JOINT IMPLEMENTATION PROJECT

«Implementation of technological modernization of PJSC «Gorokhiv Sugar Mill»

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

13 . 11 .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 PJSC «Gorokhiv Sugar Mill»

13 . 11 .2012 ________________ **Prytulyuk Anatoliy Pavlovych**

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JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

"Implementation of technological modernization of PJSC "Gorokhiv Sugar Mill"

Sector: 13.Waste recycling and utilization.

Version of the document: 03

Date of the document: 29/10/2012

A.2. Description of the project:

The project aims at improving and modernizing the practice of recycling of organic waste at PJSC "Gorokhiv Sugar Mill". The project activity results in decrease of the amount of sugar beet pulp to be disposed in landfills, where due to decomposition of organic matter in the pulp under anaerobic conditions the methane releases, which is a greenhouse gas.

This project has been realized at the production facilities of PJSC "Gorokhiv Sugar Mill". Sugar beet pulp is a by-product of its production, which is a spent sugar-beet chips. This product has valuable feed properties and can be successfully used for feeding cattle, which eats good quality pulp in any form: fresh, benign acidic, siloing or dry. The technical process of sugar plant involves the production of fresh pulp. The high content of organic components makes it an excellent environment for intensive growth of microorganisms that cause rapid deterioration of pulp, though it can no longer be used for feeding cattle and must be taken to landfills for disposal as an organic waste[1]. Reducing the water content makes it suitable for ensiling (preservation of pulp by creating conditions for lactic acid fermentation). The period of pulp storage can be increased to one year and more, when it is air-tightly preserved. By ensuring a deeper pulp extraction, the plant expands opportunities to use the beneficial beet pulp, which increases the demand, consequently reducing the amount of pulp that could deteriorate. However, the shelf life for pulp silage is short as well, so the range of consumers is limited to livestock breeding complexes, located near the sugar plant. To increase the amount of pulp that can be recycled, it is required to reduce its water content to 14% and less. For this purposes the pulp drying and granulation equipment is used. The resulting product is suitable for long-term warehousing and transportation for long distances.

Historically, the plant was equipped with pulp drying systems. But drying drums that were built in the 60s of the last century has not been operated since 2000 due to their poor technical condition. Actually manufacturing scheme of sugar production has been simplified so that the pulp formed passed the drying stage and when being liquid it would be drained off and taken to pulp pit, where natural filtration of water through the soil and evaporation into the atmosphere occur. The proposed project activity provides the reconstruction of obsolete equipment of pulp drying system and installation of presses of deep pulp extraction. Currently all planned activities are realized and lead to the generation of CO_2 emissions reduction.

Situation before the project implementation

Before the project realization, equipment and infrastructure (warehouses, adjusted logistics system) necessary to decrease moisture content in the pulp, wherefore it quickly deteriorated, and this valuable feed resource turned into organic waste, which at first was stored in pulp pits (up to three months) and

[1] 1583.2.9.01 is a code attributed to a beet pulp as per the State Classifier of Ukraine SC 005-96 "Waste Classifier".

then transported to landfills. When emptying the pulp pits from deteriorated pulp, 3-5% of its mass left at the pit bottom, containing a large number of microorganisms that rapidly contaminated new pulp and speeded up the pace of its deterioration. Due to the use of this practice, the pulp produced at the JI project plant could not be used for feeding cattle and was disposed at landfills.

Baseline scenario

In the baseline scenario in the absence of the project the situation would continue: the company would still store sugar beet pulp in pits in the substance as it was produced, with no additional actions aimed at reduction of its moisture content. After filling the pulp pits with pulp, it would be transported and disposed at landfills. This scenario foresees decomposition of organic matter with the generation of landfill gas containing greenhouse gas – methane.

Sugar production is a main business activity of PJSC "Gorokhiv Sugar Mill". However, other products or waste are secondary and those to which not much attention is paid. The base scenario envisaged the continuation of the pulp handling practice that used to be applied by the plant. This scenario does not require any changes to the technical process of the plant, investment and does not face any barriers.

