JOINT IMPLEMENTATION PROJECT

«Implementation of technological modernization of LLC «TH «Shepetivsky Sugar»

Position of manager of the company,
institution, establishment -developer of the document.
General Director of LLC «MT-Invest Carbon»

29 . 10.2012 ____________ **Falendysh Yaroslav Myroslavovych**

P. for S.

Position of the head of the entity
-owner of the source,
where is planning to carry out the JI Project
Director of LLC "TH "Shepetivsky Sugar"

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JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
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Annexes

SECTION A. General description of the project

A.1. Title of the project:

Implementation of technological modernization of LLC "TH "Shepetivsky Sugar"

Sectoral scope: (3) Energy demand.
(13) Waste handling and disposal.

Version of the document: 3.0

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A.2. Description of the project:

The project is aimed at achieving greenhouse gases emission reductions through decreasing specific natural gas and electricity consumption during sugar production, and advancing waste management practices at LLC "TH "Shepetivsky Sugar". As a result of the project implementation energy consumption of the enterprise is reduced, which is related to greenhouse gases emissions, and the quantity of the beetroot pulp decreases, which would be moved to landfill, where as a resultant of anaerobic fermentation of the organic matter contained in the beetroot pulp methane would be released, which is a greenhouse gas.

The project is implemented at LLC "TH "Shepetivsky Sugar" which is located in Khmelnitsk oblast of Ukraine. The project activity includes two parts:

1) Implementation of the energy efficiency measures to reduce consumption of electricity and natural gas;
2) Advancement of the waste utilization practices.

Reductions in specific consumption of natural gas and electricity are achieved as a result of replacement of filtering equipment, installation of frequency converters, introduction of new burners for gas-fired boilers, replacement of centrifuges and partial automatisation of the process.

Beetroot pulp is a side product of sugar production and is a desugarizated chips of sugar-beet. This product has valuable fodder qualities and can be used for feeding cattle, which actively consumes beetroot pulp of any type: fresh, good soured, ensilage or dry. Technological process of the sugar plant leads to occurrence of fresh beetroot pulp. High content of organic matter makes it an excellent environment for intensive growth of microorganisms, which are the reason for its fast spoilage, which is why it cannot be used for forage and has to be moved to landfill as an organic waste[1]. Reducing water content of beetroot pulp already makes it siloable (siloing is a beetroot pulp conservation through creating conditions for lactate fermentation). Storage time of ensilage if kept with no contact with oxygen extends to a year or more. By additional pressing out of the beetroot pulp, the enterprises widen their options for its useful utilization, which increases demand for it that finally leads to reduction of the spoiled beetroot pulp. The proposed project activity includes advanced squeezing of the beetroot pulp by introducing additional presses.

At the moment the project activity is already implemented and generates emission reductions.

Situation before the project

[1] Beetroot pulp was assigned a code 1583.2.9.01 in accordance with State Classifier DK 005-96 "Waste Classifier".

Before implementation of the project the enterprise operated equipment with higher energy demand per unit of the produced sugar. It was operational and could be used further provided that regular maintenance activities are undertaken.

Before the beginning of the project necessary equipment for additional pressing of the beetroot pulp was not available, which was the reason why it quickly became spoiled and this valuable fodder resource turned to organic waste, which first were stored in the pulp pits (during three month), and then was moved to landfills. When pulp pits were emptied some about 3-5% of the spoiled beetroot pulp would remain, containing big quantity of microorganisms, which quickly contaminated the fresh beetroot pulp and accelerated its spoiling. Because of such practice the beetroot pulp could not be used for cattle feeding and was removed to landfills.

Baseline scenario

Baseline scenario is continuation of current practice: specific consumption of natural gas and electricity would remain at pre-project levels, and beetroot pulp would be stored as it was produced in pulp pits, with no additional efforts undertaken to reduce its water content. When pulp pit would be full, beetroot pulp would be removed to landfill. This scenario envisages decay of the organic matter with release of the landfill gas, which contains greenhouse gas methane. Baseline scenario requires no changes in the technological process of the plant, and therefore no big capital investments would have to be made, except for operational expenses, and does not faces any barriers.

Project scenario (technical summary)

In the project scenario replacement and modernisation of equipment takes place (replacement and upgrading of pumping equipment, replacement burners, transformer stations, filtration, etc.), which leads to decrease in consumption of natural gas and electricity. Also, equipment to reduce water content of the beetroot pulp is introduced, this allows its useful utilization for cattle feeding, therefore it is not removed to landfill and methane is not released into the atmosphere.

History of the project including its JI component

The project was initiated by LLC "TH "Shepetivsky Sugar" in the middle of 2003. It was started with the creation of the Working Group on Technical Modernization and Advancement of Waste Utilization Practices at LLC "TH "Shepetivsky Sugar" in November 2003.

Main activities were implemented during 2005-2011, that in 2005 started generating greenhouse gases emission reductions, quantity of which will gradually increase as components of the project activity are commissioned. Emissions reductions will be sold as ERUs in the international market of emissions reductions, and the funds obtained will improve the financial performance of the project to a level that justifies the means that were used for its implementation. From the very beginning, JI mechanism was one of the prominent factors of the project and financial benefits under this mechanism plays an important role in making the decision on the start of the operation and considered to be one of the reasons for beginning of the project realization.

The project has been applied to the State Environmental Investment Agency of Ukraine and was obtained the Letter of Endorsement #2679/23/7 on 20/09/2012.

Project implementation schedule is presented as Table 5 below.

A.3. Project participants:

Table 1. Project participants.

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host Party)	LLC "TH "Shepetivsky Sugar"	No
The Netherlands	United Carbon Finance Ltd	No

LLC "TH "Shepetivsky Sugar" – Shepetivsky Sugar Plant is 165 years old! The history of this great enterprise starts in 19th century. In 1843 knyaz Y.Sagushko starts construction of the sugar refinery, which gives its first production in 1846. Because of high production levels of white and refined sugar Shepetivsky Sugar Plant was one of the biggest sugar plants of the industry till 1996. Procurement of the necessary quantities of raw sugar-beet is ensured by close cooperation with farmers, which allows continuous sugar production during the season. Due to cleverly made investments into technological process, successful work of technological, engineering departments, the plant each year conducts planned reconstructions of the existing equipment. Sugar production in 2010 was 26,9 million tonnes.

Shepetivsky Sugar Plant LLC is the owner of emissions reduction generated as a result of the project implementation.

United Carbon Finance Ltd is a potential buyer of ERUs generated as a result of project implementation. Please see Annex 1 of this PDD for detailed contact information.

"MT-Invest Carbon" LLC is a consultant in the development of JI projects and is not a project participant. It is responsible for development of data substantiating materials, PDD, support LLC "TH "Shepetivsky Sugar" in the process of determination, obtaining Letter of Endorsement and a Letter of Approval, support for the final determination of the project. "MT-Invest Carbon" LLC is a potential buyer of the emission reduction units generated by the project.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

Ukraine

A.4.1.2. Region/State/Province etc.:

Figure 1. Geographical location of the project activity – Khmelnitsk region of Ukraine.

A.4.1.3. City/Town/Community etc.:

The Enterprise is located in Shepetivka town of Khmelnitsk region. This project is implemented on industrial site of LLC "TH "Shepetivsky Sugar".

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

Khmelnitsk region is an administrative unit of Ukraine with its center in Khmelnitsk city. Area of the region is 20600 km^2 (3.41% of total territory of Ukraine), it is populated by 1 361 000 people (as of 2006). Region has 13 towns, 24 urban villages, 1415 villages and 20 rayons.

Shepetivka is a town in Khmelnitsk region of Ukraine, the administrative center of Sepetivsky rayon. It occupies third place in region by its population. Location of Shepetivka town on the map of Ukraine is illustrated on the figure 2.

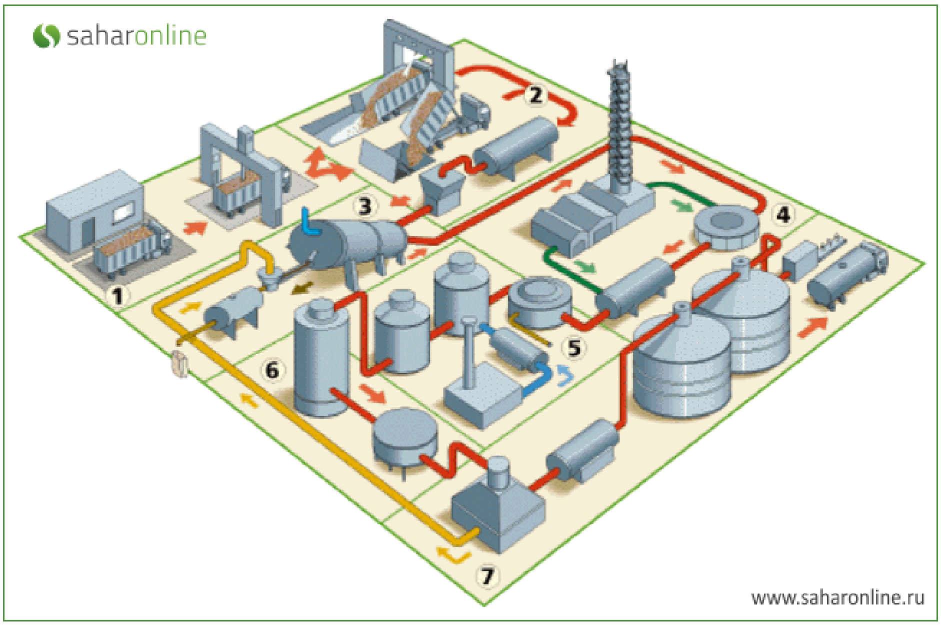
Figure 2. Location of Shepetivka town on the map of Ukraine.

The geographic coordinates of the site are: N 50°11'00" E 27°04'00".

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

Sugar production technology

Sugar production is a complicated, multiphase process, the technical scheme of which is shown in the figure 3. It consist of sugar beet receipt, their discharge and washing, chopping**,** transferring sucrose and other non-sucrose components into the solution (diffusion), purification of juice by adding lime water and such gases as CO_2 (saturation), and SO_2 (sulfitation), concentration of purified juice to the syrup by evaporation and its further concentration in vacuum-apparatus till dense mass is achieved (7% of water) – fillmass 1, that is further processed in centrifuges to get crystalized sugar. The process in more details is described below.



Legend of the technological scheme:	
1. receipt of sugar beet	5. evaporation ;
2. discharge and washing;	6. crystallisation ;
3. diffusion (pulp generation);	7. centrifugal process..
4. saturation;	

Figure 3. Technological scheme of sugar production from sugar beet (Source: Sakhar online[2])

Receipt of sugar beet

Specifics of raw materials which enter the production process is a key factor for high quality sugar production.

During beets harvesting and transporting grass and other small and heavy additives mix with the sugar beet: beet tops, send, and stones. The quantity of these crudes in case of using mechanical devices of cultivation and gathering is near 10-12% of raw materials. The input laboratory analyses the beets when sugar-mill receives the beets. Technological quality of sugar beets is being characterizes by several parameters and the main of them are: saccharinity (the average sucrose content is about 18%) and beet juice purity. Receipt of sugar beets, collecting samples, measuring dirtiness and sucrose content is performed according to state standard GOST 17421-82 "Sugar beets for industrial processing. Provision requirements."[3]

Discharge and washing

Fine washing and cleaning beets from crudes before starting treatment allows raising the quality of the final product, reducing quantity of reagents which are used for purifying beets juice and prolonging lifetime of such equipment as: beet slicing machine, diffusion apparatus, filters, etc.

"Wet" type of beets transportation to the treatment point is most popular on sugar-mills. It starts with beets being washed out from the vehicle with help of flush, then by hydro transporters they are being moved to

[2] http://www.saharonline.ru/e_shema.php?enc=301

[3] http://www.complexdoc.ru/pdf/%D0%93%D0%9E%D0%A1%D0%A2%2017421-82/gost_17421-82.pdf

processing facilities. The primer wash occurs during transportation of beets, crudes are separated by grit catchers, thrash-catchers, stone-extractors. The beets washers are used for the final washing. Clay and soil is best to wash out in drum type washing machines when beets rub one each other. After that beets move to rinsers and tube type washing machines. After that beets are collected in the storage bunker before beet cutter.

Diffusion

In order to separate sugar with diffusion method, beets should be cut by slicing machines which produce beet chips. The productivity of diffusion station and sugar content of desugarized beetroot pulp depends very much on the quality of primer beet chips. Beet ships can be rabbet or plate formed which depends on type of slicing machine. Thickness of chips is 0,5-1 mm. Its surface should be smooth and crackles. When the slices are too thin they create lumps and juice circulation inside the diffusion stations gets weaker.

During diffusion the beet chips are poured with hot water, which ruins cell membrane and sucrose diffuse into the solution. It is possible to dissolve up to 98% of sucrose if diffusion station works properly. Nonsucroses are being dissolved also, they are: protein and pectin substances and products of their dissociation, reducing sugars, amino acids etc. extraction of which occur later in the other processes. As a result diffuse juice is obtained, which is sent further to the next stages of technological process, and **sugarless beetroot pulp** – waste product of sugar production.

Saturation and sulfitation

During saturation process diffusion juice is being treated with lime milk and saturation gas (CO_2). Lime and carbon dioxide is obtained during limestone burning[4]. CaO reacts with diffusion juice components when lime milk is added, forming insoluble compounds with its nonsugar components, which precipitate and can be filtered out. Treatment with CO_2 and SO_3 allows refining sucrose and transferring impurities into insoluble compounds which can be filtered. To raise the quality of filtration the process is repeated several times. Syrup purity should be at least 92%[5] because mistakes that were done before this stage are impossible to correct further.

Evaporation

Sugar syrup is obtained by evaporation of the refined diffusion juice.

Crystallization

Crystallization starts in vacuum stations. During crystallization syrup concentrates to fillmass – dense mass with water content 7%. When fillmass is being separated in centrifuge crystals of sugar and treacle - the inter crystal substance, with high sucrose content (filmass II) - appears. Fillmass of second product is being evaporated and separated in second time. Produced sugar is dried and packed.

Beetroot pulp characteristics

As it was written before beetroot pulp is a byproduct of sugar production which appears after the diffusion process. The beetroot pulp is sugarless slices of sugar beetroots. Fresh beetroot pulp is usually stored in the special temporary tanks, then in beetroot pulp pits. From pits it can be transported into the landfill or utilized.

