	Project Implementation Unit
RES	Renewable energy sources
SAEE	State Agency for Energy Efficiency and Energy Savings of Ukraine
toe	tonne of oil equivalent
ToR	Terms of Reference
UN	United Nations
UNDP	United Nations Development Programme
USD	United States Dollars

I. Executive summary

Recently, there have been noticeable changes in the energy sector of Ukraine, in particular in the fields of renewable energy, individual and district heating. Energy security considerations, including reduction of the dependence on imported fuels (especially natural gas) have become increasingly important. The Government has made the gradual alignment of natural gas prices and its subsidy reduction to some certain categories of consumers, increasing their interest in energy saving and/or usage of alternative fuels.

A number of documents were adopted having reinforced the legislative/regulatory framework for renewable energy implementation, including biomass, as well as encouraging replacement for natural gas with other energy sources.

Thus, in Ukraine biomass is gradually establishing itself as an important element in the government's renewable energy portfolio, including due to the project efforts.

Despite serious legislative, regulatory, financial and feedstock supply barriers, biomass is viewed as viable/desirable for large-scale deployment in the municipal sector in Ukraine. Since biomass is more relevant for heating than power generation given relative conversion efficiencies, the project particularly supports agricultural biomass utilization for municipal heat and hot water supply.

The project is addressing practically all key biomass market development challenges with a focus on improving the legislative/regulatory framework, establishing a financial support mechanism, implementing demonstration projects, introducing certain biomass fuel types, and enhancing awareness of the opportunities associated with the utilization of biomass in the municipal sector.

While generally progressing at a slower pace than initially planned, in 2016 the project managed to carry out a sizable variety of activities foreseen under its implementation framework and produce tangible outputs described further in this report.

In 2016 all project components were addressed to a greater or lesser extent with good progress achieved under Components 3 and 4, and modest progress under Component 1 and 2 due to external factors affecting the project implementation.

While already being a biomass sector development vehicle, the project strives to achieve more by providing insight into different aspects of biomass deployment in Ukraine.

II. Background

2.1. Country context

Situation in Ukrainian municipal heat energy sector

In 2016 the project has compiled a comprehensive study of Ukrainian biomass boilers market presenting the most recent data on municipal heat energy sector development, biomass boilers production, supply and consumers, market structure and prospects. The below summary of the situation in Ukrainian municipal heat energy sector refers to this study.

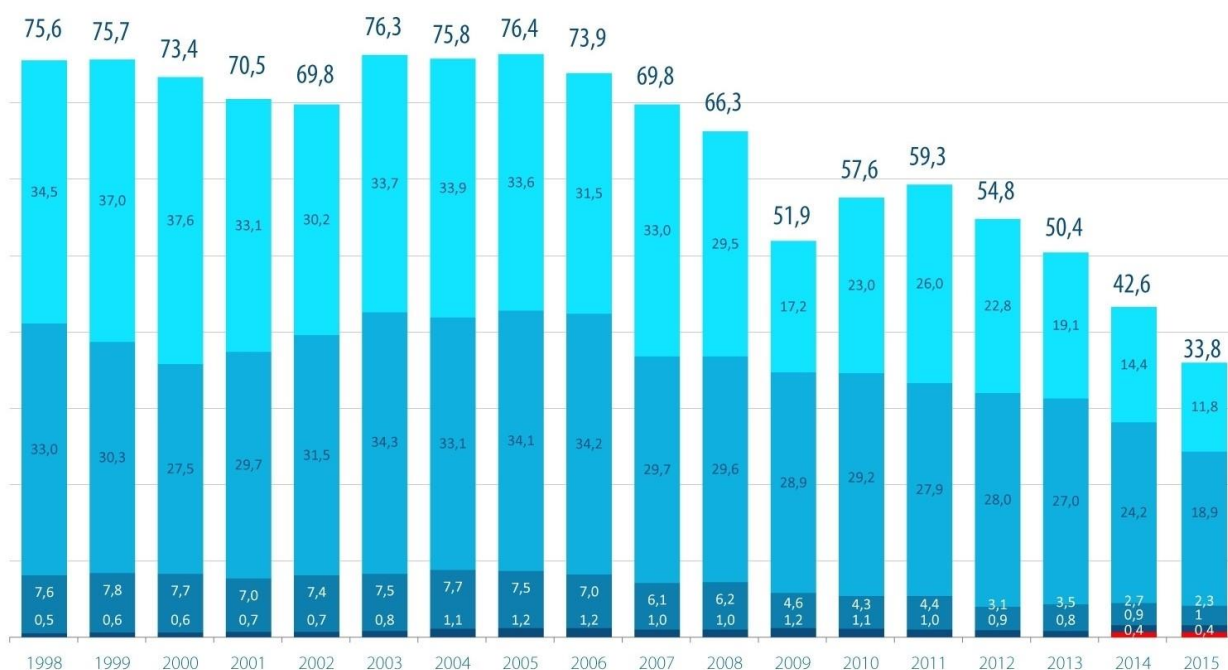
Ukraine is traditionally rated among Europe's top energy consumers, including for municipal heating needs. Thermal energy for this purpose is provided by the centralized district systems, smaller de-centralized boilers and individual heating means. According to the

National Energy and Utilities Regulatory Commission of Ukraine (which is Ukraine's Energy Regulatory Authority) 56.2% of the thermal energy is generated at the boiler plants, 41.2% - by combined heat and power plants, various cogeneration units and nuclear power plants, and 2.6% at the facilities that use alternative and renewable energy sources; main fuel types used for district heating are natural gas (90.4%), coal (4.4%), alternative and renewable energy sources (2.6%), heat from nuclear power plants (2,5%), and other fuels (0.1%)¹.

From 2014 year on, greatly due to the economic crisis caused by the armed conflict in eastern Ukraine and political tension with the Russian Federation, Ukraine is actively promoting the development of alternative energy sources as Ukraine's dependence on foreign energy supplies is perceived to be one of the key threats to the country's national security. The current government pays particular attention to energy security issues trying to increase the level of energy independence and substitute expensive imported natural gas (both for economic and political reasons).

After the occupation of the Autonomous Republic of Crimea in March 2014 and due to the inability to establish control over temporarily occupied territories of Luhansk and Donetsk oblasts as well as because of the general economic downturn during 2014-2015 and other factors, consumption and import of natural gas in Ukraine sharply decreased in 2014 by roughly 17 billion m³ (28%) compared with 2011 or by 15% compared with 2013 and amounted to 42.6 billion m³ in 2014, including 8.6 billion m³ (20% of the country's total gas consumption) used by district heating plants for heating and hot water supply purposes. In 2015, gross natural gas consumption in Ukraine totaled 33.8 (over 20% year-to-year reduction). In 2016, estimated 33.2 billion m³ of natural gas was consumed in Ukraine that is 2% less compared with the previous year as reported by the state-run gas transport company Ukrtransgaz.

Gross natural gas consumption in Ukraine (1998-2015)²



- - Industry;
- - Households, Heat generating companies, Public facilities;
- - Gas production and processing losses of gas producers and transporters;

¹ NEURC's Annual Report 2015: http://www.nerc.gov.ua/data/filearch/Catalog3/Richnyi_zvit_NKREKP_2015.pdf

² According to the National oil and gas company "Naftogas of Ukraine" data: <http://www.naftogaz.com/>

- Gas processing losses of gas distributors;
- Unauthorized gas withdrawal in the so-called zone of anti-terrorist operation in the east of Ukraine³.

Import of natural gas also decreased from 32,9 billion m³ in 2012 (representing 60% of the country's total gas demand) and 28 billion m³ in 2013 (50% of the country's total gas demand) to 19,5 billion m³ in 2014 (about 46% of the country's total gas demand) and 16,4 billion m³ in 2015 (48,5% the country's total gas demand).

Consumer demand for heat energy in Ukraine is satisfied mainly through the district heating facilities. According to the State Statistics Service of Ukraine, the total number of boiler plants has decreased in 2014 from 35 to 31 thousand and the total number of boiler units installed at the district heating facilities – from 80 to 68 thousand, thus the total installed capacity of the heat generating facilities in Ukraine in 2014 amounted to 96 thousand Gcal/h (that is 22 thousand Gcal/h less than in 2012). This year-to-year reduction (also continued in 2015-2016), however, is mostly attributed to the inability of statistical accounting in the temporarily occupied territories of Crimea, Donetsk and Lugansk oblasts of Ukraine, rather than introduction of energy efficiency measures. Overall, the total effect of all external and internal factors led to a reduction in heat production by almost 30% compared to 2012.

It should be noted that district heating companies in Ukraine usually have excessive installed capacity (mostly due to obsolete boilers out of operation, but still accounted on the balance sheets, and/or because of the significant reduction of heat consumption by industrial customers). In the situation, when connection of new customers to the central heating and hot water supply systems is extremely rare due to the introduction of more efficient individual installations in new buildings, it must be practical to decommission all obsolete boilers working on fossil fuels and further reduce the total installed capacity by roughly 50% - up to 45 thousand Gcal/h, which will still allow generating enough heat energy to satisfy end-users' needs.

According to the Ministry of Regional Development, Construction and Housing and Communal Services of Ukraine, 83,882 residential buildings are connected to the district heating systems and 31,471 buildings have centralized hot water supply. For example, in Kyiv with 12,500 residential apartment buildings, about 90% (11 012 buildings) are connected to the district heating systems, while only about 75% (9446 buildings) to the centralized hot water supply. In other cities the situation is much worse. Centralized hot water supply has "survived" only in 65 settlements of Ukraine, mostly in oblast cities (capitals of the regions) and also in Kyiv, Lviv and Poltava oblasts, but in fact it is used in only 34 cities – generally during the heating season only.