Project scenario

Project scenario provides the reconstruction of obsolete pulp drying equipment and installation of additional presses of deep pulp extraction, which resulted decreasing of moisture content in the pulp, which allows its beneficial utilization as feed for cattle, thus it is not to be disposed at landfills and methane does not release into the atmosphere in result of pulp decomposition.

Project history

The project was initiated at PJSC "Gorokhiv Sugar Mill" in mid 2004. Along with the ratification of the Kyoto Protocol, the opportunity to receive additional financial benefits from reducing greenhouse gases has appeared that was an additional reason for project realization. The installation of new equipment and reconstruction of existing drying equipment occurred during 2004-2007. Emission reductions will be sold as ERUs in the international emission trading market, 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, the joint implementation mechanism was one of the prominent factors of the project, and financial benefits under this mechanism plays an important role in deciding on the start of the operation and is considered to be one of the reasons to launch the project realization.

The project has been applied to the State Environmental Investment Agency of Ukraine and was obtained the Letter of Endorsement #3175/23/7 on 25/10/2012

Project implementation schedule is presented as Table 3 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)	PJSC "Gorokhiv Sugar Mill"	No
The Netherlands	United Carbon Finance Ltd	No

PJSC "Gorokhiv Sugar Mill" is a modern enterprise with processing capacity of 4500 tons of sugar beet per day. The main product of the plant is sugar. Joint products are burnt lime, pulp, molasses. Sugar produced at PJSC "Gorokhiv Sugar Mill" is in great demand in the national market; it is indispensable in the food and pharmaceutical industries. PJSC "Gorokhiv Sugar Mill" sugar became a finalist of Product Quality All-Ukrainian Competition "100 Best Products of Ukraine". In recent years, the company performed gasification and radical reconstruction of the plant, upgrading of technical equipment, computerization of production processes, strengthened cooperation with farmers of different forms of ownership and expanded network of procurement centers, constantly introducing best domestic technologies for sugar beets processing. PJSC "Gorokhiv Sugar Mill" was certified against management system under the requirements of DSTU ISO 9001-2001 (ISO 9001-2000), ISO 14001-2004, ISO 22000-2005 and OHSAS 18001:199. In the context of this project, PJSC "Gorokhiv Sugar Mill" is the owner of emission reductions, which were generated as a result of project implementation.

United Carbon Finance Ltd is a potential byer 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 Khorostkivskiy Sugar Plant LLC 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 emissions reduction units generated due to the project implementation.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Part(ies):

Ukraine

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

This project is being realized at the production facilities of PJSC "Gorokhiv Sugar Mill". The enterprise is located in Marianivka Town, Gorokhiv District of Volyn Region. The location of the Volyn Region is illustrated on the map of Ukraine in Figure1.

Figure 1 – Location of the Volyn Region on the map of Ukraine

Volyn Region is an administrative and territorial unit of Ukraine with its center in Lutsk. Square area is 20143 km^2 (3.3% of Ukraine territory), population - 1 038 988 people (as of 2012). There are 11 cities, 22 towns, 1054 villages and 16 districts.

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

Marianivka town, Gorokhiv District. Satellite photo of Marianivka town is showed in Figure 2.

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

Figure 2 – Satellite photo of Marianivka town

Geographic coordinates of the project:

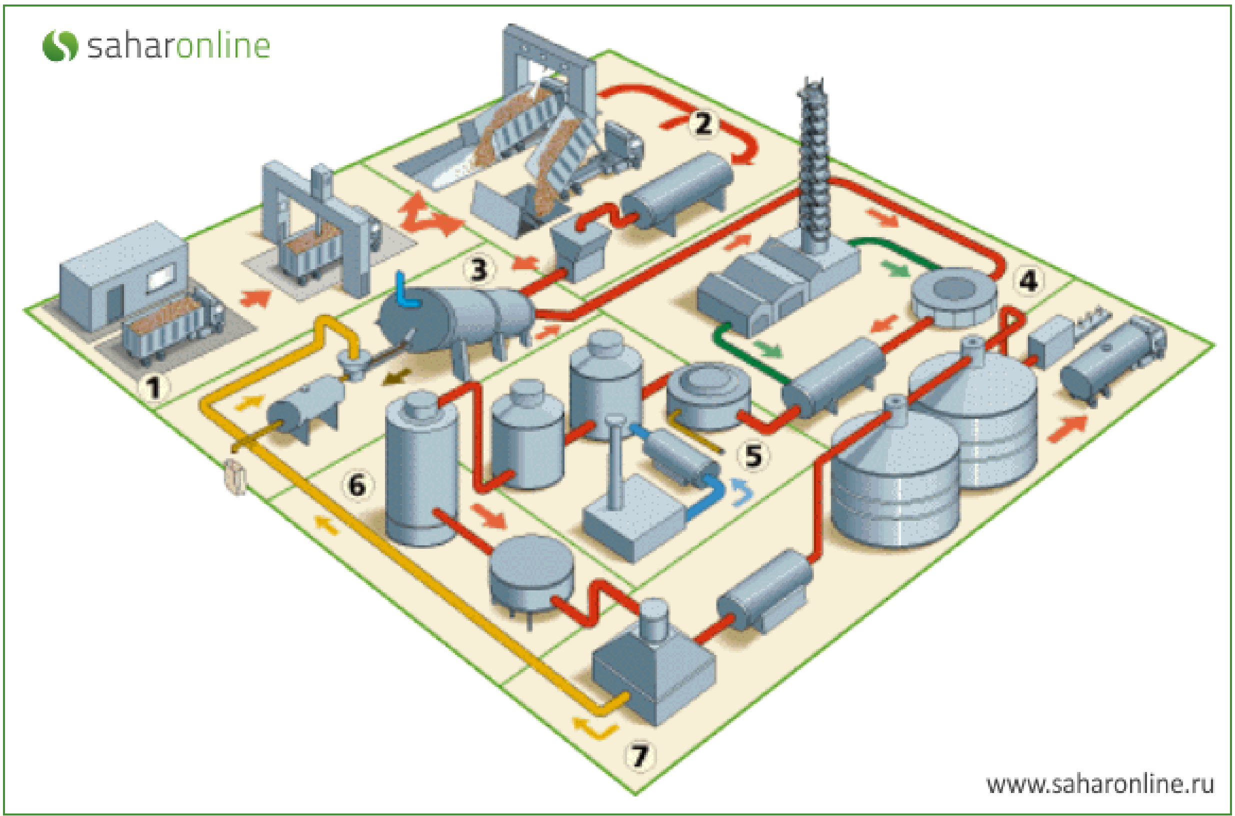
50°26′56.98″ N 24°48′59.35″ E

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

The project provides the reconstruction of process equipment to modernize the waste handle practice at PJSC "Gorokhiv Sugar Mill". The company is producing sugar from sugar beet under typical manufacturing scheme.

Technology of sugar production

Sugar production is a complex multistage process illustrated at the technological process flow-chart in Figure 3. It comprises of beet supply, its unloading and washing, shredding, extraction of sucrose and other sugar-free components into the solution (diffusion), purification of diffusion juice with addition of lime and use of CO_2 gas (carbonation) and SO_2 (sulfication), condensing of purified juice to the syrup consistency through evaporation. Its further thickening in vacuum evaporators until it turns into thick mass (7% of water content) – a massecuite from which crystallized sugar are produced during centrifugation. Every stage is described in detail below.



Flow-chart description:

1. Sugar beet supply;
2. Unloading and washing;
3. Diffusion (pulp generation);
4. Saturation;
5. Evaporation;
6 Crystallization;
7. Centrifugation.