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[4] CO_2 emissions due to thermal decomposition of limestone are not taken into account in this joint implementation project, since the project activity does not affect them

[5] http://www.saharonline.ru/e_evaporator.php?enc=306

Beetroot pulp consists of pectin substances, cellulose, hemicelluloses. Also there is a small quantity of proteins, mineral substances and sugar. Small quantity of cellulose, good assimilation of carbohydrates, and proteins makes it a very valuable cattle fodder. Cattle eat beetroot pulp of different types: fresh or properly soured in special pits, ensilaged or dried. To sour beetroot pulp it should be kept in special pits. Composition of different types of beetroot pulp is shown in table 2.

Table 2 Composition of different types of beetroot pulp is shown in table (Source: Yuhagroprom[6]).

Characteristic	**Beetroot pulp, %**			
	fresh	**pressed**	**soured**	**dried**
Quantity of raw proteins	1.2-1.5	1.7-1.9	1.3-2.6	7-9
Quantity of cellulose	3.5-4.5	5.0-7.0	2.8-4.2	19-23
Quantity of non nitrogen extracted substance	4.3-6.5	8.5-10.0	2.7-5.8	55-65
alkali	0.6-1.0	1.1-1.4	0.7-1.8	2.4-4.3
Fat	0.4-0.7	0.6-0.9	0.7-1.0	0.3-0.5

The main problem with beetroot pulp treatment is the high content of organic substances, they cause fermentation and decay processes, which spoil its fodder characteristics transforming useful extra product into the waste which has to be deposited. Fresh beetroot pulp may be ensilaged or used for cattle feeding only during the short period of time[7] after it was produced. It is acceptable to allow short-term anaerobic fermentation of beetroot pulp in pits to get soured beetroot pulp, which can be used during 3 days after it is ready. The most widespread type of beetroot pulp conservation is ensilaging. Warm beetroot pulp is packed into the airless vessels where the lactobacilli grow; they secrete lactic acid which becomes a preservative. Ensilaged beetroot pulp can be stored more than a year.

Cattle feeding with spoiled beetroot pulp can cause serious digestion problems[8]. This is why fresh beetroot pulp which was not used for cattle feeding or without proper immediate treatment inevitably becomes a liquid waste product, which must be deposited at landfill.

Description of the project activity

As it was mentioned before, project activity consists of two parts:

3) Implementation of the energy efficiency measures to reduce consumption of electricity and natural gas;
4) Advancement of the waste utilization practices.

Implementation of the energy efficiency measures to reduce consumption of electricity and natural gas

In order to reduce energy consumption during 2005-2011 the series of activities were implemented, which caused decrease of specific consumption of natural gas and electricity during sugar production.

To reduce electricity consumption such actions were undertaken:

1. Station for postfiltration of juice of second saturation was upgraded
2. Station for filtration of suspension of first saturation was upgraded;

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[6] M.V. Kolesnikov. "The storage and use of sugar beet pulp. The chemical composition of the pulp" http://www.ugagroprom.ru/2/

[7] M.D. Isaev. "Why, you can use pulp and molasses?" http://agro.tatarstan.ru/rus/file/pub/pub_37228.doc

[8] M.V. Kolesnikov. "The storage and use of sugar beet pulp. The chemical composition of the pulp" http://www.ugagroprom.ru/2/

3. Sulfited syrup filtration station was upgraded;
4. Frequency converters on pump motors for juice of first saturation filtration were installed;
5. Station for postfiltration of juice of first saturation was upgraded;
6. Syrup and molasses pumps were changed.

Natural gas consumption was reduced by realization of such activities:

1. Station for filtration of first saturation suspension was upgraded;
2. Jet-niche burners on steam boiler №5 TM-25/39 was installed[9];
3. Jet-niche burners on steam boiler №3 TM-25/39 was installed;
4. Jet-niche burners on steam boiler №4 TM-25/39 was installed;
5. Jet-niche burners on steam boiler №6 TM-50/39 was installed;
6. Backward washing scheme after KF-1000 filters for liming in lime section were installed and fitted;
7. Automatics of fillmass making process were installed and fitted;
8. Automatics of fillmass of second and third products making process were installed and fitted;
9. Centrifugal station for fillmass of first product centrifugation was upgraded.

Detailed information about completed project activities, technical characteristics of installed equipment and achieved results are in table below.

Table 3. Technological characteristics of installed equipment and results of implementation of project activities (energy efficiency).

№	**Activities**	**Year of implementation**	**Equipment**	**Technological characteristics**	**Power efficiency effect**
1.	Upgrade of second saturation juice postfiltration station	2005	Filter MVJ - 4 units.	S of filtration: 70 m^2; V of filters: 9,3 m^3; working pressure: 1,6 kg/sm^2; Weigh of filter: 4120 kg. Dimensions: L=2745 mm, B=2600 mm, H=3450 mm.	Reduction of electricity consumption.
2.	Upgrade of station for filtration of suspension of first saturation	2006	Filters KF-1000 – 3 units.	Number of chambers: 55; S of filtration: 76,7 m^2; V of filters: 166,5 m^3; working pressure: 1,6 MPa; Energy consumption: 0,3 kWh.	Reduction of electricity consumption, Decreasing vapor consumption for process needs due to the use of after suspension washing water in technological process, reducing natural gas consumption.
3.	Upgrade of sulfited syrup filtration station	2007	bag filters – 7 units.	S of filtration: 2,5 m^2. Number of filtering elements: 6 units.	Reduction of electricity consumption.

[9] Jet-niche burners are also lead to electricity savings

№	Activities	Year of implementation	Equipment	Technological characteristics	Power efficiency effect
4.	Installation of frequency converters on pump motors for filtration of juice of first saturation	2009	Frequency converter	Type: MFC 310-55 Motor power: 55 kW.	Reduction of electricity consumption.
5.	Installation of jet-niche burners on steam boiler #5 TM-25/39	2009	jet-niche burner MDGG - 1000 - 2 units	Gas consumption: 1300 m^3 per hour.	Rising of steam boiler efficiency, reduction of natural gas consumption
6.	Upgrade of station for postfiltration of juice of first saturation	2010	Filters MVJ-60 – 5 units., controller "Shnider"	S of filtration: 60 m^2; V of filters: 9,3 m^3 working pressure: 1,6 kg/sm^2.	Reduction of electricity consumption.
7.	Replacement of syrup and molasses pumps	2010	SVN-80/32 - 2 units; SVN-50/32 - 2 units.	pump thrust: 32m; capacity: 22 kWt.	Reduction of electricity consumption.
8.	Installation of jet-niche burners on steam boiler #3 TM-25/39	2010	jet-niche burner MDGG - 1000 - 2 units	Gas burning: 1300 m^3 per hour.	Rising of steam boiler efficiency, reduction of natural gas consumption
9.	Installation of jet-niche burners on steam boiler #4 TM-25/39	2010	jet-niche burner MDGG-1000 - 2 units	Gas burning: 1300 m^3 per hour.	Rising of steam boiler efficiency, reduction of natural gas consumption
10.	Installation of jet-niche burners on steam boiler #6 TM-50/39	2010	jet-niche burner SNT 45 - 4 units	Gas burning: 1100 m^3 per hour.	Rising of steam boiler efficiency, reduction of natural gas consumption
11.	Backward washing scheme after KF-1000 filters for liming in lime section installed	2010	Heater PSS-40; pumps SOT-30 - 2 units.	Pump thrust: 25 m; capacity: 10 kW.	Decreasing vapor consumption by the process due to the use of after suspension washing water in technological process, natural gas consumption reducing.
12.	Automatisation of fillmass of second and third products making process	2010	Automatics of fillmass of second and third products	Automatic fillmass maker based on P-110 controller	Decreasing vapor consumption by the process of fillmass of second and the third products making. Natural gas consumption

№	Activities	Year of implem entation	Equipment	Technological characteristics	Power efficiency effect
					reduction
13.	Upgrade of centrifugal station for fillmass of first product	2011	Centrifuge BW-1300S - 4 units.	charging: 1360 kg/cycle; Productivity: 350000 kg/day	Decreasing vapor consumption by the process of fillmass of the first product making. Natural gas consumption reduction

Filters:

Filters-thickeners are used for filtration of juice of first saturation, second saturation and for postfiltration. Filter-press is used for filtration of juice of first saturation with the highest amount of sediment to be filtered. All mentioned liquids have high density, it means that their proper work requires high energy inputs, so its upgrading is of great importance and leads to significant energy saving. Effectiveness (purity of filtered juice), speed of filters, consumption of energy depends on the quality of raw material, quality of filtration elements, renewing of filtration elements and timely removing of stained sediment.

Installation of filters-thickeners of type MVJ, chamber filters KF-1000 and bag filters allowed reducing energy consumption. It became possible due to application of number of energy efficient solutions:

- double section construction of filtration frame allows to simplify the process of renewal of filter elements;
- automatic removal of stained sediments;
- elimination of energy intensive vacuum pumps from production cycle;
- more effective system of removing stained sediment: by using vibrators and hose pipe flushing. It allows the filter to work with clean filtration elements, avoiding consumption of extra energy.

Frequency converter:

Due to creation of required voltage on the output of frequency converter, installation of this device allows to change speed of motor smoothly. Control is executed by inner microprocessor or manually. It allows to use energy in the optimal way. Without those frequency converters the motors used to work at maximum capacity, irrespective of their load.

Jet-niche burners:

One of the main features of micro diffusion gas burners of MDGP series is high effectiveness and ecologically clean natural gas burning. The mechanism of MDGP burner is based on jet mixing of air and natural gas and getting combustion mixture. Jet-niche technology is based on creation of whirling structures, which appear behind specially mounted body with bad airflow characteristics, by mutual interaction of system of fuel stream in oxidizer flow with backward streams. Jet-niche technology also provides small hydraulic resistance in fuel and oxidizer flows and it allows decreasing the load and necessary electrical capacity of devices in 1.5-2 times, this leads to energy saving. Micro diffusion process of gas burning takes place in short flame, this provides high stability of burning process against the gas pressure drops in gas pipeline, steady temperature field in combustion chamber of heating device and maximum of fuel oxidation, this provides high efficiency of burning.

New technology of gas burning combined the best factors of cinematic and diffusion burning. This combination allows reducing natural gas losses for 3,5…20%, and the electrical energy in 2 and more times compared to burners of other modifications.

Automatics of fillmass producing of second and third products

Fillmas boiling takes place in vacuum, under high temperatures. This process is being mostly controlled by fillmass making operator. To reduce the influence of human factor and decrease vapor wastes for the fillmass boiling, automatic controllers of fillmass readiness were installed. Automatics allow supplying the optimum volume of vapor into the vacuum apparatus, which is needed for heating and thickening. Automatics also ensure timely fillmass removing.

Installation of modern centrifuge BW-1300S

New, modern centrifuge BW-1300S is equipped with electrical motor with frequency converter and with function of energy recuperation. Frequency converter allows optimal use of electrical energy. Recuperation function allows restoring the energy of breaking and supply it back to electrical grid of the enterprise. Effective wringing of treacle allows using less gas during fillmass boiling and its further drying.

As a consequence of project activities step-by-step decreasing of specific energy and natural gas consumptions was achieved, which caused the greenhouse gases emissions reducing during the sugar production.

Advancement of the waste utilization practices

The project activities include installation of presses of deep wringing for beetroot pulp which decrease its water content, which increases its term of use and ensilaging. This allows avoiding spoiling of beetroot pulp and its consequent disposal at landfills, where it would decompose causing methane emissions.

Table 4. Technological characteristics of installed equipment and results of implementation of the project activity (beetroot pulp treatment)

№	**Activities**	**Year of implentation**	**Equipment**	**Specification**	**Energy saving effect**
1	Installation of additional presses for deep wringing	2007	Presses BABBINI P-18 - 2 units.	Type: P18 NH; Motors: 1500 cycles\minute. Motors capacity: 1 - 160 kW; 2 - 132 kW.	Getting beetroot pulp which can be used or transported

Presses

Press allows making additional pressing to achieve up to 19%-21% of dry substance in the final product.

The press consists of: separator, screw, base, regulator device, electrical motor, connecting pipes and additional filtration surface. Mechanism: fresh beetroot pulp gets into the separator, where some water separates which then moves out of separator through the connecting pipe. Then beetroot pulp moves into the press chamber, where the main volume of water is being pressed off. Then this water is separated through the main cylinder sieve and moved out through the other connecting pipe. Pressing occurs because of volume decrease in screw chamber with the moving of beetroot pulp.

Special devises regulate time and level of pressing: base, sieve, cone, rod, spring, bracket, flange, cone and base of pressing screw. Pressing level depends on moving of cone with the sieve into the right and left, and the clearance for the beetroot pulp exit decreases or increases. Pressure into the sieve is transferred by the springs, by tightening of which the level of pressing is regulated.

By performing additional pressing, the enterprise developed possibilities of using beetroot pulp, which caused increased demand for it and decreased the quantity of spoiled beetroot pulp. As a result the whole volume of beetroot pulp is realized to the stock-farms, which are located within 200-250 km from Shepetivka.

The implementation of the proposed project has a positive impact on the environment, as the quantity of waste which was to be deposited was reduced. Also it is worth to mention reducing methane and other gases emissions caused by beetroot pulp anaerobic decomposition in the waste layer. The activity of the project owner is performed complying with permitted limits for emissions, water use and waste depositing.

The project has already been implemented. Main project activity was being realized during 2005-2011, that leaded to occurrence of emission reductions starting from 2005 and gradually increasing as components of the project activity were being commissioned. Decision making about the project was also influenced by retification of the Kyoto Protocol by Ukraine on 4th of February 2004.Below is the implementation scheadule of the main stages of the project activity.

Table 5. Implementation schedule of the project.