Meanwhile the heat production from alternative and renewable energy sources including biomass is gradually growing. In view that bioenergy is to be the main contributor to the renewable energy sector and is expected to take around a 85% share in renewable heating (5000 ktoe out of 5850 ktoe total renewable heat energy target till 2020; see the National indicative RES target under the Legal framework section here below), Ukraine progresses rather slowly in terms of harmonization of legislation with Directive 2009/28/EC and setting favorable legislative and regulatory framework for the promotion of renewable energy.

On the positive side, programmes to incentivise the replacement of gas with biomass used by households and municipalities (public facilities) for heating (according to the Cabinet of Ministers of Ukraine Regulation of 09.07.2014 № 293 «On stimulating replacement of natural gas within the heating sector»; Regulation of 10.09.2014 № 453 "On stimulating of the natural gas substitution in the thermal energy production for the institutions and organizations

³ temporarily occupied territories of Donetsk and Lugansk oblasts of Ukraine,

financed from the state and the local budgets"; and the Decree of the Cabinet of Ministers "Plan for short- and medium-term measurements for the natural gas consumption reduction for the period till 2017"; a Government program to support purchase of "non-gas" boilers according to the Cabinet of Ministers of Ukraine Regulation of 01.10.2014 № 491 "On amendments to the Procedure of using funds allocated in the central budget for energy saving and energy efficiency measures"⁴ applied in 2014-2016 has brought some results as biomass used for heating reached 2102 ktoe in 2015 (1934 ktoe in 2014) compared with 1433 ktoe in 2009 in the official energy balances. However, the basis for 2020 renewable energy target calculation was 2,937 ktoe biomass energy consumption in 2009 (based on the "Biomass Consumption Survey Study" performed for the Energy Community), which has not been reached yet at the end of 2016.

Heat producers running on alternative fuels, regardless of output and installed capacity, must obtain a license (until 26.11.2016 from the National Energy and Utilities Regulatory Commission, after 26.11.2016 from regional (oblast) state authorities. According to the register of licensees maintained by the NEURC, in 2015 there have been 264 licensees producing heat energy from alternative and renewable energy sources⁵, while the total number of licenses issued for this type of economic activity is over 300. The largest number of licensees is registered in Kyiv (39), Ternopil (25), Ivano-Frankivsk (23) Zhytomyr (21) and Rivne (19) oblasts. The total number of municipal boiler plants running on alternative fuels (including peat) is over 2,400 (with an average installed capacity of 0.4 Gcal/h or 450 kW), including over 3,300 boiler units (0.29 Gcal /h or 330 kW) with the total installed capacity of 950 Gcal/h, constituting 7.8% of the total municipal heating facilities of Ukraine.

National sources indicate that Ukraine has 750-1,465 PJ (18-35 Mtoe/yr) of primary biomass economic potential that can substitute 21.6-26 billion m³ of natural gas (Bioenergy, 2014; SAE). To ensure compliance with the requirements of the National Renewable Energy Action Plan until 2020 in the heating sector it is necessary to replace 5.8 Mtoe/yr of traditional (fossil) energy sources, including 4.6 Mtoe/yr (5.7 billion m³/yr of natural gas) in the district heating sector that makes about 65% of the total fuel (mostly natural gas) used at the heat generating facilities. Thus the installed capacity of biomass boilers in the district heating should total at least 18,500 MW (about 16,000 Gcal/h)⁶ by 2020 (RE Action Plan figure is 11,875 MW) that equals to 16.5% of the current total installed capacity of heat generating equipment in Ukraine. Given that at the beginning of 2016 the total installed capacity of biomass fired boilers in Ukraine has been about 1,000 Gcal/h, it should increase by at least 15 times by 2020 to meet national targets for renewable energy.

Legal framework

The biomass energy development activities in Ukraine fall within the renewable energy policy and legislation framework. Despite having a quite comprehensive framework allowing for the promotion of energy from renewable sources, Ukraine still lacks consistency and coherence in pursuing a strong reform agenda on renewables and energy efficiency in primary and secondary legislation to ensure compliance with the requirements of Directive 2009/28/EC (the Renewable Energy Directive), the updated Energy Strategy of Ukraine for the period until 2030 and various adopted short- and medium-term energy-related action plans.

After becoming a member of the Energy Community in 2011 and with the adoption of Directive 2009/28/EC, Ukraine committed to a binding 11% target of energy from renewable

⁴ All Resolutions repealed as of end 2016

⁵ No separate statistics on biomass available

⁶ Calculation of the project's experts <http://bioenergy.in.ua/uk/library/korisni-materiali/a-comprehensive-study-of-the-market-of-boilers-of-biomass-in-ukraine/>.

sources in gross final energy consumption in 2020 compared with a share of 3.8% in 2009. The target for renewable energy sources in heating and cooling is even a little bit higher – from 3.4% in 2009 to 12.4% in 2020. This commitment was reflected in the simplified National Renewable Energy Action Plan until 2020 (available in English as Annex 1 to this report), not fully compliant with the template⁷, adopted by the Government in October 2014 (Decree of the Cabinet of Ministers of Ukraine dated 01.10.2014 № 902-p).

National indicative RES target till 2020 and estimated indicative interim trajectory for the shares of energy from renewable sources in heating and cooling, 2014-2020

Heating by source	2009	2014	2015	2016	2017	2018	2019	2020
Overall share of renewable energy sources in heating and cooling, %	3,4	5,7	6,7	7,7	8,9	10,0	11,2	12,4
Total final energy consumption from RES, ktoe	1473	2580	3083	3576	4139	4692	5261	5850
Including biomass, ktoe:	1 433	2 280	2 700	3 100	3 580	4 050	4 525	5000
solid biomass	1433	2260	2660	3040	3500	3950	4400	4850
biogas		20	40	60	80	100	125	150
Actual consumption of biomass in the heating sector	1433	1934	2102					

Thus, the National Renewable Energy Action Plan until 2020 and The Energy Strategy of Ukraine for the period until 2030 (adopted in March 2006, updated in 2013 by the Decree of the Cabinet of Ministers of Ukraine dated 24 July 2013, No.1071-r) are the key policy documents for the promotion of renewable energy.

Legal relations in the field of renewable energy, including bioenergy are regulated by over 100 legislative acts. **The framework for renewable energy in the municipal sector** consists of the following main pieces of legislation:

The Law of Ukraine “On Electricity Sector” (specifies legal, economic and institutional principles and relationships for generating, transmitting, supplying and using energy; addresses energy security, competition and protects the consumers and employees of the industry; establishes a “green” tariff for electricity generated from alternative sources). In 2015, amendments to the Law of Ukraine “On Electricity Sector” introduced a new definition of “biomass” that brought the term in compliance with the Directive 2009/28/EC, enabling power generated both from waste, and from products of agriculture and forestry, to qualify for „green” tariff. Biomass was legally defined as non-excavated biologically renewable substance of organic origin, which is capable of biological decomposition, such as products, waste, fishery, forest and agriculture (crop and livestock) residue and residue from the technologically connected industry areas, as well as components of industrial or domestic waste capable of biological decomposition.

- *The Law of Ukraine “On Alternative Energy Sources”* (specifies legal, economic, ecological and institutional principles for using alternative energy sources and promotes the use of alternative energy sources).
- *The Law of Ukraine “On Alternative Fuels”* (specifies legal, social, economic, ecological and institutional principles for generation and use of alternative fuels as well as incentives to promote the use of alternative fuels).
- *The Law of Ukraine “On Energy Saving”*.
- *The Law of Ukraine “On Heat supply”*.
- *The Law of Ukraine “On the Electricity Market”*.

⁷ Energy Community Secretariat report data <https://www.energy-community.org/>

- *The Law of Ukraine “On Amending Certain Laws of Ukraine with respect to Securing Competitive Conditions for Generation of Electricity from Alternative Energy Sources,*
- *The Law on housing and communal services”.*
- Instruction of the Cabinet of Ministers of Ukraine of 03.09.2014 # 791-r “Plan of measures to implement the Directive 2009/28/EC dtd 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC”.
- Instruction of the Cabinet of Ministers of Ukraine of 01.10.2014 # 902-r “On National Renewable Energy Action Plan for the period until 2020”.