Stage	***Dates***
Decision making about the project	27/06/2003
Investment phase	06/03/2005-23/07/2011
Construction and fettling works, including:	01/07/2005-14/08/2011
Upgrade of second saturation juice postfiltration station	2005
Upgrade of station for filtration of suspension of first saturation	2006
Upgrade of sulfited syrup filtration station	2007
Installation of frequency converters on pump motors for filtration of juice of first saturation	2009
Installation of jet-niche burners on steam boiler #5 TM-25/39	2009
Upgrade of station for postfiltration of juice of first saturation	2010
Replacement of syrup and molasses pumps	2010
Installation of jet-niche burners on steam boiler #3 TM-25/39	2010
Installation of jet-niche burners on steam boiler #4 TM-25/39	2010
Installation of jet-niche burners on steam boiler #6 TM-50/39	2010
Backward washing scheme after KF-1000 filters for liming in lime section installed	2010
Automatisation of fillmass of second and third products making process	2010
Upgrade of centrifugal station for fillmass of first product	2011
Operation phase	01/08/2005-31/12/2029
Generation of emission reductions	01/08/2005-31/12/2029

The project does not require intensive staff training. The required amount of employees can obtain a basic technical training at the project site. Most of the necessary workers such as engineers, agricultural technicians, machine operators, power engineers and mechanics, truck drivers are locally available. Local resources meet project maintenance needs: own and hired workers and repair contractors. Project foresees the need for training. All employees must have a valid certificate of vocational education, and periodically pass safety training and exams. Professional training in all required areas of professional project is available in the educational institution of Ukraine.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

LLC «TH «Shepetivsky Sugar» implements the JI project with the following objectives:

- Reduction of greenhouse gases emissions from combustion of fossil fuels;
- Reduction of greenhouse gases emissions due to electricity consumption;
- Reduction of greenhouse gases emissions due to waste utilization;
- Development of new technologies;
- Development of closed wastes-free production cycle;
- Contribution to the increase of cattle forage;
- Improvement of environmental and social situation in the region.

Emission reductions are achieved due to decreasing of natural gas and electricity consumption for sugar production and avoiding methane release inside the landfill gas, which happens after beetroot pulp is moved to landfill. After implementation of the project activity beetroot pulp is processed in order to avoid its spoiling which makes its storage time longer that make it possible to transport the pulp on longer distances to the consumer.

In the absence of the proposed project consumption of natural gas and electricity would remain on the previous high level, while fresh beetroot pulp would lose its valuable fodder qualities as a consequence of intensive processes of fermentation and decay which would unavoidably start under high temperatures of summer months of sugar season. After this, the only way that the plant could remove it from its territory was transporting it to landfills? Where as a result of its decay landfill gas would be released, which contains methane.

Since the project at hand leads to occurrence of greenhouse gases emission reductions into the atmosphere, such reduction was taken into account at decision making stage. Emissions reductions will be sold as ERUs in the international market of emissions reductions, and the funds obtained will improve the financial performance of the project to a level that justifies the means that were used for its implementation.

Detailed description on the baseline setting and additionality demonstration can be found in section B of this PDD.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

Calculations of emission reductions provided in the file Excel *20120727_Shepetovka_ER.xls.*

Table 6. Estimated amount of emission reductions before the first crediting period

	Years
Length of the crediting period	3
Year	Estimate of annual emission reductions in tons of CO_2 equivalent
Year 2005	4 684
Year 2006	29 333
Year 2007	197 116
Total estimated emission reductions before the crediting period (tons of CO_2 equivalent)	231 133
Annual average of estimated emission reductions over the crediting period (tons of CO_2 equivalent)	77 044

Table 7. Estimated amount of emission reductions during the first crediting period

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tons of CO_2 equivalent
Year 2008	234 052
Year 2009	239 553
Year 2010	270 867
Year 2011	285 131
Year 2012	293 837
Total estimated emission reductions over the crediting period (tons of CO_2 equivalent)	1 323 440
Annual average of estimated emission reductions over the crediting period (tons of CO_2 equivalent)	264 688

Table 8. Estimated amount of emission reductions after the first crediting period

	Years
Length of the period after 2012, for which emission reductions are estimated	17
Year	Estimate of annual emission reductions in tons of CO_2 equivalent
Year 2013	304 375
Year 2014	313 132
Year 2015	320 411
Year 2016	326 460
Year 2017	331 488
Year 2018	335 667
Year 2019	339 139
Year 2020	342 026
Year 2021	344 424
Year 2022	346 418
Year 2023	348 075

Year 2024	349 452
Year 2025	350 596
Year 2026	351 548
Year 2027	352 338
Year 2028	352 995
Year 2029	353 541
Total estimated emission reductions for the relevant period (tons of CO_2 equivalent)	5 762 085
Annual average of estimated emission reductions for the relevant period (tons of CO_2 equivalent)	338 946

A.5. Project approval by the Parties involved:

The Letter of Endorsement #2679/23/7 was issued by the State Environmental Investment Agency of Ukraine on 20/09/2012. Obtaining the Letter of Approval by the Host country is expected after completion of the determination process.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

In accordance with the Guidance on criteria for baseline setting and monitoring (Version 03)[10] (hereinafter referred to as the Guidance), the baseline for a JI project is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of GHGs that would occur in the absence of the proposed project.

In accordance with the Paragraph 9 of the Guidance the project participants may select either a) an approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach); or b) or a methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM); or c) an approach to the setting of baseline and monitoring that has already been applied to comparative JI projects.

Project participants chose an approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach).

Description and justification of the baseline chosen is provided below in accordance with the Guidelines for users of the Joint Implementation Project Design Document Form, version 04[11], using the following step-wise approach

Step 1. Indication and description of the approach chosen regarding baseline setting

To determine the baseline scenario and demonstrate additionality the Combined tool to identify the baseline scenario and demonstrate additionality (Version 04.0.0) has been applied. The recommendations of the Guidelines for objective demonstration and assessment of barriers were also taken into account (Version 01).

Step 2. Application of the approach chosen

Step 0. Determining whether the project activity was the first of its kind
Outcome II: The project activity was not the first of its kind.

Step 1. Identification of alternatives to the project activity

The following plausible alternatives to the implementation of each component of the project activity are identified that (a) were available to the project participants; (b) could not be implemented simultaneously with the project activity and (c) ensure the obtaining of the same result as the project activity had.

E1: Continuation of the current situation which does not require any investment;
E2: Continuation of the current situation which requires expenses in order to maintain working condition of the equipment;
E3: Partial realization of energy efficiency program, financed by the project owner;
E4: Implementation of the project activity, financed by the third party;
E5: Implementation of the project activity not being registered as a JI project.

P1: Continuation of the current situation which does not require any investment;
P2: Utilization of beetroot pulp to produce biogas;
P3: Processing of beetroot pulp for utilization for cattle feeding;
P4: Production of beetroot pectin, pectin gum or food fibers from beetroot pulp.

[10] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[11] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

Step 1a. Description of alternatives to the project activity

E1: Continuation of the current situation which does not require any investment;
According to this alternative the existing equipment is used until its operational lifetime ends up. The alternative does not require any investments and costs, and is unattractive in long-term perspective, because the strategy of LLC "TH "Shepetivsky Sugar" under favorable conditions foresees future intensive development and growth in output.

E2: Continuation of the current situation which requires expenses in order to maintain working condition of the equipment;
This alternative envisages the continuation of the same specific power and natural gas consumption, as well as at the pre-project level. After the equipment failure, its replacement would have been carried out element-by-element to the equipment with similar technical specification that would have not led to the emergence of energy-saving effect due to the lack of systematic approach and limited opportunities for optimizing of energy consumption.

E3: Partial realization of energy efficiency program, financed by the project owner;
This alternative foresees a partial implementation of energy efficiency program, implementation of those measures, which do not require significant capital investment and a sound technical upgrade of the facilities. This option requires less money for its implementation. This option would not be appropriate due to the lack of a systematic approach; therefore the resulting effect would be much lower than the result from implementation of project activity. Whereas, while making a decision on the project the future income from the sale of ERUs was taken into account, in this case their volume was insufficient for a positive decision.

E4: Implementation of the project activity, financed by the third party;
According to this alternative, the introduction of programs aimed at energy efficiency improvement at the enterprise would be performed and financed by a third party, i.e. energy service company. These companies offer to install some pieces of equipment and compensate the cost through the savings achieved. The project activity envisages modernization of the existing equipment and replacement of its elements, which is not usually covered by energy service companies due to difficulties in separating the achieved effect in the system of other actions, which complicates payments for the delivered service. Thus, the implementation of this alternative was unrealistic.

E5: Implementation of the project activity not being registered as a JI project.
This option includes the implementation of the project activity without registration it as JI project in the absence of additional financial revenues from the sale of ERUs. This option requires significant capital investment and generates the same emissions reductions as in the project scenario.

P1: Continuation of the current situation which does not require any investment;
Fresh beetroot pulp as it was produced with no additional processing to reduce its water content would be moved to pulp pits, from which it would be transported to landfills after the pits would get full and beetroot pulp spoiled. At landfill it would be disposed in accordance with the approved waste limits. This option did not required any additional investments.

P2: Utilization of beetroot pulp to produce biogas;
This option foresees construction of methane tank for controlled anaerobic digestion of sugar production waste and dry biomass additives, installation of the special equipment for enrichment and purification of the produced methane and construction of the necessary infrastructure for its combustion to generate heat or electricity (boilers or power generators). This option also requires continuous supply with dry biomass and other additives to intensify fermentation process and to improve composition of the resulting material so that

it would be possible to use it as soil fertilizer. If such a use of the fermented material is not possible, the process will result in small volume of waste with methane generation potential which is close to zero. This waste would be deposited at landfill.

P3: Processing of beetroot pulp for utilization for cattle feeding;

All types of unspoiled beetroot pulp can be used for cattle feeding. In order to prolong its life and to improve its fodder qualities beetroot pulp is processed in different ways (ensilage, drying, granulation, enrichment with protein substitutes). This lets to find new consumers of the fodder beetroot pulp through increasing the delivery distance of quality pulp and raising its volume that can be used for cattle feeding. The option demands installation of special equipment for drying and granulating of beetroot pulp and construction of the storage places for dry beetroot pulp.

For the project owner ensilage of the beetroot pulp is not reasonable, because high volume containers are required for long term storage of beetroot pulp with no contact with air (ensilage process takes 6-8 weeks, after which it can be used). If hermetic folia sleeves of 350 tonnes capacity are used for ensilage, the enterprise would need to have large storage facilities to keep them. Transporting of the ensilage is also difficult because it quickly spoiled in the aerobic conditions[12], therefore ensilage is reasonable being done close to the consumer. However project participants are interested in installation of additional beetroot pulp presses for better wringing. In this way they increase the volume of the fresh beetroot pulp that can be potentially realized for cattle feeding.

P4: Production of beetroot pectin, pectin gum or food fibers from beetroot pulp.

Beetroot pulp is one of the most perspective raw material for production of low etherified pectin[13], that is widely used in medicine, pharmacology and confectionary industry that value it for its antibacterial qualities, ability to produce water soluble films and bind ions of heavy metals. Pectin extraction from the beetroot pulp is most often performed by hydrolysis with mineral acids.

Also beetroot pulp can be used to get pectin gum, production process of which basically is dissolving pectin and araban in the cold water. Gum output is 2.5-3% of fresh beetroot pulp.

The other promising way for beetroot pulp utilization is production of dietary fibers – edible parts of plants or similar carbohydrates, that are resistant to digestion and absorption in small intestines, and that totally or partially are fermented in large intestine. Human daily need in dietary fibers is 28-38 grams. By using modern dietary fibers production technologies the variety of goods is obtained that can be widely used in food production.

For the project participants realization of this option would mean construction and equipping the separate production facility for getting pectin form fresh or dried beetroot pulp. At the time of decision making about the project no offers from the third parties willing to invest in such an activity were received.

Outcome of Step 1a: The following list of realistic and viable alternatives to the project activity was obtained:

E2: Continuation of the current situation which requires expenses in order to maintain working condition of the equipment;
E5: Implementation of the project activity not being registered as a JI project.

[12] V. Krutko, «On beetroot pulp once again», Ukrainian sugar makers' herald: http://www.google.com.ua/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CE8QFjAA&url=http%3A%2F%2Fsugar-journal.com.ua%2Fcustom%2Ffiles%2FVesnik_ua_04_11%2Fua_4_6.pdf&ei=l6n6T_mlMo22hAe5jMGkAQ&usg=AFQjCNG607qJf1YPuTc6agvLFThwa6BR6Q

[13] Donchenko L.V. «Recycling beetroot pulp»: http://www.ugagroprom.ru/1/

P1: Continuation of the current situation which does not require any investment;
P2: Utilization of beetroot pulp to produce biogas;
P3: Processing of beetroot pulp for utilization for cattle feeding;
P4: Production of beetroot pectin, pectin gum or food fibers from beetroot pulp.

Step 1b. Compliance with the effective legislation.

Legislation on energy saving in Ukraine serves to create the conditions for implementation of energy efficiency technologies, strengthening the priority of this direction for Ukrainian economy development, supporting of scientific research on energy saving, etc. The main regulatory document is the Law of Ukraine "On energy efficiency". Stipulated penalty fines for excessive use of fuel, though, as the experts note, due to the lack of appropriate regulations, this rule is not performed.[14] All of the above mentioned alternatives to the project activity comply with the legislation on energy efficiency in Ukraine.

Activities attributed to waste management in Ukraine are governed by the following regulations:

Law of Ukraine "On ensuring sanitary- epidemiological welfare of population", the Law of Ukraine "On wastes"; the Law of Ukraine "On licensing system in economic activity"; the Cabinet of Ministers of Ukraine Decree # 1218 dtd. 03/08/1998 "On approval of the procedure of drafting, approval and revision of waste generation and placement limits", the Cabinet of Ministers of Ukraine Decree # 1109 dtd. 22/06/1999 "On approval of the Statute of the State sanitary and epidemiological surveillance in Ukraine", President of Ukraine Decree # 400/2011 dtd. 06/04/2011 "On state sanitary-epidemiological service of Ukraine".

According to the provisions of this legislative environment, companies must receive from waste management designated executive authorities permits for waste disposal within the established limits in storages equipped in accordance with the applicable standards[15], and by paying the corresponding fee for waste disposal. In accordance with Instruction on procedure of calculation and payment for environmental pollution # 162, approved by the Ministry of Environmental Protection and Nuclear Safety of Ukraine and State Tax Administration of Ukraine dtd. 19/07/99, in case of overlimiting waste disposal the fine is paid a five times the amount of the fee for waste disposal.

Thus, the implementation of any of the above mentioned alternatives complies with the legislation subject to following the procedures of waste management.

Outcome of Step 1b: All these realistic and feasible alternatives to the project activities comply with the present current legislation of Ukraine.

Step 2. Barrier analysis.

At the time of decision making about the project Ukrainian sugar industry was in deep crisis[16]. Decreasing of areas under sugar-beet provoked deficit for raw material for sugar plants which results in their significant underload. In addition to it the plants were using old obsolete equipment and suffered from ineffective governmental policy in the industry which made sugar production at most on them unprofitable, situation was worsened by competition with cane raw sugar refiners. Because of these factors the quantity of working sugar plants in Ukraine decreased dramatically. Thus, in 1991 Ukraine had 192[17] operating sugar plants, while in 2011 their number became 61[18]. Stagnation of the sugar industry continues in 2012[19], plants are experiencing hard economic situation, state sugar price regulation significantly lowers profitability of sugar making in Ukraine.

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[14] http://www.epravda.com.ua/columns/2010/03/16/229811/
[15] http://www.budinfo.org.ua/doc/1812504.jsp
[16] http://dt.ua/ECONOMICS/tsukrova_galuz_ukrayini_vid_solodkih_mifiv_do_girkoyi_realnosti-31612.html
[17] http://www.umoloda.kiev.ua/number/1252/160/44359/
[18] http://agronovator.ua/ua/sugar_factories/
[19] http://www.myvin.com.ua/ua/news/region/14920.html

The main barrier that prevents the implementation of project activities is financial barrier. The total cost of the implemented activities under the project is about 10 157 thousand UAH. This is a significant cost, which the project owner did have at the time of making the decision on implementation of the project activities, and they should be involved in capital market.

Both projects are implemented in terms of investment climate in Ukraine, which is not favorable. Ukraine is a country of high risk for business and investment. The risk of investing in Ukraine is additionally confirmed by the country rating according to international rating agency Moody's and the corresponding risk premium. In the following table risk premium for Ukraine:[20]

Table 9. Risk premium for Ukraine

Total Risk Premium, %	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Ukraine	11.57	11.59	10.8	10.16	10.04	14.75	12.75	12.5

As discussed during the roundtable of OECD (Organization for Economic Cooperation and Development) on the development of business and investment climate in Ukraine, the existing legal framework is not only inadequate, but significantly sabotages the development of market economy in Ukraine. According to Western press reports, the following conclusion can be made: the tax and legal system reforming has improved the situation by adopting the Commercial Code, Civil Code and Tax Code dated January 1, 2004, but there are still unsatisfactory elements that represent a risk for foreign investors[21]. It is believed that Ukraine is heading in the right direction with the introduction of significant reforms, but it still has a long way to realizing their full potential. Frequent and unpredictable changes in the legal system along with the contradictory and inconsistent Civil and Commercial Codes do not allow transparent and stable legal conditions for business. This is seen by international companies as a source of great uncertainty, which makes risky predictions about future business goals and strategies.

According to various sources and as described above, the investment climate in Ukraine is risky and unfavorable, private capital from domestic or international sources are not available or accessible only at excessively high price because of real and perceived risks of doing business in Ukraine.

Below the influence of economic conditions on the decision regarding the implementation of alternatives to the project activity is considered.

E2: Continuation of the current situation which requires expenses in order to maintain working condition of the equipment;
Realization of this option did not require significant capital investments, only regular operational expenses, which provided that the plant works, would be available for the project owner. That is why financial barrier didn't exist for this option.
E5: Implementation of the project activity not being registered as a JI project.
This option needed big financial investments, which was prevented by existence of financial barrier.

P1: Continuation of the current situation which does not require any investment;
Realisation of this option did not require capital investment; therefore, financial barrier did not exist.
P2: Utilization of beetroot pulp to produce biogas;
Necessary investment for implementation of this option is about 80 million UAH.

[20] Data provided by Aswath Damodaran, Ph.D., Stern School of Business NYU http://pages.stern.nyu.edu/~adamodar/
[21] Foreign direct investment in Ukraine - Donbass, Philip Berrys, Problems of foreign economic relations and attraction of foreign investments: a regional perspective, ISSN 1991-3524, Donetsk, 2007. p. 507-510

P3: Processing of beetroot pulp for utilization for cattle feeding;

Implementation of this option requires investment in pulp presses, equipment for beetroot pulp drying, instruments for dry pulp granulation, building storage facilities. Besides, operation of this equipment increases operational expenses of the enterprise on natural gas and electricity.

P4: Production of beetroot pectin, pectin gum or food fibers from beetroot pulp.

This option envisages greenfield building of a separate plant for processing beetroot pulp into pectin, pectine gum or food fibers. Volume of the necessary investment is hundreds of millions of UAH. For this option financial barrier is the most significant.

Outcome: Thus the existence of financial barrier would prevent the implementation of the above listed alternatives to the project activity, but alternatives E2: "Continuation of the current situation which requires expenses in order to maintain working condition of the equipment" and *P1:* "Continuation of the current situation which does not require any investment". Thus, the continuation of the current situation is the most plausible future scenario that is the baseline.

This baseline scenario has been established according to the criteria outlined in the Guidance by JISC:

1) On a project specific basis;
2) In a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors. All parameters and data are either monitored by the project participants or are taken from sources that provide a verifiable reference for each parameter. Project participants use approaches suggested by the Guidance and the methodological Tools approved by the CDM Executive Board;
3) Taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector. The above analysis shows that the chosen baseline is the most plausible future scenario, taking into account the current situation in the sugar industry of Ukraine;
4) In such a way that emission reduction units (ERUs) cannot be earned for decreases in activity levels outside the project activity or due to force majeure. According to the proposed approach emission reductions will be earned only when project activity will generate refined oil products, so no emission reductions can be earned due to any changes outside the project activity;
5) Taking account of uncertainties and using conservative assumptions. A number of steps have been taken in order to account for uncertainties and safeguard conservativeness:
    a. If possible, the same approach to calculating the level of baseline and project emissions as specified in the National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine are used. The National emissions inventories use country-specific emission factors that are set to meet the IPCC values;
    b. Lower range of parameters is used for calculation of baseline emissions and higher range of parameters is used for calculation of project activity emissions;
    c. To reduce uncertainty and ensure conservativeness of emission calculations default values were used to the extent possible.

Detailed description of baseline emissions calculation, employed calculation formulae and emission factors are provided in the Annex 2 "Baseline information" of this project design document.

Key information and data used to establish the baseline are provided below in tabular form:

Data/Parameter	$P_{sugar,PJ,y}$			
Data unit	t			
Description	Project sugar production			
Time of determination/monitoring	Monitored throughout the monitoring period			
Source of data (to be) used	Reporting data of the LLC "TH "Shepetivsky Sugar"			
Value of data applied (for ex ante calculations/determinations)	**2005**	**2006**	**2007**	**2008**
	18 755	23 540	28 367	25 008
	2009	**2010**	**2011**	**2012**
	20 727	26 943	25 690	24 592
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is measured for commercial purposes of the enterprise on site.			
QA/QC procedures (to be) applied	In accordance with the procedures of the project owner.			
Any comment	No			

Data/Parameter	$SEC_{NG,BL}$
Data unit	th. m^3/t sugar
Description	Baseline specific natural gas consumption
Time of determination/monitoring	Fixed ex ante (average 2000-2002 years)
Source of data (to be) used	Reporting data of the LLC "TH "Shepetivsky Sugar"
Value of data applied (for ex ante calculations/determinations)	0.89
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is measured for commercial purposes of the enterprise on site.
QA/QC procedures (to be) applied	In accordance with the procedures of the project owner.
Any comment	No

Data/Parameter	$SEC_{EE,BL}$
Data unit	th. kWh/t sugar
Description	Baseline specific electricity consumption
Time of determination/monitoring	Fixed ex ante (average 2000-2002 years)
Source of data (to be) used	Reporting data of the LLC "TH "Shepetivsky Sugar"
Value of data applied (for ex ante calculations/determinations)	0.66
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is measured for commercial purposes of the enterprise on site.
QA/QC procedures (to be) applied	In accordance with the procedures of the project owner.
Any comment	No

Data/Parameter	W_x			
Data unit	t			
Description	Amount of sugar production organic waste, that would be transported to the disposal site in the period x			
Time of determination/monitoring	Monitored throughout the monitoring period			
Source of data (to be) used	Reporting data of the LLC "TH "Shepetivsky Sugar"			
Value of data applied (for ex ante calculations/determinations)			**2007**	**2008**
			183 353	144 655
	2009	**2010**	**2011**	**2012**
	98 791	143 039	118 556	126 260
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is measured for commercial purposes of the enterprise on site.			
QA/QC procedures (to be) applied	In accordance with the procedures of the project owner.			
Any comment	No			

Data/Parameter	NCV_{NG}			
Data unit	GJ/th. m^3			
Description	Net calorific value of natural gas			
Time of determination/monitoring	Monitored throughout the monitoring period			
Source of data (to be) used	National Inventory Report of Ukraine (value for food industry)			
Value of data applied (for ex ante calculations/determinations)	**2005**	**2006**	**2007**	**2008**
	33.94	33.94	33.94	33.8
	2009	**2010**	**2011**	**2012**
	33.8	33.8	33.8	33.8
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Actual data, reported by the Ukrainian DFP annually			
QA/QC procedures (to be) applied	Latest available country specific values			
Any comment	No			

Data/Parameter	$EF_{grid,y}$			
Data unit	$kgCO_2$/kWh			
Description	Emission factor for grid electricity consumption			
Time of determination/monitoring	Monitored throughout the monitoring period			
Source of data (to be) used	Ukrainian DFP Orders and other sources (for period 2005-2007 the data from "Standardized emission factors for the Ukrainian electricity grid" were used, Table 8, page 10)[22]			
Value of data applied	**2005**	**2006**	**2007**	**2008**

[22] http://www.neia.gov.ua/nature/control/uk/publish/category?cat_id=111922

(for ex ante calculations/determinations)	0.896	0.896	0.896	1.219
	2009	**2010**	**2011**	**2012**
	1.237	1.225	1.227	1.227
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Factor of specific indirect emissions of carbon dioxide for consumption of electricity by 2nd-class consumers.			
QA/QC procedures (to be) applied	Latest available country specific values			
Any comment	No			

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

To determine the baseline scenario and demonstrate additionality the Combined tool to identify the baseline scenario and demonstrate additionality (Version 04.0.0) has been used. The recommendations of the Guidelines for objective demonstration and assessment of barriers (Version 01) were also taken into account.

The proposed JI project is not the first of its kind. The following step-wise approach is used to demonstrate that the project carbon dioxide emissions reductions by sources are additional with respect to any other emissions reductions:

Step 1. Identification of alternatives to the project activity

Alternatives were identified and described in the previous Section B.1. of this PDD while determining the baseline scenario.

E2: Continuation of the current situation which requires expenses in order to maintain working condition of the equipment;
E5: Implementation of the project activity not being registered as a JI project.

P1: Continuation of the current situation which does not require any investment;

P2: Utilization of beetroot pulp to produce biogas;

P3: Processing of beetroot pulp for utilization for cattle feeding;

P4: Production of beetroot pectin, pectin gum or food fibers from beetroot pulp.

Step 2. Barrier analysis

Barrier analysis of identified alternatives was conducted in the previous Section B.1. of this PDD while determining the baseline scenario. As the result of analysis, the following alternatives to project activities have remained that are not project scenario without JI mechanism, which were identified by baseline scenario:

E2: Continuation of the current situation which requires expenses in order to maintain working condition of the equipment;
P1: Continuation of the current situation which does not require any investment;

As demonstrated in previous Section, the main barrier that prevents the project implementation is financial. As a result of selling greenhouse gas emission reductions expected revenues of about 3.9 million euros or 39 million UAH, representing about 45% required for the project funds that are weighty argument when making decision on the project. Thus, participation in joint implementation mechanism eliminates barriers for the project.

Therefore, when the requirements of Step 1 and 2 were satisfied, then according to the Combined tool to identify the baseline scenario and demonstrate additionality (Version 04.0.0) it can be preceded to the analysis of common practices.

Step 3: Investment analysis

Not performed according to the Combined tool to identify the baseline scenario and demonstrate additionality (Version 04.0.0).

Step 4: Common practice analysis

Step 4a: The proposed CDM project activity(s) applies measure(s) that are listed in the definitions section above [23] of the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 04.0.0).

Sub-step 4a(1): Calculate the applicable output range as +/-50% of the design output or capacity of the proposed project activity.

Sugar plants of the region are all employing typical scheme and all fall into +/-50 percent range by sugar production of the plant where the project activity was implemented. Total[24] number of the working sugar plants in the region is 8.

Sub-step 4a(2): In the applicable geographical area, identify all plants that deliver the same output or capacity within the applicable output range.

There are 8 such plants in the Khmelnitsk region, but no information on implementation of energyefficiensy measures or their waste management practices was found in the open sources. To perform common practice analysis data from one of the close regions were used: Vinnytsya region has a slightly larger territory, but is located in the same climatic conditions, have similar specialization in agriculture, companies there are working under the same legislative base and economic conditions, as in Khmelnitsk region. There are 12 sugar plants in the region (N_{all} = 12).

Sub-step 4a(3): Within the plants identified, identify those that apply technologies different to the technology applied in the proposed project activity.

Energy efficiency measures of the same scope are implemented on none of the plants. Utilization of beetroot pulp takes places at 2 plants only, beetroot pulp from the rest of the plants was to be moved to landfill[25], thus (N_{diff}=10).

Sub-step 4a(4): Calculate factor $F=1-N_{diff}/N_{all}$, representing the share of plants using a technology similar to the technology used in the proposed project activity in all plants that deliver the same output capacity as the proposed project activity.

F=1- 10/12=0,167

The proposed project activity is regarded as common practice within a sector in the applicable geographical area if both the following conditions are fulfilled:

(a) The factor F is greater than 0.2;
(b) $N_{all}-N_{diff}$ is greater than 3.

[23] Activities aimed at the avoidance of methane emissions.
[24] http://sugarua.com/ua/sugarnews_ukr/lists/1201
[25] Regional state administration of Vinnytsya, Resolution # 446 from 08.11.2006. «On approving limits on occurrence and treatment of waste in 2007» http://search.ligazakon.ua/l_doc2.nsf/link1/VI060112.html

None of the above conditions is met by the project activity, consequently, it is not a common practice, we proceed to outcome of the step 4.

Outcome of Step 4: The proposed project activity is not a common practice.

Analysis outcome: Since all three steps of analysis were satisfied, the project is additional.

B.3. Description of how the definition of the project boundary is applied to the project:

The project activities are physically limited to the territory of LLC "TH "Shepetivsky Sugar" and equipment listed in the Section A.4.2.

The table below shows an overview of all emission sources in the baseline and project scenarios. Project boundary has been delineated in accordance with provisions of Paragraphs 14, 15, 16 of the Guidance on criteria for baseline setting and monitoring (Version 03)[26].

Table 10. Sources of emissions in the baseline and project scenario.