Policy Instruments stimulating renewable energy

There are two main instruments used to stimulate growth and attract investment in renewable energy in Ukraine:

1) A "green" (feed-in) tariff envisaged by The Law of Ukraine “On Electricity Sector”⁸ (also referred to as the Law of Ukraine “On Electric Power Industry”) was introduced in 2009 for electricity generated from alternative sources that applies to all RES technologies (except for blast-furnace and coke gases; and in case of hydro energy up to a capacity of 10 MW only). Established by the National Energy and Utilities Regulatory Commission for each electricity producer, the "green tariff" is based on a tariff multiplier, the value of which varies according to the kind of RES involved. The green tariff is fixed in euro until 2030, and its amount is specified by multiplication of the retail tariff for consumers of the second voltage type as of 1 January 2009 (UAH 0.5846, at that time EUR 0.05385) by the “green” tariff coefficient for the relevant type of alternative energy. The “green” tariff coefficient depends on the commissioning date of the electricity generation facility (including separate phases of construction) that produces electricity from alternative energy sources. Generally, the coefficient is reduced by 10% if facilities are commissioned after 2014, by 20% if facilities are commissioned after 2019 and by 30% if facilities are commissioned after 2024. However, there are exceptions, including for biomass and biogas. The “green coefficient” for biomass and biogas remains 2.30 until the end of 2019; 2.07 from 2020 to 2024 and 1.84 until the end of 2029. Until the end of 2019, this leads to the current green tariff rate amounting to 0.1239€ per kWh for power generating facilities using biomass and biogas:

In line with the Article 17-3 of the Law of Ukraine “On Electricity Sector” the “Green” tariff coefficients for electricity generating facilities that run on bioenergy are as follows:

Energy source	Green” tariff coefficients for electricity generating facilities that use alternative energy sources					
	Until 31.01.2013	01.04.2013-31.12.2014	01.01.2015-30.06.2015	1.07.2015-31.12.2019	01.01.2020-31.12.2024	01.01.2025-31.12.2029
Biomass	2.3	2.3	2.07	2.3	2.07	1.84
Biogas	-	2.3	2.07	2.3	2.07	1.84

The National Commission for State Energy and Public Utilities Regulation quarterly converts the “green” tariff into national currency on the basis of the average official currency rate of the National Bank of Ukraine. All generated electricity, except for volumes for personal needs, is paid under the “green” tariff. Wholesale electricity market of Ukraine (which is the union of suppliers and producers of electricity and is represented by the government-owned energy

⁸ The information about the “green” tariff is provided in accordance with “The Law of Ukraine “On Electricity Sector” # 575/97-BP dated 16.10.1997 as in force on 01.01.2017 including major changes introduced by the Law of Ukraine “On changes to certain acts of Ukraine in relation to provision of competitive conditions of electricity generation from alternative energy sources” #514-19 dated 04.06.2015 (became effective on 16 July 2015), and The Law of Ukraine “On amendments to the Law of Ukraine “On Electricity Sector” regarding the “green” tariff coefficients for electricity generated from alternative sources” # 1804-19 dated 22.12.2016.

company Energorynok) is obliged to purchase such "green" energy under "green" tariff and make full payment for the cost of electricity, regardless of the installed capacity or volume of supply.

The use of equipment of Ukrainian origin by the investors is stimulated by the relevant premium to the "green" tariff (throughout all term of its validity) if the electricity generating facility is commissioned between 1 July 2015 and 31 December 2024. However, such premium is not applicable to electricity sites of private households. If equipment of Ukrainian origin is used at least on the level of 30%, the premium is 5%; if equipment of Ukrainian origin is used at least on the level of 50%, the premium is 10%.

As of 01.06.2016, 5 companies (with total installed capacity of 35.2 MW) generating electricity from solid biomass and 7 facilities (with total installed capacity of 17.3 MW) using biogas have received the green tariff in Ukraine.

2) *Provision of customs and tax exemptions*

Until 2015 the producers of green energy enjoyed more tax benefits than now⁹. Amendments made to the Tax Code of Ukraine in late 2014 cancelled tax privileges for producers of electricity from alternative energy sources concerning income and land taxation.

There are currently 2 major remaining tax benefits:

1. Tax preferences for import of equipment and materials pursuant to Article 197.16 of the Tax Code of Ukraine providing that no VAT is applicable to transactions on import to the territory of Ukraine of:

- equipment which is functioning on the basis of alternative energy sources, energy saving equipment and materials, means of measuring, control and management of energy resources, equipment and materials for production of alternative types of fuels or electricity from renewable energy sources;
- materials, equipment, components used to manufacture equipment that runs on renewable energy.

2. Transactions concerning sale of electricity generated by qualified cogeneration units and / or from renewable energy sources are not subject to excise tax pursuant to Article 213.2.8 of the Tax Code of Ukraine.

The main institutions responsible for the implementation of renewable energy policy are the State Agency for Energy Efficiency and Energy Savings of Ukraine (SAEE) under the auspices of the Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine and the National Energy and Utilities Regulatory Commission (NEURC).

2.2. Project genesis

The formulated full-sized project aimed at "Development and Commercialization of Bioenergy Technologies in the Municipal Sector of Ukraine" with the GEF-funded budget of 4,700,000 USD and committed co-financing for over 30,000,000 USD was approved by GEF in early 2014 and the officially started on 24 June 2014. Following the engagement of the Project Manager in September 2014 and holding of the Project Inception Workshop on 19 November 2014 the actual implementation of the project has begun.

UNDP Ukraine is implementing the project directly (using UNDP Direct Implementation Modality), given the multiple governmental parties benefiting from it. However, in line with the

⁹ Recommendations on the renewal of tax benefits are described in the Chapter 3.1. of this report under "The Detailed Bioenergy Roadmap to support implementation of the National Renewable Energy Action Plan until 2020" result.

established procedure of state registration of international technical assistance projects and considering that the State Agency on Energy Efficiency and Energy Saving of Ukraine (SAEE) is currently the main state institution responsible for the implementation of renewable energy policy, the SAEE has been defined as the project beneficiary according to the State Registration of the Project (Project Registration Card #3332-01 dtd 01-02-2016 issued by the Ministry of Economic Development and Trade of Ukraine). Other Key project partners include: the Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine, the Ministry of Ecology and Natural Resources of Ukraine, the Ministry of Agrarian Policy and Food of Ukraine, target municipalities and regions.

The year 2015 was quite challenging for the project implementation due to various political transformations in Ukraine that caused serious changes in the national institutional context affecting the project design, partnership arrangements and progress.

Overall, by the beginning of 2016 the project was on-track with its Component 1, Component 4 and partially Component 3, related to improving market-oriented policy and legal/regulatory framework, conducting various outreach activities and implementing municipal biomass demonstration projects.

There were delays with the project's Component 2 (biomass market development through support of the Biomass Support Unit) and partially Component 3 (Financial Support Mechanism – FSM) due to major institutional changes within the state executive bodies (ministries) and liquidation of the initially selected partner for the FSM development and implementation.

2.3. Project strategy in 2016

The situation in the biomass energy sector in Ukraine requires a multifaceted approach to address existing challenges and gaps. In fact, there is no biomass sector per se – bioenergy is developed within renewable energy framework and included in renewable energy targets. The institutional and regulatory framework of the biomass energy is scattered amongst several government agencies/ministries, lacks cohesion and clear mandates. There is lack of reliable data with no clearly defined data collection mechanisms; key responsible government agencies/ministries are not well coordinated and have thus failed to put in place a comprehensive regulatory mechanism; awareness about biomass energy advantages in the municipal sector are not high enough; some segments of the audience are not well targeted; relatively high upfront cost (compared with e.g. natural gas fired boilers) is a critical barrier to adoption of bioenergy technologies; there are also some sustainability issues associated with using biomass as well as serious concerns over the quality of biomass products (pellets) etc.

Therefore the project was, to a greater or lesser extent, to address the above issues in its implementation plan for 2016. The planned activities included addressing policy and regulatory issues, development of a FSM, analyzing supply and demand side gaps and issues, developing procedures for developers of projects utilizing agricultural biomass, formulating an outreach and training strategy, building and enhancing capacities of existing institutions, providing technology that enable use of agricultural biomass in the municipal heat and hot water supply sector, promoting energy crops cultivation etc.

As the project consists of four components (activities) outlined below, the action plan for 2016 is summarized under each component.

COMPONENT (ACTIVITY) 1: Market-oriented policy and legal/regulatory framework.

This activity aims to formulate and introduce a streamlined and comprehensive market-oriented policy and legal/regulatory framework (“macro level” activities) to promote municipal biomass for heat and hot water services in the country, which includes national/municipal targets for biomass energy for heating.

Situation analysis at the beginning of 2016:

The process of legal/regulatory framework review has started by the project in 2015. A team of project’s experts examined and analysed the existing legal framework regulating bioenergy utilization in the municipal sector in Ukraine, as well as the EU Energy Directives to be implemented in Ukraine in line with the Ukraine's commitments in the context of the Energy Community Treaty which Ukraine acceded to in February 2011. These included, inter alia, the Budget Code of Ukraine, the Law of Ukraine «On energy saving», the Law of Ukraine «On heat supply», the Law of Ukraine «On alternative energy sources», the Law of Ukraine «On introducing new investment opportunities, guaranteeing rights and legal interests of businesses entities for conducting large-scale energy modernization», the Law of Ukraine «On housing and communal services», the Law of Ukraine «On the priority of social development of villages (rural areas) and agricultural sector in the national economy», Decree of the Cabinet of Ministers of Ukraine «On approval of Energy Strategy of Ukraine for the period until 2030»; Decree of the Cabinet of Ministers of Ukraine «On the National Renewable Energy Action Plan until 2020», Directive 2003/55/EC, Directive 2004/67/EC, Regulation (EC) 1775/2005, Directive 2004/8/EC, Directive 2002/91/EC, Directive 2006/32/EC, Directive 92/42/EC.

Once the key laws/regulatory acts that require amendments in order to focus on the bioenergy technologies utilization had been identified, the following key changes were suggested by the project experts’ team:

➤ Proposed changes to the Budget Code of Ukraine:

- Secured allocations for repayment of the loan taken for purchase of any energy generating equipment (except gas-fired) or partial reimbursement of the loan taken for purchase of energy efficient equipment and/or materials for implementation of energy saving measures.
- Reinvesting of savings from energy efficiency measures performed in municipal (public, budget funded) institutions into further EE projects in public institutions.
- Extended list of local budgets’ expenses for implementing renewable energy and alternative fuels projects.
- Provision of budget subsidies (subventions) to local budgets for implementing energy saving technologies in public institutions.