	Sources	**Gas**	**Included/ Excluded**	**Justification/Description**
Baseline scenario	Emissions due to natural gas combustion	CO_2	Included	Main emission source.
		CH_4	Excluded	Neglected for simplification. Conservative.
		N_2O	Excluded	Neglected for simplification. Conservative.
	Emissions due to electricity consumption	CO_2	Included	Main emission source.
		CH_4	Excluded	Neglected for simplification. Conservative.
		N_2O	Excluded	Neglected for simplification. Conservative.
	Emissions due to organic waste decay at landfill (beetroot pulp)	CO_2	Excluded	Neglected for simplification. Conservative.
		CH_4	Included	Main emission source.
		N_2O	Excluded	Neglected for simplification. Conservative.
	Fuel combustion during pulp transportation to landfills	CO_2	Excluded	Neglected for simplification. Conservatively.
		CH_4	Excluded	Neglected for simplification. Conservatively.
		N_2O	Excluded	Neglected for simplification. Conservatively.
Project scenario	Emissions due to natural gas combustion	CO_2	Included	Main emission source.
		CH_4	Excluded	Neglected as in baseline scenario.
		N_2O	Excluded	Neglected as in baseline scenario.
	Emissions due to electricity consumption	CO_2	Included	Main emission source.
		CH_4	Excluded	Neglected as in baseline scenario.
		N_2O	Excluded	Neglected as in baseline scenario.
	Emissions due to organic waste decay at landfill (beetroot pulp)	CO_2	Excluded	Neglected as in baseline scenario.
		CH_4	Included	Main emission source.
		N_2O	Excluded	Neglected as in baseline scenario.
	Emissions due to electricity consumptions by beetroot	CO_2	Excluded	Neglected due to insignificant volume in accordance with paragraph 14 of the Guidance[27].

[26] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[27] Annual electricity consumption by beetroot pulp presses if continuously operated at full capacity during entire sugar production season will not exceed 584 MWh, which leads to emission of about 710 tonnes CO_2 annually. This is lower than 1% of annual anthropogenic emissions by sources, and less than 2000 tonnes CO_2 annually, which is why this GHG emission source was not taken into account.

	pulp presses	CH_4	Excluded	Neglected for simplification.
		N_2O	Excluded	Neglected for simplification.
	Fuel combustion during pulp transportation for utilization	CO_2	Excluded	Neglected for simplification.
		CH_4	Excluded	Neglected for simplification.
		N_2O	Excluded	Neglected for simplification.

Fuel combustion during transportation of pulp into the landfills in baseline scenario and to the agricultural enterprises for the utilization in project scenario are not taken into account as emission sources because the distance to the landfills is comparable to the distance to the majority of places of pulp utilization, so the GHG emissions are of the same quantity. Beside there is a widespread common practise of partial settling by dried pulp for beet root supplying on the plant. The integrated enterprises (more than 50% of suppliers) which are involved in both in agriculture and cattle breeding are those who have much to gain. Thereby, the project uses the transport which in the absence of the project would came back without cargo causing the emissions of GHG gases. In this case emissions of GHG gases caused by pulp transportation are equal to zero and neglecting emissions of GHG gases from transportation in baseline scenario is conservative because it reduces emission reductions due to the project implementation.

Baseline scenario
Baseline scenario is continuation of current practice in place before realization of the project. The activity of project owner in this case would be the following: absence of fresh pulp treatment with the purpose of its drying, keeping it in pulp pits, where it would get spoiled and become unusable for cattle feeding in a first three days and would be transported into the landfills, where due to its anaerobic fermentation landfill gases containing methane (GHG gas) would be formed. Natural gas and electricity consumption levels will stay on the pre-project level.

In the baseline scenario emission sources included in the project boundary are:
- Emissions due to natural gas combustion;
- Emissions due to electricity consumption;
- Emissions due to organic waste decay at landfill (beetroot pulp).

Project scenario
Due to realization of the project activity specific consumption of natural gas and electricity were significantly reduced and water content in sugar production waste was lowered, which made it possible to transport beetroot pulp on long distances to use it for cattle feeding, that excludes their anaerobic decay. Emission sources in the project scenario are:

- Emissions due to natural gas combustion;
- Emissions due to electricity consumption;
- Emissions due to organic waste decay at landfill (beetroot pulp).

Leakage
Leakage is the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that can be measured and is directly attributable to the JI project. No leakage is expected to occur as a result of the project activity.

Project boundaries are outlined in the scheme below.

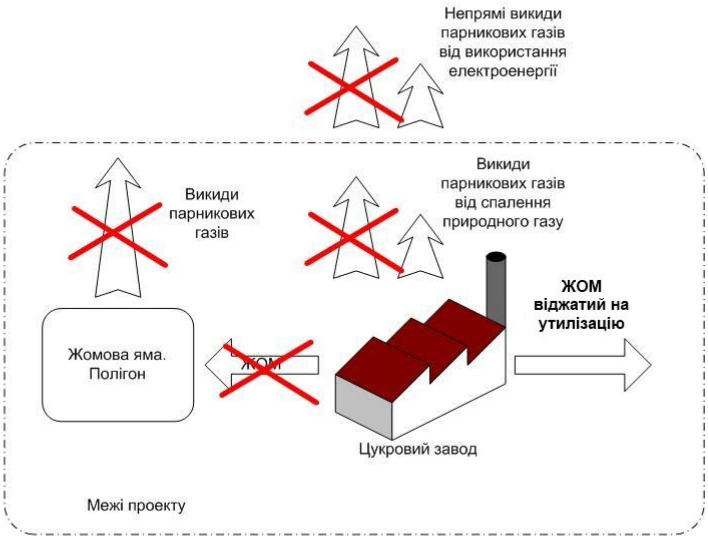

Figure 4. Project boundaries scheme.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of baseline setting: 27/07/2012

Analysis of the baseline level was performed by "MT-Invest Carbon" LLC that is not a project participant.

Contact information:

"MT-Invest Carbon" LLC
Address: of.2, bld 1 Panasa Myrnoho str., Kyiv, Ukraine, 01011
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SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is 27th of June 2003. This is the issuance date of the Order on Creation of the Working Group on Technical Modernization and Advancement of Waste Utilization Practices at LLC "TH "Shepetivsky Sugar".

C.2. Expected operational lifetime of the project:

Lifetime of the project is estimated to last until the end of 2029. Thus, the operational lifetime of the project will be 25 years or 300 months.

C.3. Length of the crediting period:

Start of the crediting period: 01/01/2008.

End of the crediting period: 31/12/2029

Length of the period before the first crediting period: 3 years or 36 months (01/01/2005-31/12/2007).

Length of the first crediting period: 5 years or 60 months (01/01/2008-31/12/2012).

Length of the period after the first crediting period: 17 years or 204 months (01/01/2013-31/12/2029).

The total length of the crediting period is 25 years or 300 months (01.01.2005-31.12.2029).

Crediting period for generating ERUs starts after the beginning of 2008 and will continue throughout the project life cycle.

Status of emission reductions or enhancements of removals generated by JI project after the first commitment period under the Kyoto Protocol (lengthening of the crediting period after 2012) may be determined in accordance with relevant arrangements and procedures under the UNFCCC and host Party.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

This monitoring plan is established in accordance with appendix B of the JI guidelines and further Guidance on Baseline Setting and Monitoring, Version 03, and Guidelines for Users of the JI PDD Form, Version 04.

The description of the monitoring plan chosen is provided using the following step-wise approach

Step 1. Indication and description of the approach chosen regarding monitoring

Option *a* provided by the Guidelines for the Users of the Joint Implementation Project Design Document Form, Version 04[28] is applied: JI specific approach is used for the monitoring plan.

Step 2. Application of the approach chosen

Baseline scenario

The baseline scenario of the proposed project is a continuation of the existing pre-project situation. Specific consumption of energy resources (natural gas and electricity) for sugar production at the plant would remain at the pre-project level, and the treatment practices for sugar production waste would also remain unchanged, i.e. its transporting to the landfill would continue.

In the baseline scenario the emission sources within the project boundaries are:

- CO_2 emissions due to natural gas combustion;
- CO_2 emissions due to electricity consumption;
- CH_4 emissions due to organic waste decay at landfill (beetroot pulp).

Project scenario

Due to realization of the project activity specific consumption of natural gas and electricity were significantly reduced and water content in sugar production waste was lowered, which made it possible to transport beetroot pulp on long distances to use it for cattle feeding, that excludes their anaerobic decay.
Emission sources in the project scenario are:

[28] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

- Emissions due to natural gas combustion;
- Emissions due to electricity consumption;
- Emissions due to organic waste decay at landfill (beetroot pulp).

Emission reductions occur as a result of decreasing emissions of carbon dioxide due to natural gas combustion and electricity consumption for the production needs of the plant and changes of methane quantity generated during storage of beetroot pulp because of cutting its volume, that arrives to landfill.

Data collection and calculations procedure

To calculate the amount of GHG emissions of the project (in baseline and project scenarios) the data of internal standard reporting, which are collected and processed independently from the JI project for commercial purposes of business activity, using the rules and procedures for collecting, processing and carrying out cross-checks will be used. This approach meets good practice of monitoring plans development. The data acquired during the monitoring will be entered into special database and stored electronically and on paper. Electronic versions of monitoring database will be sent to the Head of specially created Working Group on Technical Modernization and Advancement of Waste Utilization Practices at LLC "TH "Shepetivsky Sugar", who will send it to the JI project consultant to calculate the emissions reductions and prepare the monitoring reports. Paper versions of monitoring database will be available for examination during onsite visits of accredited independent entity at the request of his representative.

Table 2. List of fixed baseline parameters, used for emissions calculation.

Parameter	***Units***	***Description***	***Sourse***	***Value***
$SEC_{NG,BL}$	th. m^3/t sugar	Specific baseline consumption of natural gas	Annex 2 to this project design document.	0.89
$SEC_{EE,BL}$	th. kWh/ t sugar	Specific baseline consumption of electricity	Annex 2 to this project design document.	0.66

Measuring devices, data processing and archiving

According to the applied approach for monitoring, the following parameters are to be monitored: sugar production, natural gas consumption, electricity consumption, amount of sugar production organic waste, that was not sold and was transported to the disposal site, and amount of sugar production organic waste, that would be transported to the disposal site.

Sugar production, amount of sugar production organic waste, that was not sold and was transported to the disposal site, and amount of sugar production organic waste, that would be transported to the disposal site are measured using automated weighing complex, which serves for tracking of the cargo, its mass, protection of the results from unauthorized change and computer processing of the data. Measuring devices are the truck scales which are regularly calibrated. Natural gas and electricity consumption is measured by special commercial meters. Monitoring data are filled in the reports of Technical Modernization and Advancement of Waste Utilization Practices at LLC "TH "Shepetivsky Sugar", that will be used for preparation of monitoring reports.

In cases if any errors, fraud or inconsistencies will be identified during the monitoring process special commission will be appointed by project host management that will conduct a review of such case and issue an order that must also include provisions for necessary corrective actions to be implemented that will ensure such situations are avoided in future.

reports of Technical Modernization and Advancement of Waste Utilization Practices at LLC "TH "Shepetivsky Sugar" and other monitoring data required for determination and verification, and any other data relevant to the operation of the project will be kept at least two years after the last transfer of ERUs. If the expected data for baseline emissions calculation is missing: amount of sugar production organic waste, that would be transported to the disposal site – these data will not be taken into account. This is conservative. Data on natural gas and electricity consumption is very unlikely to be missing, because this is the basis for payments for the resources, and consequently operation and timely calibration of the meters is under strict control by the suppliers of the energy resources.

Training of monitoring personnel

Activities that are directly related to the monitoring do not require specific knowledge and skills other than provided in the job descriptions of personnel involved into the monitoring. The facilities at which the project is being implemented, periodic health and safety training are carried out. Control over the perfomance of the rules, detection and correction of violations is assigned to the heads of departments. Thus, the personnel responsible for monitoring, receive appropriate training on procedures and requirements for monitoring. JI projects consultant will provide consultations on the Kyoto Protocol, JI projects and monitoring.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
P-1	$FC_{NG,PJ,y}$ project natural gas consumption	Operational data of the project owner	th. m^3	m	Continuously with monthly summing up	100%	Electronic and paper	-
P-2	NCV_{NG} Net calorific value of natural gas	National Inventory Report of Ukraine (value for food industry)[29]	GJ/th. m^3	e	Actual data, reported by the Ukrainian DFP annually	100%	Electronic and paper	Latest available country specific values
P-3	$EC_{PJ,y}$ Project electricity consumption	Operational data of the project owner	th. kWh	m	Continuously with monthly summing up	100%	Electronic and paper	-
P-4	$EF_{grid,y}$ emission factor for grid electricity consumption	Ukrainian DFP Orders[30]	$kgCO_2$/ kWh	e	annually	100%	Electronic and paper	Factor of specific indirect emissions of carbon dioxide for consumption of

[29] The project owner's figures were not used due to lack of data for the project period (acts a natural gas exploration, issued on a monthly basis). Instead, data from national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine, which is common practice for JI projects in Ukraine.

[30] http://www.neia.gov.ua/nature/control/uk/publish/category?cat_id=111922

								electricity by 2nd-class consumers. Latest available country specific values
P-5	P_x amount of sugar production organic waste, that was not sold and was transported to the disposal site	Operational data of the project owner	t	m	Continuously with monthly summing up	100%	Electronic and paper	-
P-6	φ correction factor to account for uncertainties	Study on validation of landfill gas formation models	dimensionless	e	annually	100%	Electronic and paper	Oonk H., Weenk A., Coops O., Luning L. (1994) Validation of landfill gas formation models; EWAB 9427; NOVEM, Utrecht, The Netherlands. The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-7	f share of methane being captured	The data from project owner regarding the	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter

	and utilized at the disposal site	landfill used						contained in the Excel calculation spreadsheet, attached to the PDD
P-8	*GWP_{CH4}* global warming potential for methane	In accordance with UNFCCC decision and Kyoto Protocol	tCO_2e/tCH_4	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-9	*OX* oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	2006 IPCC[31]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-10	*F* volume of methane in the landfill gas	2006 IPCC[32]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-11	*DOC_f* fraction of carbon of organic origin, which can be	2006 IPCC [33]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the

[31] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[32] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[33] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14

	decomposed							Excel calculation spreadsheet, attached to the PDD
P-12	*MCF* methane conversion factor	2006 IPCC[34]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-13	*DOC* Weight fraction of organic origin carbon in the beetroot pulp	Data of laboratory research	t C/ t beetroot pulp	e	annually	100%	Electronic and paper	The result is within the values specified in 2006 IPCC[35]. The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-14	*k* Decomposition factor of wastes (beetroot pulp)	2006 IPCC[36]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD

[34] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14
[35] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13
[36] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.17

The table above includes data and parameters that are monitored throughout the crediting period.

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

$$PE_y = PE_{NG,y} + PE_{EE,y} + PE_{CH_4,y},$$ (Equation 1)

where:

$PE_{NG,y}$ project CO_2 emissions due to natural gas combustion in the period *y*, tCO_2;
$PE_{EE,y}$ project CO_2 emissions due to electricity consumption in the period *y*, tCO_2;
$PE_{CH_4,y}$ project methane emissions due to organic waste decay at landfill for the period from the beginning of the project till the end of the period y, tCO_2e
y period of time for which methane emissions are calculated.

$$PE_{NG,y} = \frac{FC_{NG,PJ,y} \times NCV_{NG,y} \times EF_{NG}}{10^6}$$ (Equation 2)

where:

$FC_{NG,PJ,y}$ project natural gas consumption, th. m^3 [Parameter P-1];
$NCV_{NG,y}$ net calorific value of natural gas, GJ/th. m^3 [Parameter P-2];
EF_{NG} emission factor for natural gas combustion, $kgCO_2$/TJ (2006 IPCC)[37];
y period of time for which methane emissions are calculated;
10^6 dimensionless conversion factor, necessary for maintaining formula dimensions correspondence.

$$PE_{EE,y} = EC_{PJ,y} \times EF_{grid,y}$$ (Equation 3)

where:

$EC_{PJ,y}$ project electricity consumption, th. kWh [Parameter P-3];
$EF_{grid,y}$ emission factor for grid electricity consumption (Factor of specific indirect emissions of carbon dioxide for consumption of electricity by 2nd-class consumers), $kgCO_2$/kWh [Parameter P-4];
y period of time for which methane emissions are calculated.

Project methane emissions due to organic waste decay at landfill are calculated in the following way:

[37] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf , page 1.24

$$PE_{CH4,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot {}^{16}/_{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} P_x \cdot DOC \cdot e^{-k\cdot(y-x)} \cdot (1-e^{-k}),$$ (Equation 4)

where:

$PE_{CH_4,y}$	project methane emissions due to organic waste decay at landfill for the period from the beginning of the project till the end of the period y, tCO_2e;
P_x	amount of sugar production organic waste, that was not sold and was transported to the disposal site in the period *x*, t [Parameter P-5];
φ	correction factor to account for uncertainties, dimensionless. (Study on validation of landfill gas formation models[38]). [Parameter P-6];
f	share of methane being captured and utilized at the disposal site, fraction[39]. [Parameter P-7];
GWP_{CH4}	global warming potential for methane, tCO_2e/tCH_4 (In accordance with UNFCCC decision and Kyoto Protocol). [Parameter P-8];
OX	oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes, fraction (2006 IPCC)[40]). [Parameter P-9];
F	volume of methane in the landfill gas, fraction (2006 IPCC)[41]). [Parameter P-10];
DOC_f	fraction of carbon of organic origin, which can be decomposed, fraction (2006 IPCC) [42]). [Parameter P-11];
MCF	methane conversion factor, fraction (2006 IPCC)[43]). [Parameter P-12];
DOC	Weight fraction of organic origin carbon in the beetroot pulp, t C/ t beetroot pulp (Data of laboratory research. The result is within the values specified in 2006 IPCC)[44]). [Parameter P-13];
k	Decomposition factor of wastes (beetroot pulp), fraction (2006 IPCC)[45]). [Parameter P-14];
x	period during the crediting period: $x \in (1; y)$;
y	period of time for which methane emissions are calculated.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

ID number *(Please use numbers to ease cross-*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/	Comment

[38] Oonk H., Weenk A., Coops O., Luning L. (1994) Validation of landfill gas formation models; EWAB 9427; NOVEM, Utrecht, The Netherlands..

[39] The data from project owner regarding the landfill used.

[40] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15

[41] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15

[42] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14

[43] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14

[44] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13

[45] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.17

referencing to D.2.)							paper)	
B-1.	$P_{sugar,PJ,y}$ sugar production	Operational data of the project owner	t	m	Continuously with monthly summing up	100%	Electronic and paper	-
B-2.	NCV_{NG} Net calorific value of natural gas	National Inventory Report of Ukraine (value for food industry)[46]	GJ/th. m^3	e	Actual data, reported by the Ukrainian DFP annually	100%	Electronic and paper	Latest available country specific values
B-3.	$EF_{grid,y}$ emission factor for grid electricity consumption	Ukrainian DFP Orders[47]	$kgCO_2$/ kWh	e	annually	100%	Electronic and paper	Factor of specific indirect emissions of carbon dioxide for consumption of electricity by 2^{nd}-class consumers. Latest available country specific values
B-4.	W_x amount of sugar production organic waste, that would be transported to the disposal site	Operational data of the project owner	t	m	Continuously with monthly summing up	100%	Electronic and paper	-

[46] The project owner's figures were not used due to lack of data for the project period (acts a natural gas exploration, issued on a monthly basis). Instead, data from national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine, which is common practice for JI projects in Ukraine.

[47] http://www.neia.gov.ua/nature/control/uk/publish/category?cat_id=111922

B-5.	*φ* correction factor to account for uncertainties	Study on validation of landfill gas formation models	dimensionless	e	annually	100%	Electronic and paper	Oonk H., Weenk A., Coops O., Luning L. (1994) Validation of landfill gas formation models; EWAB 9427; NOVEM, Utrecht, The Netherlands. The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-6.	*f* share of methane being captured and utilized at the disposal site	The data from project owner regarding the landfill used	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-7.	GWP_{CH4} global warming potential for methane	In accordance with UNFCCC decision and Kyoto Protocol	tCO_2e/tCH_4	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD

B-8.	*OX* oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	2006 IPCC[48]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-9.	*F* volume of methane in the landfill gas	2006 IPCC[49]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-10.	DOC_f fraction of carbon of organic origin, which can be decomposed	2006 IPCC [50]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-11.	*MCF* methane conversion factor	2006 IPCC[51]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD

[48] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[49] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[50] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14
[51] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14

B-12.	*DOC* Weight fraction of organic origin carbon in the beetroot pulp	Data of laboratory research	t C/ t beetroot pulp	e	annually	100%	Electronic and paper	The result is within the values specified in 2006 IPCC[52]. The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-13.	*k* Decomposition factor of wastes (beetroot pulp)	2006 IPCC[53]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD

The table above includes data and parameters that are monitored throughout the crediting period.

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Baseline emissions are calculated in the following way:

$$BE_y = BE_{NG,y} + BE_{EE,y} + BE_{CH_4,y},$$ (Equation 5)

where:

$BE_{NG,y}$ baseline CO_2 emissions due to natural gas combustion in the period *y*, tCO_2;

$BE_{EE,y}$ baseline CO_2 emissions due to electricity consumption in the period *y*, tCO_2;

$BE_{CH_4,y}$ baseline methane emissions due to organic waste decay at landfill for the period from the beginning of the project till the end of the period *y*, tCO_2e.

[52] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13
[53] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.17

y period of time for which emissions are calculated.

$$BE_{NG,y} = \frac{FC_{NG,BL,y} \times NCV_{NG,y} \times EF_{NG}}{10^6}$$ (Equation 6)

where:

$FC_{NG,BL,y}$ baseline natural gas consumption, th. m^3 (here and further in relation to natural gas – at standard conditions of temperature and pressure 20ºC and 101 325 Pa);
$NCV_{NG,y}$ net calorific value of natural gas, GJ/th. m^3 [Parameter B-2];
EF_{NG} emission factor for natural gas combustion, kg CO_2/TJ (IPCC 2006[54]);
y period of time for which emissions are calculated;
10^6 dimensionless conversion factor, necessary for maintaining formula dimensions correspondence.

Baseline natural gas consumption is a calculated value, which depends on specific baseline natural gas consumption and actual (project) sugar production, therefore:

$$FC_{NG,BL,y} = SEC_{NG,BL} \times P_{sugar,PJ,y}$$ (Equation 7)

where:
$SEC_{NG,BL}$ specific baseline natural gas consumption, th. m^3/t sugar;
$P_{sugar,PJ,y}$ sugar production, t[Parameter B-1];
y period of time for which methane emissions are calculated.

$$BE_{EE,y} = EC_{BL,y} \times EF_{grid,y}$$ (Equation 8)

where:
$EC_{BL,y}$ baseline electricity consumption, th. kWh;
$EF_{grid,y}$ emission factor for electricity consumption (emission factor for electricity consumed by the project activity in period y equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers), kgCO_2/kWh [Parameter B-3];
y period of time for which methane emissions are calculated.

Baseline electricity consumption is a calculated value, which depends on specific baseline electricity consumption and actual (project) sugar production, therefore:

$$EC_{BL,y} = SEC_{EE,BL} \times P_{sugar,PJ,y}$$ (Equation 9)

[54] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf , page 1.24

where:

$SEC_{EE,BL}$ specific baseline electricity consumption, th. kWh/t sugar;
$P_{sugar,PJ,y}$ project sugar production, t [Parameter B-1];
y period of time for which methane emissions are calculated.

Baseline methane emissions due to organic waste decay at landfill are calculated in the following way:

$$BE_{CH4,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot {}^{16}/_{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} W_x \cdot DOC \cdot e^{-k\cdot(y-x)} \cdot \left(1-e^{-k}\right), \quad \text{(Equation 10)}$$

where:

$BE_{CH_4,y}$ baseline methane emissions due to organic waste decay at landfill for the period from the beginning of the project till the end of the period y, tCO_2e
W_x amount of sugar production organic waste, that would be transported to the disposal site in the period x, t [Parameter B-4];
φ correction factor to account for uncertainties, dimensionless. (Study on validation of landfill gas formation models [55]). [Parameter B-5];
f share of methane being captured and utilized at the disposal site, fraction[56]. [Parameter B-6];
GWP_{CH4} global warming potential for methane, tCO_2e/tCH_4 (In accordance with UNFCCC decision and Kyoto Protocol). [Parameter B-7];
OX oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes, fraction (2006 IPCC)[57]). [Parameter B-8];
F volume of methane in the landfill gas, fraction (2006 IPCC)[58]). [Parameter B-9];
DOC_f fraction of carbon of organic origin, which can be decomposed, fraction (2006 IPCC) [59]). [Parameter B-10];
MCF methane conversion factor, fraction (2006 IPCC)[60]). [Parameter B-11];
DOC Weight fraction of organic origin carbon in the beetroot pulp, t C/ t beetroot pulp (Data of laboratory research. The result is within the values specified in 2006 IPCC)[61]). [Parameter B-12];
k Decomposition factor of wastes (beetroot pulp), fraction (2006 IPCC)[62]). [Parameter B-13];
x period during the crediting period: $x \in (1; y)$;
y period of time for which methane emissions are calculated.

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

This section is left blank on purpose

[55] Oonk H., Weenk A., Coops O., Luning L. (1994) Validation of landfill gas formation models; EWAB 9427; NOVEM, Utrecht, The Netherlands..
[56] The data from project owner regarding the landfill used.
[57] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[58] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[59] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14
[60] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14
[61] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13
[62] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.17

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

This section is left blank on purpose

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

This section is left blank on purpose

D.1.3. Treatment of leakage in the monitoring plan:

No leakage is expected due to realization of the project.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
-	-	-	-	-	-	-	-	-

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

Leakages in the period *y* are calculated in the following way:

$$LE_y = 0,$$ (Equation 11)

where

LE_y Leakages due to the project in the period y, tCO_2e.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

$$ER_y = BE_y - LE_y - PE_y \quad \text{(Equation 12)}$$

ER_y emission reductions following the project implementation in the period y, tCO_2e;

BE_y baseline emissions of the project in the period y, tCO_2e;

LE_y leakage as a result of implementation of the project in the period y, tCO_2e;

PE_y project emissions in the period y, tCO_2e;

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

Any negative impact on the environment as a result of project is missing. Accordingly, the requirements of the Host Party cannot are not applied (see Section F.1).

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.1.1.1. – ID P-1 $FC_{NG,PJ,y}$ project natural gas consumption	low	The parameter is determined in accordance with internal procedures of the project owner using special commercial flow meter. Calibration interval of such meters is 2 years. Detailed information will be provided in the monitoring report.
D.1.1.1. – ID P-2 D.1.1.3. – ID B-2 NCV_{NG} Net calorific value of natural gas	low	Information is sourced from official greenhouse gases emissions reporting of Ukraine, which is prepared in accordance with international rules for such reporting: National Inventory Report. Detailed information will be provided in the monitoring report.

D.1.1.1. – ID P-3 $EC_{PJ,y}$ Project electricity consumption	low	The parameter is determined in accordance with internal procedures of the project owner using special commercial electricity meter. Calibration interval of such meters is 6 years. Detailed information will be provided in the monitoring report.
D.1.1.1. – ID P-4 D.1.1.3. – ID B-3 $EF_{grid,y}$ emission factor for grid electricity consumption	low	Information is sourced from Ukrainian DFP Orders, adopted for obligatory use on state level in the joint implementation projects. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-5 P_x amount of sugar production organic waste, that was not sold and was transported to the disposal site	low	The parameter is determined according to internal accounting procedures adopted by the company. The data are cross-checked with the calculated amount of the sugar production organic waste, which is defined as the product of the amount of processed sugar beet multiplied by sugar production organic waste formation rate per tonne of sugar beet, which is deducted from the amount of realized sugar production organic waste. Thus, through the procedure of calculation is consistent with standard technical procedures, used in the sugar production sector. Detailed information will be provided in the monitoring report.
D.1.1.3. – ID B-1 $P_{sugar,PJ,y}$ Sugar production	low	The parameter is determined in accordance with internal procedures of the project owner using track scales. Calibration interval of such meters is 1 year. Detailed information will be provided in the monitoring report.
D.1.1.3. – ID B-4 W_x amount of sugar production organic waste, that would be transported to the disposal site	low	The parameter is determined by the use of truck scales and by their inability to use - the standard coefficients. Calibration interval of such scales is 1 year. Detailed information will be provided in the monitoring report.
D.1.1.1. – ID P-6 D.1.1.3. – ID B-5 φ correction factor to account for uncertainties	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-7 D.1.1.3. – ID B-6 f share of methane being captured and utilized at the disposal site	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-8 D.1.1.3. – ID B-7 GWP_{CH4} global warming potential for methane	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.