➤ Proposed changes to the Law of Ukraine «On heat supply»:

- Giving authority to the Government to set and revise minimum share of renewable energy in gross final energy consumption.
- Introduction of long-term contracts (up to 5 years) for heat supply to public (budget funded) institutions for the heat generated through renewable and alternative sources.
- Fixing energy tariffs under energy performance contracts for the heat generated through renewable and alternative sources (subject to inflation adjustment).

➤ Proposed changes to the Law of Ukraine «On energy saving»:

- Mandatory metering and regulation of energy consumption.
- Mandatory recording of energy consumption (supply) data obtained through metering.
- Promotion of bioenergy technologies for heat and hot water supply.
- Introduction of long-term contracts for heat supply.
- Tax incentives for renewable energy equipment manufacturers and users.
- Prioritizing loans for purchase of energy saving equipment.
- Setting the margin for renewable heat energy rates at no less than 25%.

➤ Proposed changes to the Law of Ukraine «On alternative energy sources»:

- Possibility to sign an energy performance contract with the purpose of energy and/or cost savings and/or reducing energy/utility bills.
- Proposed changes to the Law of Ukraine «On housing and communal services»:
 - Referring to the principles of state regulation of prices / tariffs for housing and communal services – enabling the intended use and return of investments attracted to implement projects replacing fossil energy with alternative/renewable energy sources.
- Proposed changes to the Law of Ukraine «On the priority of social development of villages (rural areas) and agricultural sector in the national economy»:
 - Investment support to the development of alternative energy from solid biomass and effective economic support to introduction of bioenergy technologies in agro-industry.
 - Funding of measures promoting production of alternative solid fuels from biomass.
 - Establishing material and technical facilities for production of alternative solid fuels from biomass.
- Proposed changes to the «Energy Strategy of Ukraine for the period until 2030»:
 - Prioritize the development of municipal biomass heating systems.
 - Expand the resource potential for heat energy generation.
 - Identify the alternative energy sources (biomass) potential for heat energy generation.
 - Create favorable environment for boosting bioenergy technologies use in heat and hot water supply.
- Proposed changes to the «National Renewable Energy Action Plan until 2020»:
 - Stimulate the increase of renewable heat energy production.
 - Expand the resource potential for heat energy generation from biomass.

During autumn 2015 the proposed changes were discussed during the working meetings with the key national partners and further officially submitted to the central executive bodies of Ukraine for review, comments and feedback.

At the end of 2015 it also became evident that while started from more optimistic data, the progress in renewable energy utilization did not indicate that Ukraine would be on track to meet the binding 11% target in 2020. The following activities have been deemed urgent:

- A revised and complete National Renewable Energy Action Plan has been needed in the light of recent developments to ensure that Ukraine is on track with its 2020 target.
- An overhaul of the existing legislation to properly transpose and implement the EU Directive and create a predictable, stable and investor-friendly renewable energy framework that will help attracting much needed investment in this sector.

Planned actions/activities for 2016:

1. Develop detailed Bioenergy Roadmap in pursuance to the National Renewable Energy Action Plan until 2020.
2. Develop regional programs on biomass utilization for heat and hot water supply (in Zakarpattia, Volyn, Ivano-Frankivsk, Dnipropetrovsk, Zhytomyr, Cherkassy, Poltava oblasts).
3. Organize public and professional discussions of legislation changes/amendments through seminars and round tables and follow up the process of adoption of the proposed in 2015 legal changes.
4. Develop criteria and procedures aimed to introduce a transparent process of selection/award of municipal biomass projects for potential budgetary support.
5. Attract expertise to develop market oriented policy to promote municipal biomass utilization for heat and hot water supply services.

COMPONENT (ACTIVITY) 2: Developing capacity within the Government to support development and implementation of municipal biomass programme through establishing a Biomass Support Unit.

This activity aims to support development and implementation of a municipal biomass programme and to formulate appropriate incentives to attract project developers.

Situation analysis at the beginning of 2016:

In line with the Project strategy outlined in the Project Document, the project was to develop capacity within the Ministry of Agrarian Policy and Food of Ukraine to support development and implementation of a municipal biomass programme through the establishment of a Biomass Support Unit. However, due to political and institutional transformations in Ukraine occurred in 2014, the Ministry of Agrarian Policy and Food of Ukraine has had limited authority to lead and manage a Biomass Support Unit. The biomass utilization in the municipal sector is now within the authority of the Ministry of Regional Development, Construction, Housing and Communal Services, biomass policy issues - within the authority of the State Agency for Energy Efficiency and Energy Savings of Ukraine (a Government agency reporting to the Cabinet of Minister of Ukraine and coordinated through the Vice Prime Minister of Ukraine - Minister of Regional Development, Construction, Housing and Communal Services). In view of this change, the project suggested the establishment of an Interagency Biomass Working Group under the possible leadership of the Ministry of Regional Development, Construction, Housing and Utilities of Ukraine involving few key state executive bodies that was presented and discussed during the First Project Board meeting held on 16 June 2015. Establishing an Interagency Biomass Working Group, as proposed by the project, was discussed with the Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine, the State Agency on Energy Efficiency and Energy Saving of Ukraine, the Ministry of Ecology and Natural Resources of Ukraine and the Ministry of Agrarian Policy and Food of Ukraine, and the latter proposed to establish the Biomass Group under the Cabinet of Ministers of Ukraine, as there were no other single authority (state body) to manage the Biomass Working Group. Therefore establishment of the Biomass Working Group has been postponed until further discussions and decisions.

Meanwhile, on 08.12.2015 a Working Group for Renewable Energy was established under the State Agency on Energy Efficiency and Energy Saving of Ukraine, including representatives of the Ministry of energy and coal industry of Ukraine, the National Energy and Utilities Regulatory Commission, state-owned company national energy company "Ukrenergo", renewable energy associations, leading NGOs and business corporations. This working group is not a full alternative to the Biomass Working Group or the Biomass Support Unit, but still it is an important step to facilitate shaping state policy towards biomass utilization.

Planned actions/activities for 2016:

1. Provide support to Biomass Support Working Group.
2. Compile Analytical Report and Recommendations on tariff and price regulation for heat and hot water supply in the municipal sector in Ukraine.

COMPONENT (ACTIVITY) 3: Financial Support Mechanism and Pilot Projects.

This activity is aimed to promote investments in municipal biomass through the establishment/strengthening of a Financial Support Mechanism (FSM) within financial institutions.

Situation analysis at the beginning of 2016:

To help provide access to finance for implementing municipal biomass projects, the Project is to set and strengthen a Financial Support Mechanism under its component 3 that would enable financial incentivization of investment in agricultural biomass projects, as such projects are typically more expensive than those involving the traditional methods of energy generation, and they are in some cases also considered to be riskier investments due to technology or resource uncertainties. Originally, the project document envisaged a financial

support mechanism (FSM) being established within the state-owned DerzhZem bank. However, as the DerzhZem bank was to be liquidated following the Parliament decision taken in June 2014, the adaptive management needed to be taken on the project in order to re-design the financial support mechanism with a new partner.

The operating procedures of UNDP prevented it from directly managing a financial support mechanism. However, UNDP could partner with a financial institution to jointly manage and implement such a mechanism. Therefore, UNDP sought to identify a new partner for the financial support mechanism component of the project. In 2015 the project engaged an International Consultant on the FSM with the objective to help identify a partner or partner(s) to design and then launch and implement a sustainable financing mechanism which can be launched either by a Ukrainian bank or banks or by an international financial institution (IFI) or international financial institutions (IFIs) in Ukraine with the goal of launching this mechanism and having it operational in early 2016. This work involved reviewing international best practice on financial support mechanisms for renewable energy, including in Ukraine, identifying and selecting a partner (financial institution) to develop and launch the financial support mechanism. As an outcome of the consultations and analysis, the negotiations have started with the International Finance Corporation (IFC) office in Ukraine to involve it as the FSM development and implementation partner.

Promotion of biomass utilization for municipal has been another important task of the project. In 2015, based on the performed situation analysis, seven oblasts (Ivano-Frankivsk, Zakarpattia, Poltava, Cherkasy, Dnipropetrovsk, Volyn' and Zhytomyr) were selected and approved by the Project board as pilot sites for the development of regional programs on biomass utilization for heat and hot water supply, with a focus on energy willow cultivation (establishment of willow plantations/nurseries); and three oblasts (Cherkasy, Zhytomyr and Kyiv) were selected as pilot sites for technical demonstration projects (straw pellets fired boilers installation). After having the Partnership Memoranda signed, the project has started implementation of 10 demonstration project in the selected municipalities. Seven projects involving installation of biomass (straw pellets) fired boilers were completed during 2015 in the selected municipalities – 3 projects in Uman' and 4 projects in Zhytomyr.

Planned actions/activities for 2016:

1. Develop Financial Support Mechanism in cooperation with International Finance Corporation.
2. Formulate Analytical report on Ukrainian legislation and regulations for establishing of the biomass financial support mechanism.
3. Compile a Comprehensive study of the biomass boilers market in Ukraine (identification of the growing points).
4. Conduct Research on bioenergy technologies available for biomass heat and hot water supply in the municipal sector.
5. Hold opening and launching ceremony of three straw-fired boilers in Kyiv and seminar on project's implementation experiences.
6. Implement pilot technical projects on supply and installation of straw pellets fired boilers.
7. Implement pilot projects on energy crop cultivation in pilot oblasts.
8. Conduct pellets' quality testing.

COMPONENT (ACTIVITY) 4: Outreach programme and dissemination of project experience/best practices.

This activity is to formulate an outreach programme and document/disseminate project experience/best practices/lessons learned for replication within the country (and in the region).