D.1.1.1. – ID P-9 D.1.1.3. – ID B-8 *OX* oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-10 D.1.1.3. – ID B-9 *F* volume of methane in the landfill gas	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-11 D.1.1.3. – ID B-10 DOC_f fraction of carbon of organic origin, which can be decomposed	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-12 D.1.1.3. – ID B-11 *MCF* methane conversion factor	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-13 D.1.1.3. – ID B-12 *DOC* Weight fraction of organic origin carbon in the beetroot pulp	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-14 D.1.1.3. – ID B-13 *k* Decomposition factor of wastes (beetroot pulp)	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

The Head of the Working Group on Technical Modernization and Advancement of Waste Utilization Practices at LLC "TH "Shepetivsky Sugar" will be responsible for performance of monitoring data collection, recording, visualization and archiving, as well as periodic inspection of measuring instruments. This person will be responsible filling in the data base of project monitoring parameters based on readings of the measuring equipment. On the basis of this consolidated database and primary documents (internal reports on Technical Modernization and Advancement of Waste Utilization Practices at LLC "TH "Shepetivsky Sugar") JI project consultant will prepare Monitoring Reports. The following block diagram demonstrates principal scheme of data flow.

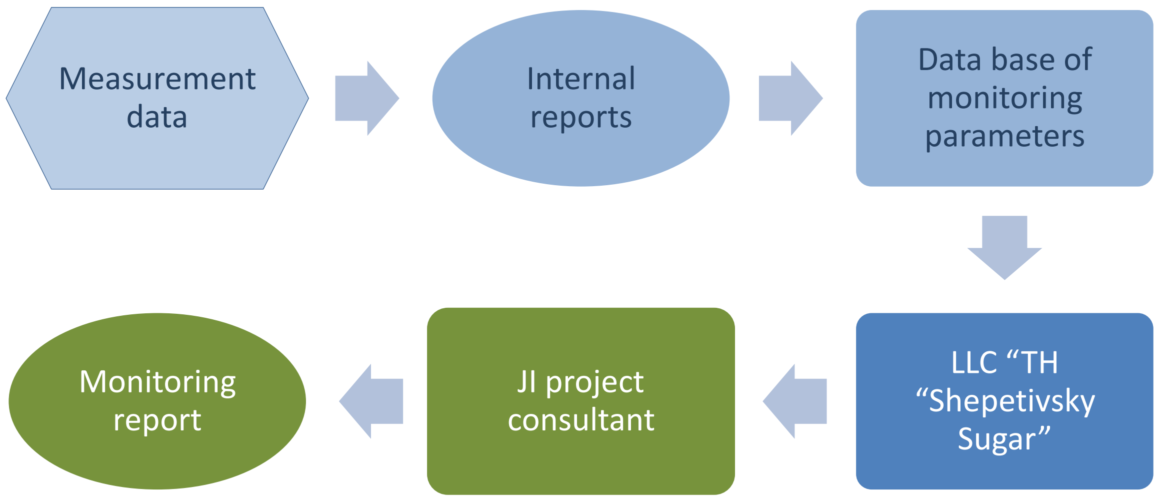

Figure 5. Monitoring flowchart.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Monitoring plan is to be performed by LLC "TH "Shepetivsky Sugar" that is a project participant.

Monitoring plan is developed by "MT-Invest Carbon" LLC that is not a project participant.

Contact information:

"MT-Invest Carbon" LLC
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Phone: +38 044 280 2350
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Vasylieva Nataliya Vjacheslavivna
E-mail: nataliya.vasylieva@mtinvest.com.ua
Position: Joint Implementation project manager
Phone/fax: +38 044 280 23 50

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table 12. Estimated project emissions before the first crediting period.

	Units	2005	2006	2007	Total
Project emissions due to natural gas combustion	tCO_2	0	17 549	21 763	**39 312**
Project emissions due to electricity consumption	tCO_2	6 408	7 130	8 980	**22 518**
Project methane emissions due to organic waste decay at landfill	tCO_2	0	0	0	**0**
Project emissions before the first crediting period	**tCO_2**	**6408**	**24679**	**30743**	**61 830**

Table 13. Estimated project emissions during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
Project emissions due to natural gas combustion	tCO_2	16 404	12 103	18 378	14 130	15 254	**76 269**
Project emissions due to electricity consumption	tCO_2	8 928	6 069	10 032	8 222	8 319	**41 570**
Project methane emissions due to organic waste decay at landfill	tCO_2	0	0	0	0	0	**0**
Project emissions during the first crediting period	**tCO_2**	**25332**	**18172**	**28410**	**22352**	**23573**	**117839**

Table 14. Estimated project emissions after the end of the first crediting period.

Year	Units	Project emissions
2013	tCO_2e	23 573
2014	tCO_2e	23 573
2015	tCO_2e	23 573
2016	tCO_2e	23 573
2017	tCO_2e	23 573
2018	tCO_2e	23 573
2019	tCO_2e	23 573
2020	tCO_2e	23 573
2021	tCO_2e	23 573
2022	tCO_2e	23 573
2023	tCO_2e	23 573
2024	tCO_2e	23 573

2025	tCO_2e	23 573
2026	tCO_2e	23 573
2027	tCO_2e	23 573
2028	tCO_2e	23 573
2029	tCO_2e	23 573
Estimated project emissions after the end of the first crediting period	**tCO_2e**	**400 741**

E.2. Estimated leakage:

Table 3. Estimated leakages before the first crediting period.

	Units	2005	2006	2007	Total
Estimated leakages before the first crediting period	**tCO_2e**	**0**	**0**	**0**	**0**

Table 4. Estimated leakages during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
Estimated leakages during the first crediting period	**tCO_2e**	**0**	**0**	**0**	**0**	**0**	**0**

Table 17 Estimated leakages after the end of the first crediting period.

Year	Units	Leakages
2013	tCO_2e	0
2014	tCO_2e	0
2015	tCO_2e	0
2016	tCO_2e	0
2017	tCO_2e	0
2018	tCO_2e	0
2019	tCO_2e	0
2020	tCO_2e	0
2021	tCO_2e	0
2022	tCO_2e	0
2023	tCO_2e	0
2024	tCO_2e	0
2025	tCO_2e	0
2026	tCO_2e	0
2027	tCO_2e	0
2028	tCO_2e	0
2029	tCO_2e	0
Estimated leakages after the end of the first crediting period	**tCO_2e**	**0**

E.3. The sum of E.1. and E.2.:

Table 18. Estimated total project emissions before the first crediting period.

	Units	2005	2006	2007	Total
Total Project emissions before the first crediting period	tCO_2	**6408**	**24679**	**30743**	**61 830**

Table 19. Estimated total project emissions during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
Total Project emissions during the first crediting period	tCO_2	**25332**	**18172**	**28410**	**22352**	**23573**	**117839**

Table 20. Estimated total project emissions after the end of the first crediting period.

Year	Units	Project emissions
2013	tCO_2e	23 573
2014	tCO_2e	23 573
2015	tCO_2e	23 573
2016	tCO_2e	23 573
2017	tCO_2e	23 573
2018	tCO_2e	23 573
2019	tCO_2e	23 573
2020	tCO_2e	23 573
2021	tCO_2e	23 573
2022	tCO_2e	23 573
2023	tCO_2e	23 573
2024	tCO_2e	23 573
2025	tCO_2e	23 573
2026	tCO_2e	23 573
2027	tCO_2e	23 573
2028	tCO_2e	23 573
2029	tCO_2e	23 573
Estimated total project emissions after the end of the first crediting period	**tCO_2e**	**400 741**

E.4. Estimated baseline emissions:

The calculation results are presented in the table below. Calculations were made in the file *20120727_Shepetovka_ER.xls*, attached to the PDD.

Table 21. Estimated baseline emissions before the first crediting period.

		2005	2006	2007	Total
Baseline emissions due to natural gas combustion	tCO_2	0	40 090	48 310	**88 400**
Baseline emissions due to electricity consumption	tCO_2	11 092	13 922	16 776	**41 790**

Baseline methane emissions due to organic waste decay at landfill	tCO_2	0	0	162 773	**162 773**
Estimated baseline emissions before the first crediting period.	**tCO_2**	**11092**	**54012**	**227859**	**292963**

Table 22. Estimated baseline emissions during the first crediting period.

Source		2008	2009	2010	2011	2012	Total
Baseline emissions due to natural gas combustion	tCO_2	42 414	35 153	45 696	43 571	41 708	**208 542**
Baseline emissions due to electricity consumption	tCO_2	20 122	16 923	21 785	20 806	19 917	**99 553**
Baseline methane emissions due to organic waste decay at landfill	tCO_2	196 848	205 649	231 796	243 106	255 785	**1 133 184**
Total baseline emissions during the first crediting period	tCO_2	**259384**	**257725**	**299277**	**307483**	**317410**	**1441279**

Table 23. Estimated baseline emissions after the end of the first crediting period.

Year	Units	Baseline emissions
2013	tCO_2e	304 375
2014	tCO_2e	313 132
2015	tCO_2e	320 411
2016	tCO_2e	326 460
2017	tCO_2e	331 488
2018	tCO_2e	335 667
2019	tCO_2e	339 139
2020	tCO_2e	342 026
2021	tCO_2e	344 424
2022	tCO_2e	346 418
2023	tCO_2e	348 075
2024	tCO_2e	349 452
2025	tCO_2e	350 596
2026	tCO_2e	351 548
2027	tCO_2e	352 338
2028	tCO_2e	352 995
2029	tCO_2e	353 541
Estimated baseline emissions after the end of the first crediting period	**tCO_2e**	**5 762 085**

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

The calculation results are presented in the table below. Calculations were made in the file *20120727_Shepetovka_ER.xls*, attached to the PDD.

Table 24. Estimated emission reductions before the first crediting period.

		2005	2006	2007	Total
Emission reductions before the first crediting period	tCO_2	**4684**	**29333**	**197116**	**231133**

Table 25. Estimated emission reductions during the first crediting period.

		2008	2009	2010	2011	2012	Total
Emission reductions during the first crediting period	tCO_2	**234052**	**239553**	**270867**	**285131**	**293837**	**1323440**

Table 26. Estimated emission reductions after the end of the first crediting period.

Year	Units	Emission reductions
2013	tCO_2e	304 375
2014	tCO_2e	313 132
2015	tCO_2e	320 411
2016	tCO_2e	326 460
2017	tCO_2e	331 488
2018	tCO_2e	335 667
2019	tCO_2e	339 139
2020	tCO_2e	342 026
2021	tCO_2e	344 424
2022	tCO_2e	346 418
2023	tCO_2e	348 075
2024	tCO_2e	349 452
2025	tCO_2e	350 596
2026	tCO_2e	351 548
2027	tCO_2e	352 338
2028	tCO_2e	352 995
2029	tCO_2e	353 541
Estimated emission reductions after the end of the first crediting period	**tCO_2e**	**5 762 085**

E.6. Table providing values obtained when applying formulae above:

Table 27. Estimated balance of emissions under the proposed project before the first crediting period.

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2005	6 408	0	11 092	4 684
Year 2006	24 679	0	54 012	29 333

Year 2007	30 743	0	227 859	197 116
Total (tonnes of CO_2 equivalent)	**61 830**	**0**	**292 963**	**231 133**

Table 28. Estimated balance of emissions under the proposed project over the first crediting period.

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2008	25 332	0	259 384	234 052
Year 2009	18 172	0	257 725	239 553
Year 2010	28 410	0	299 277	270 867
Year 2011	22 352	0	307 483	285 131
Year 2012	23 573	0	317 410	293 837
Total (tonnes of CO_2 equivalent)	**117 839**	**0**	**1 441 279**	**1 323 440**

Table 29. Estimated balance of emissions under the proposed project after the end of the first crediting period.

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2013	23 573	0	327 948	304 375
Year 2014	23 573	0	336 705	313 132
Year 2015	23 573	0	343 984	320 411
Year 2016	23 573	0	350 033	326 460
Year 2017	23 573	0	355 061	331 488
Year 2018	23 573	0	359 240	335 667
Year 2019	23 573	0	362 712	339 139
Year 2020	23 573	0	365 599	342 026
Year 2021	23 573	0	367 997	344 424
Year 2022	23 573	0	369 991	346 418
Year 2023	23 573	0	371 648	348 075
Year 2024	23 573	0	373 025	349 452
Year 2025	23 573	0	374 169	350 596
Year 2026	23 573	0	375 121	351 548
Year 2027	23 573	0	375 911	352 338
Year 2028	23 573	0	376 568	352 995
Year 2029	23 573	0	377 114	353 541
Total (tonnes of CO_2 equivalent)	**400 741**	**0**	**6 162 826**	**5 762 085**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

The Host Party for this project is Ukraine. Environmental Impact Assessment (EIA) is the part of the Ukrainian project planning and permitting procedures. Implementation regulations for EIA are included in the Ukrainian State Construction Standard DBN A.2.2.-1-2003[63] (Title: "Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures").

Annex F of this standard contains a list of "types of projects or activities which constitute higher environmental risk" for which full EIA is mandatory, and the Ministry of Environment being the competent authority. Project activity, which relates to construction of sugar plants is included to this list.

According to the legislation of Ukraine, a detailed EIA for this project is not needed.

In general, environmental impact of the project activity is positive. Reduction of natural gas consumption leads to decrease in emissions of its combustion products to the atmosphere. Lowering electricity consumption reduces negative effects of its production.

Implementation of the project activity also has a positive social impact through removing of the concentrated odor beetroot pulp storage facilities and improving working conditions at the sugar plant. Since in the area of the project implementation the use of well water is widespread, the reduction of groundwater pollution has positive effects on health of locals.

Since the project does not lead to negative impacts on the environment, transboundary impacts that occur in any other country, and are caused by implementation of this project, which is physically located entirely within Ukraine, are absent.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The proposed project will have a positive overall impact on the environment compared to the existing condition. Thus, in general, the impact of reconstruction is negligible.