Situation analysis at the beginning of 2016:

In 2015 the project has started development of the National plan for implementing outreach/promotional activities to support biomass projects targeting domestic (and international) investors and launched the development of the Municipal Biomass Guide with detailed step-by-step approach for implementing municipal biomass programmes. This work is to be completed by early 2016 to provide a strong basis for the project's outreach programme.

Planned actions/activities for 2016:

1. Develop Municipal Biomass Guide with detailed step-by-step approach for implementing municipal biomass programs.
2. Develop a Practical Guide on energy willow cultivation in Ukraine.
3. Conduct the first stage of an awareness campaign promoting biomass utilization for heat and hot water supply in the municipal sector in Ukraine.
4. Develop Brochure on bioenergy technologies utilization in the municipal sector in Ukraine.
5. Organize the Annual Regional Biomass conference with the focus on the pilot region.

III. Progress Review

3.1. Formulating a streamlined and comprehensive market-oriented policy and legal/regulatory framework to promote municipal biomass for heat and hot water services

Promoting changes and amendments to the Ukrainian legislation and regulation in force covering bioenergy technologies in the municipal sector to facilitate biomass use in the municipal heat and hot water supply.

The project has been instrumental in supporting the policy development activities in terms of prioritizing bioenergy deployment. Thus,

- **The Detailed Bioenergy Roadmap to support implementation of the National Renewable Energy Action Plan until 2020** was developed in 2016 by the project experts upon request of the State Agency on Energy Efficiency and Energy Saving of Ukraine and presented at the VIII International Investment Business Forum “Energy Efficiency and Renewable Energy” in Kyiv on 01-02 November 2016.

This detailed Roadmap (available in Ukrainian on the project website <http://bioenergy.in.ua/uk/library/korisni-materiali/dorozhnia-karta-z-rozvitku-tverdogo-biopaliva-ukrayini/>), the first of its kind in Ukraine, gives a detailed strategic analysis of the (solid) biomass market situation and prospects in Ukraine. Based on the vision formulated in the “concept” bioenergy roadmap prepared by the project in 2015, the Roadmap specifies the tasks stated in the National Renewable Energy Action Plan until 2020 taking into account existing resource base and defined measures necessary to achieve the biomass utilization objectives.

The Detailed Bioenergy Roadmap also provides recommendations for optimizing the regulatory/legal framework supporting the deployment of biomass technologies in Ukraine, including but not limiting to the following:

- Introduce an exemption from import VAT and customs duties on certain types of imported renewable energy equipment.
- Specify clearly the grid connection procedure for power generating facilities running on biomass and other RES as well (as there is no official guidance available for biomass, and there are now several procedures for some other RES that vary according to the

type of generation and, in some cases, the part of Ukraine in which the generation takes place).

- Adopt necessary changes to the legislation in force to facilitate demonopolization of the Ukrainian electricity market.
- Prioritize and make available soft bank financing for biomass equipment manufacturers.
- Review national energy strategy to prioritize solid biomass utilization in the municipal sector.
- Elaborate sectoral energy efficiency programmes for industries and communal and utilities sectors.
- Simplify procedures for obtaining land use permits for companies utilizing RES.
- Develop a clear procedure for connecting facilities to the heating network.
- Renew the tax benefits recently cancelled by the amendments to the Tax Code of Ukraine as well as other benefits, including:
 - exemption from import VAT and customs duties for renewable energy equipment;
 - 75 per cent reduction in land tax for land used for renewable energy power plants;
 - limits on rental payments (annual payments not exceeding 3% of the appraised monetary value of a land plot) for land leased from state and municipal authorities for location, arrangement, construction, maintenance and operation of energy generating facilities running on RES;
 - exemption from the tax duty in the form of a special mark-up on produced electricity (3 per cent of produced electricity); and
 - exemption from corporation tax on profit derived from the sale of biofuels (temporarily until 2022);
 - exemption from corporation tax on profit derived from cogeneration or generation of energy using bioenergy;
 - exemption from corporation tax on profit for renewable energy equipment manufacturers as specified by the Law of Ukraine “On alternative fuels”;
 - exemption from corporation tax on profit derived from the sale of electricity produced from renewable sources (temporarily until 2021);
 - 50% exemption from corporation tax on profit derived from EE projects for enterprises listed under the State registry of enterprises designing and implementing EE projects and measures;
 - exemption from VAT for suppliers of equipment listed in the Article 7 of the Law of Ukraine “On alternative fuels” on the territory of Ukraine, as well as import of equipment (having no analogues produced in Ukraine) used for reconstruction of existing or construction of new biofuel production facilities, and production of means of transport or technology equipment using biofuels, including agricultural machinery (temporarily until 2019).

Next, a detailed modeling for the sector between now and 2020-2030 and further for each region of Ukraine is required to form the basis for a longer term analysis and action. However, this requires expensive expertise and therefore is currently beyond the scope of the Project.

- At the regional level, municipal level targets have been developed as a part of the **formulated Municipal Biomass Programmes for 7 pilot oblasts** (Poltava, Ivano-Frankivsk, Zakarpattia, Volyn’, Dnipropetrovsk, Zhytomyr and Cherkassy). Municipal Biomass Programmes provide for a systematic approach to the transition from the traditional district heating system to a modern and efficient system that involves the use of available local biomass fuels instead of imported natural gas. The Programmes describe the current situation with energy consumption in the regions, analyze the local biomass potential, and suggest activities, measures, monitoring and quality management

approaches to ensure prompt introduction of the biomass technologies in the regions. The Programmes are consistent with the priorities of the National Energy Strategy of Ukraine till 2030 in terms of energy efficiency objectives, and envisage a significant reduction in the use of natural gas in the sector. The key indicators of the Programmes are summarized in the table below.

Summary of the Municipal Biomass Programmes for 7 pilot oblasts of Ukraine

No	Indicators		Volyn'	Dnipropetrovsk	Zhytomyr	Zakarpattia	Ivano-Frankivsk	Poltava	Cherkasy
1	Land area	thous. km ²	20,2	31,9	29,8	12,7	13,9	28,7	20,9
2.	Total population	mln people	1,04	3,29	1,26	1,26	1,38	1,44	1,23
3.	Total technically achievable biomass utilization potential per year	ktce	438	1990	188,57	2,7	49,1	90,2	239,4
		quantity, thousand tons	876,1	3980	377,14	5,4	98,3	180,3	478,8
	Including:								
	Agriculture residues	quantity, thousand tons	809,1	2480	251,84	-	-	41,2	160,8
	Energy crops cultivation	Thousand hectares	6,7	150,0	12,53	0,54	9,83	13,91	31,8
quantity, thousand tons		67	1500	125,3	5,4	98,3	139,1	318	
4.	Required funding	Total, mln UAH	76,1	95,7	979,1	321	101,2	176,74	944
		including:							
		for agro industry, mln UAH	-	16, 2	464,8	68,9	40,0	-	408
	for municipal heating, mln UAH.	76	77, 5	486,5	252,1	61,2	176,74	534	
5.	Estimated annual biomass consumption (including wood residues) by municipal facilities after the programme implementation	thousand tons	46,6	2	610	128	30,2	41,2	31,1
6.	Annual CO ₂ emissions reduction resulted from the programme implementation ¹⁰	тыс. т.	45,7	1,96	597,8	125,4	29,6	40,4	30,4

¹⁰ Annual CO₂ reduction was calculated using the CO₂ emissions reduction calculator available at <http://biomass.kiev.ua/useful-info/calculators/replacement-with-biomass>

All the developed Municipal Biomass Programmes have been submitted to and discussed with the respective local authorities and now pending approval of the local councils. The Municipal Biomass Programmes are available on the project web site <http://bioenergy.in.ua/uk/library/zviti-proektu/proekti-regionalnikh-program-vikoristannia-bioenergetichnikh-tekhnologii-u-teplo-ta-gariachomu-vodopostachanni/>.

- In 2015 the project experts have reviewed and **proposed amendments to the key laws within the energy and renewables framework to help boost bioenergy technologies utilization**. As an outcome, 8 draft laws with the proposed amendments were presented to the key governmental partners in autumn 2015.

Four out of eight draft laws suggested by the projects have been used so far in the following governmental and deputies' draft legislation.

Submitted by the Government:

- "On Amendments to the Law of Ukraine "On Heat Supply "on the transfer of authority to set tariffs and licensing the production of energy from alternative energy sources", registration #4580 dtd 04/05/2016;

- "On Amendments to some legislative acts of Ukraine concerning improvement of relationships in the heating sector, including district heating and hot water supply services", registration #4643 dtd 11/05/2016;

"On Amendments to Article 19 of the Law of Ukraine "On Heat Supply "on signing long-term contracts for the supply of heat energy", registration #4581 dtd 05/04/2016.

Submitted by a group of the People's Deputies of Ukraine:

"On Amendments to the Law of Ukraine "On Heat Supply" to stimulate the production of heat energy from alternative energy sources". registration #4334 dtd 30/03/2016.

The following elaborations provided by the project provided the basis for the above draft laws:

- Granting authority to local governments (municipalities and local self-governing bodies) to harmonize investment programs for heat generating facilities and installations running on alternative and renewable energy sources with an annual output not exceeding 55,000 Gcal/yr.

- Authorizing Crimean, regional (oblast) governments, Kyiv and Sevastopol city state administrations for licensing the production of thermal energy at the generating facilities and installations running on alternative and renewable energy sources with an annual output not exceeding 55,000 Gcal/yr.

- Authorizing the National Energy and Utilities Regulatory Commission for licensing the production of thermal energy at the generating facilities and installations running on alternative and renewable energy sources with an annual output exceeding 55,000 Gcal/yr.

- Authorizing local authorities to set tariffs for thermal energy produced from renewable energy sources at 90% of the current tariff for heat produced from natural gas for the needs of budgetary institutions.

- The tariff for thermal energy produced from renewable energy sources for the needs of households is set at 90% of the current tariff for heat produced from natural gas for the needs of households.

- Introduction of long-term contracts (minimum 5 years) for the supply of thermal energy to budgetary institutions, if the thermal energy is produced at heat generating installations running on alternative energy sources and using alternative fuels.

In 2016, the Parliament adopted amendments to several Ukrainian Laws on the promotion of renewable energy, and the following progress has been observed in the enacting the above and other suggested amendments to the legislation:

- Law of Ukraine “On amendments to the Law of Ukraine "On Heat Supply" in order to stimulate generation of heat energy from alternative energy sources” – has passed the first reading on 22.09.16.
 - Law of Ukraine “On National Energy and Utilities Regulatory Commission” – approved by the Government, adopted by Verkhovna Rada, not yet signed by President of Ukraine.
 - Law of Ukraine “On Heat supply” – approved by the Government and submitted to Verkhovna Rada of Ukraine for final adoption.
- The project also developed **Criteria and procedures for the introduction of a transparent process in the selection/award of municipal biomass projects** and compiled an Analytical report (available in Ukrainian) further presented and turned over to the Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine. The Analytical report describes in detail the scope and stages of the biomass project development for the municipal heating and hot water supply sector (from energy audit and evaluation of annual attainable amount of biomass, risk assessment in the implementation of bioenergy projects, to general and specific requirements, control procedures and selection criteria to be applied when developing and implementing bioenergy projects). The project has applied these criteria and procedures while selecting the pilot projects described in the Chapter 3.3. here below.

3.2. Developing capacity within the Government to support development and implementation of municipal biomass programme through establishing a Biomass Support Unit

Providing Support to the Renewable Energy Working Group

As the Ministry of Agrarian Policy and Food of Ukraine has now limited authority to lead and manage a Biomass Support Unit (that had to be established by the project in line with the Project Document), and proper institutional arrangements are not in place yet, the project provides expert support to the Renewable Energy Working Group established on 08.12.2015 under the State Agency on Energy Efficiency and Energy Saving of Ukraine. The Renewable Energy Working Group includes representatives of the Ministry of energy and coal industry of Ukraine, the National Energy and Utilities Regulatory Commission, state-owned company national energy company “Ukrenergo”, renewable energy associations, leading NGOs and business corporations.

Analytical Report on tariff and price regulation for heat and hot water supply in the municipal sector in Ukraine

The prices and tariffs for the heating and hot water supply services in Ukraine are subject to state regulation. Therefore the Study on tariff and price regulation for heat and hot water supply in the municipal sector in Ukraine was essential to help ensure predictable and transparent business environment in heat energy and hot water supply, including from bioenergy source.

The Study analyzes the current system of tariff and price management in the municipal heat and hot water supply sector, including existing legislation and regulation framework, its disadvantages and improvements required; provides overview of the national and local level regulatory authorities; analyzes various types of tariffs, the net cost of services and typical tariff structure for the last 2 years; provides SWOT and gap analysis of the pricing and tariff strategy principles; analyses the cost and the tariff structure for the last 2 years; recommends improvements in tariff and price regulation for the thermal energy generated from bioenergy sources. The Analytical Report is available in Ukrainian on the project website <http://bioenergy.in.ua/uk/library/zviti-proektu/analitichnii-zvit-shchodo-tarifoutvorennya-ta->

[tsinovogo-regulivannia-postachannia-tepla-ta-gariachoyi-vodi-v-munitsipalnomu-sektori-v-ukrayini/](#) .

3.3. Establishment of a Financial Support Mechanism and Implementation of Pilot Projects

Establishment of a Financial Support Mechanism

The overall aim of the Financial Support Mechanism is the development of a standardized financial product that banks can use to finance the types of technical projects being supported by the Project. Additionally it is to facilitate the eventual attraction of financial resources to be applied to the financial product further driving its implementation.

Originally, the Project Document envisaged a financial support mechanism (FSM) being established within the state-owned DerzhZem bank. However, reforms in 2014 in Ukraine led to the impossibility to follow the initial scheme as on 17 June 2014 the Parliament voted for the legislative proposal # 4784 “On amendments to some legislative acts of Ukraine (about functioning of the DerzhZem bank)” and on 10 September 2014 the Cabinet of Ministers of Ukraine took the decision to liquidate the DerzhZem bank. A new partner needed to be chosen to establish and implement the financial support mechanism, as the operating procedures of UNDP meant that UNDP could not directly manage the FSM.

Therefore an International Consultant on the Establishment of Financial Support Mechanism for Bio-energy in Ukraine was engaged to help identify a suitable partner or partners. Based on research into other financial support mechanisms used in similar programs regionally and around the world it was noted that any grant-oriented scheme would be very limited and that the results are often disappointing. Based on interviews with major banks in Ukraine it turned out that even in the currently challenging economic situation they in fact had funding available. However, the banks were not really in a position to adequately assess the new projects due to the absence of the experience in biomass energy technology financing. Thus, it was concluded that the ideal financial support mechanism would utilize existing financial institutions (banks) that have both the financial capacity and geographic reach to support and provide financing a large number of projects. The above was summarized in the Road Map for the Financial Support Mechanism and the Recommendations Report prepared by the International Consultant on the FSM Mr. Michael Devoe.

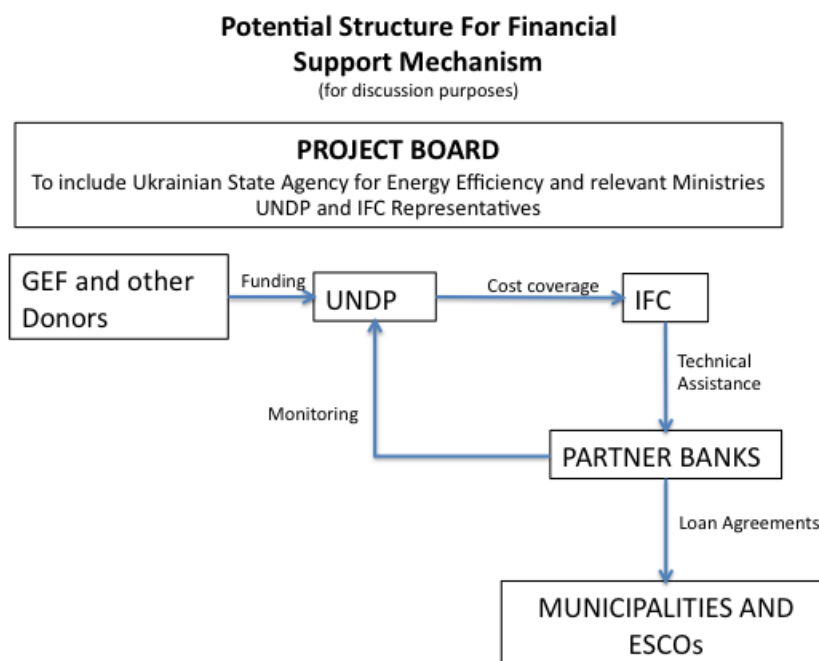
Subsequently, the adaptive management has been applied to find new approach for developing a Financial Support Mechanism that would enable a flow of investments into renewables (biomass in particular) and energy efficiency in Ukraine.

As operating procedures prevent UNDP from directly managing a Financial Support Mechanism and also because extensive technical assistance was required, there was a need to collaborate with a reputable financial institution to efficiently design, jointly manage and implement such a mechanism. In this regards, the idea to team up with the International Finance Corporation (IFC) was generated in the country office.

Being the part of World Bank group, IFC is the only UN sister agency that possesses a high-level professional expertise in the state/private sector finance and could provide this knowledge to other UN family members within an interagency partnership. IFC correspondingly has an extensive experience in development of such type of FSMs in the RBEC region and in Ukraine in particular.

After successful initial negotiations with IFC in late 2015 and early 2016, a formal agreement was expected to be signed in July 2016. Meanwhile Recommendations for the Preferred Option for the Operation of the Financial Support Mechanism implementation were developed by the project’s International Consultant on the FSM to help kick-off the process.

The key recommendation was that the UNDP develop a Financial Support Mechanism along the general lines of the diagram below aiming at the development of a viable financial product for the partner banks.



It is envisaged to create a Project Board of individuals from relevant Ukrainian ministries/banks as well as UNDP and IFC representatives to function as a supportive structure that can assist in cutting across bureaucratic lines as well as include one or more “champions” for the project, as the idea of a project champion was noted in several of the reviewed financial support mechanisms as a key factor in the success of implementation.

The UNDP as initiator of the project will oversee the formation of the project board and the development of the financial product with the IFC and partner banks.

The role of the IFC is envisaged as an implementer of the FSM. Additionally, at a later stage the IFC may assist with the provision of additional funds to the FSM via their own resources or those of other financial institutions.

The key result of the FSM will be the creation of a Financial Product (which include legal, financial and technical aspects), whereby the partner bank(s) will be in a position to finance the types of projects covered by this Project. The partner banks will be the provider of the financial product to the municipalities, ESCOs or other companies that develop projects that fall under this financial support mechanism. The Financial Product will also have to conform to all of the internal procedures and requirements of the partner bank(s) and will be promoted by them (and the UNDP) in the market. Once developed, the financial product will be presented to relevant staff at the partner banks via a training program.