[63] State Construction Standard DBN A.2.2.-1-2003 :"Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures" State Committee Of Ukraine On Construction And Architecture, 2004

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

No stakeholder consultation process for the JI projects is required by the Host Party. Stakeholder comments will be collected during the time of this PDD publication in the internet during the determination procedure.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Limited Liability Company “Trading House “Shepetivsky Sugar”
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Phone:	+38 03840 41867
Fax:	+38 03840 41867
E-mail:	bilym@ukr.net
URL:	http://sugar.net.ua/
EDRPOU code:	36681090
KVED types of economic activities[64]:	01.11.0 Growing of grain and technical crops 51.90.0 Other types of wholesale trading 51.36.0 Wholesale sugar, chocolate and sugar confectionery 52.48.9 Retail sale of other household goods 60.24.0 Activities of auto and road freight transport
Represented by:	
Title:	Director
Salutation:	-
Last name:	Bilym
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Mobile:	-
Personal e-mail:	bilym@ukr.net

[64] Types of economic activities in accordance with Classification of types of economic activities DK 009:2005 valid till 31/12/2012 in accordance with Order of State Committee of Ukraine on Technical Regulation and Consumery Policy No. 457 from 11/10/2010. Available at: http://zakon.nau.ua/doc/?code=v0457609-10. Last access 19/04/2012.

Buyer of project emission reduction units:

Organisation:	United Carbon Finance Ltd
Street/P.O.Box:	OMC Chambers, Wickhams Cay 1
Building:	
City:	Road Town
State/Region:	Tortola
Postal code:	
Country:	British Virgin Islands
Phone:	0038 044 4906968
Fax:	0038 044 4906925
E-mail:	
URL:	
Represented by:	
Title:	Chief Representative Officer
Salutation:	Mr
Last name:	Hajizada
Middle name:	
First name:	Kanan
Department:	
Phone (direct):	0038 099 2619300
Fax (direct):	
Mobile:	
Personal e-mail:	atumis@mail.ru

Project developer.

Organisation:	"MT-Invest Carbon" LLC
Street/P.O.Box:	Panasa Myrnoho str.
Building:	1
City:	Kyiv
State/Region:	Kyivska
Postal code:	01011
Country:	Ukraine
Phone:	0038 044 2802350
Fax:	0038 044 2802350
E-mail:	
URL:	http://www.mtinvest.com.ua
Represented by:	
Title:	Joint implementation project manager
Salutation:	Ms.
Last name:	Vasylieva
Middle name:	Vjacheslavivna
First name:	Nataliya
Department:	
Phone (direct):	0038 044 2802350
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Mobile:	0038 067 7770596
Personal e-mail:	nataliya.vasylieva@mtinvest.com.ua

Annex 2

BASELINE INFORMATION

In order to establish baseline scenario and to calculate baseline emissions JI specific approach is used in accordance with paragraph 9 of the Guidance on criteria for baseline setting and monitoring (version 03). To elaborate methodology for emissions calculations in this project IPCC methods, which are used for preparing national inventory reports of GHG gases emissions, are employed.

Baseline emissions are calculated in the following way:

$$BE_y = BE_{NG,y} + BE_{EE,y} + BE_{CH_4,y},$$ (Equation A2.1.)

where:

$BE_{NG,y}$ baseline CO_2 emissions due to natural gas combustion in the period *y*, tCO_2;

$BE_{EE,y}$ baseline CO_2 emissions due to electricity consumption in the period *y*, tCO_2;

$BE_{CH_4,y}$ baseline methane emissions due to organic waste decay at landfill for the period from the beginning of the project till the end of the period *y*, tCO_2e.

y period of time for which emissions are calculated.

$$BE_{NG,y} = \frac{FC_{NG,BL,y} \times NCV_{NG,y} \times EF_{NG}}{10^6}$$ (Equation A2.2.)

where:

$FC_{NG,BL,y}$ baseline natural gas consumption, th. m^3 (here and further in relation to natural gas – at standard conditions of temperature and pressure 20ºC and 101 325 Pa);

$NCV_{NG,y}$ net calorific value of natural gas, GJ/th. m^3 (National Inventory Report of Ukraine for 1990-2010[65] (value for food industry);

EF_{NG} emission factor for natural gas combustion, kg CO_2/TJ (IPCC 2006[66]);

y period of time for which emissions are calculated;

10^6 dimensionless conversion factor, necessary for maintaining formula dimensions correspondence.

Baseline natural gas consumption is a calculated value, which depends on specific baseline natural gas consumption and actual (project) sugar production, therefore:

$$FC_{NG,BL,y} = SEC_{NG,BL} \times P_{sugar,PJ,y}$$ (Equation A 2.3.)

where:

$SEC_{NG,BL}$ specific baseline natural gas consumption, th. m^3/t sugar;

[65] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

[66] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf , page 1.24

$P_{sugar,PJ,y}$ project sugar production, t;

y period of time for which emissions are calculated.

In its turn, specific baseline natural gas consumption is calculated by the following formula:

$$SEC_{NG,BL} = \frac{FC_{NG,BL,2002}}{P_{sugar,BL,2002}} \quad \text{(Equation A 2.4.)}$$

where:

$FC_{NG,BL,2002}$ baseline natural gas consumption, th. m^3. It was decided to take 2002 for the baseline year, since it was the last year of operation before decision to implement the project was made for which the data are available;

$P_{sugar,BL,2002}$ baseline sugar production, t. Similarly to previous parameter, it was decided to take 2002 for the baseline year, since it was the last year of operation before decision to implement the project was made for which the data are available;

$$BE_{EE,y} = EC_{BL,y} \times EF_{grid,y} \quad \text{(Equation A 2.5.)}$$

where:

$EC_{BL,y}$ baseline electricity consumption, th. kWh;

$EF_{grid,y}$ emission factor for electricity consumption (emission factor for electricity consumed by the project activity in period y equal to the indirect specific carbon dioxide emissions from electricity consumption by the 2nd class electricity consumers), $kgCO_2$/kWh (In accordance with Ukrainian DFP Orders[67]);

y period of time for which emissions are calculated.

Baseline electricity consumption is a calculated value, which depends on specific baseline electricity consumption and actual (project) sugar production, therefore:

$$EC_{BL,y} = SEC_{EE,BL} \times P_{sugar,PJ,y} \quad \text{(Equation A 2.6.)}$$

where:

$SEC_{EE,BL}$ specific baseline electricity consumption, th. kWh/t sugar;

$P_{sugar,PJ,y}$ project sugar production, t;

y period of time for which emissions are calculated.

In its turn, specific baseline electricity consumption is calculated by the following formula:

$$SEC_{EE,BL} = \frac{EC_{BL,2002}}{P_{sugar,BL,2002}} \quad \text{(Equation A 2.7.)}$$

[67] http://www.neia.gov.ua/nature/control/uk/publish/category?cat_id=111922

where:

$EC_{BL,2002}$ – baseline electricity consumption, th. kWh. It was decided to take 2002 for the baseline year, since it was the last year of operation before decision to implement the project was made for which the data are available;

$P_{sugar,BL,2002}$ – baseline sugar production, t. Similarly to previous parameter, it was decided to take 2002 for the baseline year, since it was the last year of operation before decision to implement the project was made for which the data are available;

Baseline methane emissions due to organic waste decay[68] at landfill[69] are calculated in the following way[70]:

$$BE_{CH4,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot {}^{16}/_{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} W_x \cdot DOC \cdot e^{-k\cdot(y-x)} \cdot (1-e^{-k}) \quad \text{(Equation A 2.8.)}$$

where:

$BE_{CH4,y}$	baseline methane emissions due to organic waste decay at landfill for the period from the beginning of the project till the end of the period y, tCO_2e.
W_x	amount of sugar production organic waste, that would be transported to the disposal site in the period x, t (Actual data for 2007-2011; forecast for 2012-2029);
φ	correction factor to account for uncertainties, dimensionless. (Study on validation of landfill gas formation models [71])
f	share of methane being captured and utilized at the disposal site, fraction[72];
GWP_{CH4}	global warming potential for methane, tCO_2e/tCH_4 (In accordance with UNFCCC decision and Kyoto Protocol);

[68] During the drafting of any study of greenhouse gas emissions resulting from anaerobic decomposition of sugar beet pulp in landfills, conducted in the western part of Ukraine in the relevant project implementation period was found, so local data is not available. Regarding the use of national data (such as data from the National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine), this would lead to a large error rate by applying parameters calculated for the average morphological composition of MSW used to estimate national emissions of greenhouse gases sector "waste" (description of the calculation on p. 287-296 National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010 years). Thus, international data on greenhouse gas emissions during the anaerobic decomposition of organic waste, depending on their characteristics, storage conditions and climatic factors are the best currently available estimates of parameters of calculation, allowing a more accurate result of emission reductions resulting from the implementation Project. Coefficients used entirely consistent with laboratory analysis of the pulp.

[69] Coefficients used for calculations represents unmanageable deep landfills with no cover material and without biogas gathering practice (IPCC classification). This is typical conditions for Ukraine.

[70] To calculate the annual baseline emissions of methane from the decomposition of organic waste from sugar mills at the site using the methodological approach used in assessing methane emissions from MSW landfills in the preparation of national reports on greenhouse gas emissions. A detailed description of the calculation methodology described on p. 287-288 National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010 biennium formula for calculating methane emissions in the project (baseline and project) is derived by substituting intermediate calculation formulas in one expression, simplified expression for calculating emissions from schedule one type of waste involved in the project (bagasse), and putting factor "global warming potential" to obtain the result in tons of CO_2 equivalent.

[71] Oonk H., Weenk A., Coops O., Luning L. (1994) Validation of landfill gas formation models; EWAB 9427; NOVEM, Utrecht, The Netherlands.

[72] The data from project owner regarding the landfill used

OX	oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes, fraction (2006 IPCC)[73]);
F	volume of methane in the landfill gas, fraction (2006 IPCC)[74]);
DOC_f	fraction of carbon of organic origin, which can be decomposed, fraction (2006 IPCC) [75]);
MCF	methane conversion factor, fraction (2006 IPCC)[76]);
DOC	Weight fraction of organic origin carbon in the beetroot pulp, t C/ t beetroot pulp (Data of laboratory research. The result is within the values specified in 2006 IPCC)[77]);
k	Decomposition factor of wastes (beetroot pulp), fraction (2006 IPCC)[78]);
x	period during the crediting period: $x \in (1; y)$;
y	period of time for which methane emissions are calculated.

Key information and data used to establish the baseline are provided below in tabular form:

Data/Parameter	$P_{sugar,PJ,y}$
Data unit	t
Description	Project sugar production
Time of determination/monitoring	Monitored throughout the monitoring period
Source of data (to be) used	Reporting data of the LLC "TH "Shepetivsky Sugar"
Value of data applied (for ex ante calculations/determinations)	**2005**: 18 755; **2006**: 23 540; **2007**: 28 367; **2008**: 25 008; **2009**: 20 727; **2010**: 26 943; **2011**: 25 690; **2012**: 24 592
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is measured for commercial purposes of the enterprise on site.
QA/QC procedures (to be) applied	In accordance with the procedures of the project owner.
Any comment	No

Data/Parameter	$SEC_{NG,BL}$
Data unit	th. m^3/t sugar
Description	Baseline specific natural gas consumption
Time of determination/monitoring	Fixed ex ante (average for 2000-2002)
Source of data (to be) used	Reporting data of the LLC "TH "Shepetivsky Sugar"
Value of data applied (for ex ante calculations/determinations)	0.89
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is measured for commercial purposes of the enterprise on site.

[73] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[74] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[75] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14
[76] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14
[77] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13
[78] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.17

QA/QC procedures (to be) applied	In accordance with the procedures of the project owner.
Any comment	No

Data/Parameter	$SEC_{EE,BL}$
Data unit	th. kWh/t sugar
Description	Baseline specific electricity consumption
Time of determination/monitoring	Fixed ex ante (average for 2000-2002)
Source of data (to be) used	Reporting data of the LLC "TH "Shepetivsky Sugar"
Value of data applied (for ex ante calculations/determinations)	0.66
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is measured for commercial purposes of the enterprise on site.
QA/QC procedures (to be) applied	In accordance with the procedures of the project owner.
Any comment	No

Data/Parameter	W_x
Data unit	t
Description	Amount of sugar production organic waste, that would be transported to the disposal site in the period x
Time of determination/monitoring	Monitored throughout the monitoring period
Source of data (to be) used	Reporting data of the LLC "TH "Shepetivsky Sugar"
Value of data applied (for ex ante calculations/determinations)	(see table below)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is measured for commercial purposes of the enterprise on site.
QA/QC procedures (to be) applied	In accordance with the procedures of the project owner.
Any comment	No

		2007	**2008**
		183 353	144 655
2009	**2010**	**2011**	**2012**
98 791	143 039	118 556	126 260

Data/Parameter	NCV_{NG}
Data unit	GJ/th. m^3
Description	Net calorific value of natural gas
Time of	Monitored throughout the monitoring period

determination/monitoring	
Source of data (to be) used	National Inventory Report of Ukraine (value for food industry)[79]
Value of data applied (for ex ante calculations/determinations)	**2005**: 33.94; **2006**: 33.94; **2007**: 33.94; **2008**: 33.8; **2009**: 33.8; **2010**: 33.8; **2011**: 33.8; **2012**: 33.8
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Actual data, reported by the Ukrainian DFP annually
QA/QC procedures (to be) applied	Latest available country specific values
Any comment	No

2005	2006	2007	2008
33.94	33.94	33.94	33.8
2009	**2010**	**2011**	**2012**
33.8	33.8	33.8	33.8

Data/Parameter	$EF_{grid,y}$
Data unit	$kgCO_2/kWh$
Description	Emission factor for grid electricity consumption
Time of determination/monitoring	Monitored throughout the monitoring period
Source of data (to be) used	Ukrainian DFP Orders and other sources (for period 2005-2007 the data from "Standardized emission factors for the Ukrainian electricity grid" were used, Table 8, page 10)[80]
Value of data applied (for ex ante calculations/determinations)	**2005**: 0.896; **2006**: 0.896; **2007**: 0.896; **2008**: 1.219; **2009**: 1.237; **2010**: 1.225; **2011**: 1.227; **2012**: 1.227
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Factor of specific indirect emissions of carbon dioxide for consumption of electricity by 2nd-class consumers.
QA/QC procedures (to be) applied	Latest available country specific values
Any comment	No

2005	2006	2007	2008
0.896	0.896	0.896	1.219
2009	**2010**	**2011**	**2012**
1.237	1.225	1.227	1.227

[79] The project owner's figures were not used due to lack of data for the project period (acts a natural gas exploration, issued on a monthly basis). Instead, data from national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine, which is common practice for JI projects in Ukraine.

[80] http://www.neia.gov.ua/nature/control/uk/publish/category?cat_id=111922

Annex 3

MONITORING PLAN

For the monitoring plan please refer to section D of this PDD.

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У цьому документі прошито, пронумеровано

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Директор

ТОВ «ТД» «Шепетівський цукор» ________ Білим Є.В.

(підпис)

МП