As an outcome of the advanced discussions a local financial institution – the state-owned bank “Oshchadbank” (the second largest bank in Ukraine with over 6000 branches) has been

selected as a partner for implementing a Financial Support Mechanism as having experience in successful implementation of a program together with the State Agency for Energy Efficiency aimed at the retail sector (supported by the IFC).

Due to lengthy legal disputes between UNDP and World Bank (IFC) legal offices on the format and details of the agreement, the negotiations continued until late 2016. As this was the first and somewhat unique experience of such cooperation between the two agencies (though both are the UN family ones, but using different templates and apply different rules), it took longer than expected (almost half a year) to find a solution for signing an agreement corresponding to the internal rules and procedures of both organizations.

Finally, in November 2016 the legal solution was found to engage IFC via the International Bank for Reconstruction and Development as also a part of the World Bank group, and the text of the Agreement was finalized. The Agreement for the Banking products for EE projects Externally Financed Output was signed between the United Nations Development Programme and the International Bank for Reconstruction and Development in December 2016.

The Agreement envisages focusing on filling the market gap of developing the commercial lending mechanisms to finance energy efficiency projects by undertaking the following activities:

- (i) Analyze the legal and regulatory framework related to unlocking commercial lending to the municipalities;
- (ii) Develop a set of solutions for improving legal and regulatory framework to unlock commercial lending to the municipalities;
- (iii) Identify and analyze potential types of projects and potential demand for commercial lending for energy efficiency projects by municipalities;
- (iv) Identify and analyze special features of lending products required from the municipalities perspective;
- (v) Identify and screen of suitable local banks interested in development of lending products for energy efficient projects to the municipalities;
- (vi) Together with the financial institution, design or adjust banking products focused on supporting implementation of energy efficiency projects, manufacturing and usage of energy efficient equipment for various client groups including municipalities, SMEs involved in productions, transportation and installation of energy efficient equipment, and individuals;
- (vii) Conduct necessary trainings for partner banks' staff (risk, legal, sales) to launch the developed banking products;
- (viii) Assist selected financial institutions in creation of pipeline by facilitating the collaboration with the potential clients.

All the above activities are expected to be completed by June 30, 2017.

It is worth mentioning that the main reason why the IFC agreed to be involved is that they believe in the biomass development in Ukraine. The experience of pilot project, other similar projects, independent analysis etc. show that the biomass technologies are economically feasible and the challenge is to make them financially feasible as well as to provide easier access to financing through the FSM. There is also a readiness expressed by the municipalities, private investors in developing of biomass technologies for heating but they have limited access to financing (Covenant of Mayors doesn't provide financing to the signatory cities). Therefore, there is a high likelihood that the FSM will be operationalized successfully.

Comprehensive Study of Ukrainian biomass boilers market

In 2016 the project carried out a very comprehensive study of the biomass boilers market to fill the data gap and analyze the municipal heat energy sector development trends, biomass boilers production, supply and consumers, market structure and prospects for wide biomass boilers introduction in the municipal sector of Ukraine.

In particular, the market of biomass-fired boilers is covered in great detail, including domestic biomass boilers manufacturers/suppliers and imported technologies, their technical characteristics, advantages and pricing policies. The study also identifies the main groups of customers in the municipal sector and provides insight into the dynamics of biomass technologies implementation, thus allowing modeling the future market trends.

There are over 100 domestic manufacturers of biomass boilers in Ukraine along with more than 130 foreign brands from 25 countries. Majority (80%) of the biomass boilers offered in Ukraine has a capacity of 100 kW or less and designed for the use of wood chips and wood pellets.

About 30 thousand biomass boiler units (up to 100 kW) mostly for household use were imported to Ukraine during 2012-2015 with a total capacity of 1,134 MW.

The Study is based on the most recent statistical data for 2012-2015 and can be considered a sort of a biomass boilers market data book.

The Study is available in Ukrainian on the project website <http://bioenergy.in.ua/uk/library/korisni-materiali/a-comprehensive-study-of-the-market-of-boilers-of-biomass-in-ukraine/>.

Implementation of municipal biomass pilot demonstration projects

During 2016 new Partnership Memoranda were signed with Volyn Oblast State Administration, Zhytomyr Oblast State Administration, Cherkassy Oblast State Administration and Dnepropetrovsk Oblast State Administration and Cherkasskoe municipality in Donetsk Oblast, to support the introduction of bioenergy technologies in the municipal heat and hot water supply aiming at improving energy efficiency, sustainability and energy management in municipal housing and communal sector.

In 2016 the project continued implementation of pilot demonstration projects in the selected municipalities. All demonstration projects so far were implemented at the educational establishments, as additionally to obvious economic and environmental effects, modern, sustainable and cost-efficient solutions for heating and hot water supply, such as biomass, also provide a real opportunity to raise students, teachers and parents' awareness of energy-efficiency benefits and challenges.

In total 12 project projects involving installation of biomass fired boilers were implemented during 2015-2016, including 7 projects completed in 2015 – 3 projects in Uman' (at the Preschool nursery and kindergarten of combined type № 21, Uman' secondary school № 9, Uman' specialized school № 12) and 4 projects in Zhytomyr (at Zhytomyr National Agroecological University, Zhytomyr preschool kindergarten № 10, Zhytomyr secondary school № 1); and 5 projects in 2016 – 3 biomass fired boilers installed in Kyiv (at the National Ecology and Nature Centre) and 2 biomass boilers under installation in Cherkasskoe municipality in Donetsk Oblast.

The boilers run on locally-grown biomass made from waste wheat straw pressed into pellets. This process is rather unique for Ukraine, and taking into account incredible amount of straw

generated annually and small stocks of wood in the country, it provides excellent development solution from both renewable energy and green jobs perspectives.

All the installed straw-fired boilers have been produced in Ukraine.

Launching ceremony of three straw-fired boilers in Kyiv participated by UN Assistant Secretary General

Experience with the first pilot biomass demonstration projects implemented in 2015 (seven biomass-fired boilers installed in the cities of Uman and Zhytomyr) confirmed that biomass boilers perform well under local Ukrainian climatic conditions.

In 2016, the National Ecology and Nature Centre (NENC) – a specialised educational establishment under the Ministry of Education and Science of Ukraine for after-school and extracurricular activities (academic and creative enrichment), was selected as one of the pilots.

The choice of the NENC for the pilot was not accidental. The Centre runs over 100 creative associations, clubs and study groups for pupils in 45 different domains, including ecology and environmental protection, agriculture and health awareness. The use of renewable heating system in an educational setting, like the National Ecology and Nature Centre, can serve as a teaching and outreach tool, as well as a case study for successful energy efficient renovation and inspire other educational institutions, pupils and their families.

To draw public attention to the project activities and promote biomass use and its benefits for heating and hot water supply services, the first three straw-pellets fired boilers ever installed in Kyiv were inaugurated on 18 October 2016 by Ms. Cihan Sultanoglu, UN Assistant Secretary General and UNDP Regional Director in Europe and the CIS during her visit to Ukraine, together with Mr. Valentyn Shlikhta, Deputy Head of State Agency on Energy Efficiency and Energy Saving of Ukraine

Switching from natural gas to biomass pellets is expected to facilitate significant savings in the National Ecology and Nature Centre budget over the 2016-2017 heating season. It also ensures proper thermal comfort in the premises, thanks to the new equipment. The money saved will be spent on installing energy-efficient windows and building insulation at the Centre.

In total about 133,000 people (mostly schoolchildren and teachers) benefit from the improved access to energy and safe, healthy and exemplary indoor environment that provides physical comfort to help students unleash their full potential.

Supporting “ENERGY FARMING” for municipal purposes

An important factor to be considered before large scale deployment of biomass for energy and heating is the implementation of replacement planting programme(s) simultaneously with biomass for fuel consumption. This is crucial for avoiding a time lag between the instantaneous release of CO₂ from burning fuels and its eventual uptake as biomass, which can take many years.

To help create a sustainable business model and support energy crops cultivation on different soils aimed at optimizing productivity whilst avoiding negative impact on environment and biodiversity, the project has implemented few pilots on establishing energy

crop nurseries in three regions of Ukraine with different climate, soil and agronomic characteristics.

While numerous crops (woody crops, grasses/herbaceous plants etc.) have been proposed or are being tested worldwide for commercial energy farming, the project aimed at helping select and start cultivation of the ideal energy crop for Ukraine.

In line with the above objectives, the project helped formulate regional biomass programmes and identify opportunities for energy crops cultivation in the selected regions of Ukraine. Given the Ukrainian climate context, much attention has been focused on the short rotation coppice species, especially so-called Swedish energy willow.

In order to provide practical assistance to the local government and accelerate biomass cultivation and utilization in the pilot regions, it was decided to establish energy willow nurseries to make rootstock available for further dissemination and to showcase the viability and feasibility of energy crops cultivation.

The idea was to establish and promote energy willow (and potentially other energy crops) commercial cultivation on the local lands among local farmers and land-owners to further use it in district and individual heating plants for heat and hot water production.

As the GEF Council recommended utilizing SGP country programmes as delivery mechanisms for relevant full-sized projects, the project cooperated with the GEF Small Grants Programme in Ukraine to better cover local communities and non-governmental organizations (NGOs) through the provision of small grants aimed at establishing energy willow nurseries in the pilot regions.

Specifically, in the spring of 2016, 3 grants have been provided through the GEF SGP to 3 environmental NGOs and energy crops cultivation have started in three regions of Ukraine: Zakarpattia (extreme west), Ivano-Frankivsk (west) and Poltava (center) regions, where energy willow nurseries have been planted over a total of 15 ha of privately-owned lands.

On three experimental plots of 5 ha each over 310,000 Swedish energy willow seedlings have been planted on different soils. The productivity of 5 ha energy willow nurseries can be up to 3 million shoots, thus providing substantial rootstock for further commercial cultivation. Next year some additional 500 ha is planned for energy willow mother plantation in one of the pilot regions.

Energy willow is very fast-growing – the average rate of growth is 1,5 metres a year and they can be eventually higher than 8 metres – vastly higher than any crop seen in Ukraine. The willows are harvested every three-four years, during winter when the soil is frozen. Once harvested, the willow does not need to be replanted — it grows right back continuously up to at least 25 years if kept well.

Energy willow, as well as other energy crops, can be grown on slopes, marginal, or degraded land thus preventing non-productive lands from further degradation and contributing to the long-term restoration and feasible economic use of low- and non-productive lands.

Starting from the next year energy willow cultivation is possible at approximately 20,000 ha of free or non-productive lands in each pilot region. 1ha of the energy willow plantation can produce over 50 tons (up to 90 tons) of biomass annually allowing to replace from 15 to 35 thousand cubic meters of natural gas, which makes it very attractive for farmers.

The harvesting of biomass will also help save the forest (as the estimated available woody biomass supply in the regions is less than for 7 years) and provide cheaper product for municipal heat and hot water services.

In order to be used for municipal heating, the above-ground biomass will be chipped on-site, then transported/stored and further burned in special biomass boilers to supply heat and hot water to schools, kindergartens, hospitals and other municipal facilities.

One farmer in the project pilot region (Ivano-Frankivsk) has already followed the lead and planted energy willow over some 21 ha of its own land with the purpose to have a good and cheap fuel for his farmstead, as well as establish a biomass-supply business.

Comprehensive analysis of the Ukrainian biomass pellets market

A manual "Comprehensive analysis of the Ukrainian biomass pellets market" was prepared by the experts of the scientific and technical centre "Biomass" within the project implementation framework.

The domestic market for fuel pellets keeps growing in Ukraine because of increasing fossil fuel prices. Pellet prices on the domestic market vary and depend on location of the plant and the vicinity to consumers and retailers.

Ukrainian domestic pellets market is still quite disorganized, and pellet production develops not that fast due to scarce investment resources and limited wood waste, though relatively high share of agricultural waste pellets (e.g. sunflower husk pellets). However, while generally straw and other agricultural residues greatly exceed the energy resource of waste wood, their use as fuel lags far behind the use of wood.

In the district heating sector only one district heating company introduced a straw-fired boiler. There were also several projects promoting the use of straw pellets.

In this context the objective of this pellets market study was to determine the main reasons that hinder the wide application of pellets from straw and other crop residues in the heating sector. Obviously, these reasons relate to various aspects – physical and chemical properties of agricultural residues, features of their production and use, existing supply chains, external factors such as global demand for pellets and also profitability of their production.

International experience, in particular from Denmark and other countries shows that efficient energy use agropellets is quite possible and feasible, provided the use of appropriate equipment and technologies. Therefore, given the urgency of the issue, the study also covered the opportunities for production and ways of stimulating the use of agropellets in Ukraine. The study is available in Ukrainian on the project website http://bioenergy.in.ua/media/filer_public/4a/02/4a0236b5-a30b-4167-8c3b-7fd4bcae8926/kompleksnii_analiz_ukrayinskogo_rinku_pelet_z_biomasi.pdf

3.4. Outreach programme and dissemination of project experience/best practices

Municipal Biomass Guide with detailed step-by-step approach for implementing municipal biomass programmes

Municipal Biomass Guide detailing a step-by-step approach for implementing municipal biomass programmes was developed by the project in 2016. This practical manual (available

in Ukrainian on the project web site <http://bioenergy.in.ua/uk/library/korisni-materiali/praktichnii-posibnik-vikoristannia-biomasi-u-munitsipalnomu-sektori/>) highlights the biomass utilization situation and legal/regulatory framework; provides available programme documents describing opportunities for the biomass utilization in the municipal heat and hot water supply sector; analyzes land-use issues that typically arise in the process of bioenergy facilities construction. It also deals with feasibility analysis requirements, business plan methodology, design, construction and operation requirements for bioenergy facilities. The Municipal Biomass Guide gives insight into standardization of services provided by bioenergy facilities and principles for tariff regulation for energy generation and supply from bioenergy facilities; analyses monitoring and operational responsibility and liability issues.

Analytical Report and Recommendations on energy crops cultivation in Ukraine

As the market for energy crops is now developing in Ukraine in response to the need for renewable energy as alternative to natural gas driven by the aim of strengthening national energy security and ensuring environmental sustainability, the practical information on the cultivation and utilization of energy crops for heat and power comes in handy.

The Analytical Report focuses on agricultural energy crops that are the crops grown primarily for producing biomass for energy purposes in an agricultural rather than a forestry context. It gives overview of the current situation in Ukraine's agricultural sector covering a wide range from conventional food crops, such as oil seed rape through to "second-generation" energy crops (willow, miscanthus, poplar etc.), and analyses political/legislative and administrative aspects of using agricultural land for energy crops, particularly those unsuitable for consumption by human or animals. The Analytical Report reviews the different types of energy crops already being used in the EU and in Ukraine, identify opportunities, characteristics and feasibility of their cultivation in Ukraine, and gives guidance on the most appropriate location, land preparation, planting techniques and crop management required.

Development of Biomass training/information toolkit (the first stage of an awareness campaign promoting biomass utilization for heat and hot water supply in the municipal sector in Ukraine)

In line with the National plan for implementing outreach/promotional activities formulated by the project in 2015, the project has developed a concept of an outreach programme and informational support primarily focused on trainings and informational campaign among municipal authorities and specialists to promote use of agricultural biomass for heating and hot water services.

The target audience for trainings and informational campaign is UNDP's partners and intermediaries at oblast and municipal levels, including state government representatives, municipal authorities and specialists, rayon level authorities and specialists as well as non-governmental organizations and community-based organizations.

The purposes of the trainings and informational campaign are:

- Encourage target group participation in biomass energy initiatives and implementation of agricultural biomass for municipal heating and hot water services.
- Advocate agricultural biomass utilization as a promising energy source to be used in municipal/commercial facilities and help implement feasible projects achieving real cost and energy savings.
- Excite public interest to biomass as a promising renewable energy source in Ukraine.
- Present environmental and economic benefits resulted from utilization of agricultural biomass.

- Present best international and national practices of using agricultural biomass (energy willow and straw).

Apart from the obvious information and educational purposes, the trainings are to a) improve knowledge and capacities for analyzing opportunities and for developing, facilitating or coordinating biomass initiatives; b) catalyze biomass technologies utilization in Ukraine; and c) promote positive changes in attitudes.

To serve the above purposes the project developed a very detailed Terms of Reference and a tender was announced in December 2016 for compiling a multi-audience biomass training/information toolkit (including manuals, materials and presentations) and deliver trainings for targeted state and municipal departments (agro-industrial complex, environment and nature resources, and housing and utilities sectors) in 24 oblasts of Ukraine and regional centers in the project's 7 pilot oblasts (Dnipropetrovs'k, Poltava, Ivano-Frankivs'k, Zakarpattia, Volyn', Zhytomyr and Cherkasy oblasts). The total estimated number of trainings is 338 events, including 72 oblast level and 266 rayon level trainings to be delivered during 2017.

Brochure on bioenergy technologies utilization in the municipal sector in Ukraine

Brochure on bioenergy technologies utilization in the municipal sector in Ukraine was compiled by the project in 2016 with the purpose of documenting best practices. It gives an overview of the situation with bioenergy technologies in the municipal sector in Ukraine; describes available practices of using bioenergy technologies for heating and hot water supply; and provides examples of successful projects carried out in the municipal sector in Ukraine.

3.5. Project implementation and monitoring in 2016

Implementation

The project duly follows its Annual Work Plan and Project Implementation Plan when implementing various activities contributing to the achievement of project objective.

In 2016 the Project Management Unit composed of a Project Manager and a Project Associate managed a sizable amount of expertise engaged to implement project activities. In total 48 various contracts were prepared, managed and supervised, including 39 individual contracts, 4 grants with environmental NGOs and 5 complex technical contracts for pilot biomass project.

The project continued partnership with numerous stakeholders – parliamentary committee, state executive bodies (Ministries and Agencies), local executive bodies (municipalities), local councils, environmental and bioenergy/renewable energy NGOs/Public Unions/Associations, GEF Small Grants Programme, International Financial Institutions, think tanks and academia.

Mid-term evaluation

In line with the GEF Monitoring and Evaluation Policy, as a full-sized GEF-financed project, it should undergo a Midterm Review (MTR). The Terms of Reference for the MTR should be drafted and advertised before the submission of the 2nd Project Implementation Report (PIR) and the MTR report must be completed and submitted to the GEF Secretariat with the 3rd PIR.

Therefore the ToR for the MTR was drafted on May 2016 and advertised on 11 August 2016 simultaneously with the 2nd PIR submission. After a long and complicated selection process, an independent MTR consultant (evaluator) was engaged in early December 2016 and a short field MTR mission conducted on 18-22 December 2016 to the project pilot sites in Ukraine. The core field mission is planned for 21-31 January 2017 and the MTR report expected by the end of February 2017.

V. Annexes

Annex 1. National Renewable Energy Action Plan until 2020 (in English)

Annex 2. Case study on energy willow nurseries establishment in Ukraine in cooperation with the GEF SGP