Figure 3. Flow-chart of sugar production process of sugar beet. (Source: Saharinline[2])

Sugar beets supply

One of the most important factors for obtaining high-quality raw sugar is a characteristic of raw material that gets recycled.

When collecting and transporting beet, except greenery that stuck to beets, small and heavy impurities: tops, straw, sand, stones also get to beets. Using mechanized means for cultivation and harvesting of sugar beet, the amount of such additives is about 10-12% of received raw materials weight. When supplying sugar beets at the plant, beet laboratory makes an analysis of received beets. Technological quality of sugar beets is characterized by a number of properties the main of which is sugar content (average sucrose content is about 18%) and purity of beet juice that is interrelated. As sucrose percentage increases, beet juice purity increases as well. Reception of sugar beet, its sampling, determination of contamination and sugar content is performed in accordance with GOST 17421-82 "Sugar beet for industrial processing. Requirements for procurement"[3].

[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

Unloading and washing

A good washing of sugar beets and timely capture of impurities before the refining process starts allows for improving the quality of products, reducing the amount of chemicals used for purification of diffusion juice and allow extend the life of capital equipment, such as beet choppers, diffusers, filters, etc.

The plants use wet method of sugar beets transportation for its processing. In this way, sugar beet is washed out of a truck body by means of water jet and hydraulic conveyors, after which it is transported to production shops. While being under the process, it is primarily washed using sand, straw, tops and stone separators through which the plant is trying to minimize the amount of impurities. For the final purification of sugar beet washing machine is used. The beets are washed from the clay and soil the best when rubbing together, that is successfully performed in washing machines of drum type. After that, the beets are taken to rinsers and washing machines of barrel type with further transportation to the tankers before being carried to beet choppers.

Diffusion

To produce sugar using diffusion method, beets have to be grinded with beet choppers, after which we can obtain beet chips. Diffusion unit efficiency and sugar content in sugar-free chips to a great extent depends on the quality of chips. Beet chips can be in the form of gutter or tablet depending on the type of diffusers. The thickness of normal chips is 0.5-1 mm. Its surface should be smooth without any cracks. Too thin chips are undesirable because they lose their shape, lump and affect the circulation in the diffusion juice units.

In the process of diffusion, beet chips are ponded with hot water, so that cell walls of sugar beet will be destructed and sucrose turn into solution. When the diffusers are running effectively and the beet chips are of high quality, over than 98% of sucrose can turn into a solution, sugar-free components dissolve as well, namely: soluble protein, peptic substances and products of their decay, reducing sugars, amino acids, etc., which are to be removed at the next stages. As a result of diffusion diffuse juice are obtained that goes further into the technological process, and ***sugar-free chips − waste of sugar production − pul***.

Further stages of sugar production are not involved into project activity and are briefly explained to give the information.

Carbonation and sulfication

During the carbonation process, diffusion juice is treated with lime milk and carbonation gas (CO_2). Lime and carbon dioxide are obtained during roasting limestone[4]. On addition of lime, CaO reacts with components of the diffusion juice, thus creating insoluble compounds with its sugar-free components that precipitate and can be separated by filtration. CO_2 and SO_3 treating allows for recovering sucrose and converting it into insoluble compounds, which are then filtered. The process can be repeated several times in order to increase the efficiency of purification. Purity of syrup should be adjusted to about 92%[5], because mistakes made during the previous stages are impossible to correct.

Evaporation

Purified diffusion juice is subjected to evaporation until it turns into syrup.

Crystallized sugar obtaining

Crystallization begins in vacuum units, where syrup is thickening until it turns into a massecuite – a dense mass with approximately 7% of water content. Massecuite is carried for centrifugation, which results in obtaining of crystallized sugar and intercrystalline substance − syrup, which has a high content of sucrose (massecuite II). It is transported for re-evaporation and centrifugation. The resulting sugar is dried and packed.

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[4] CO_2 emissions due to thermal decomposition of limestone are not taken into consideration within the joint implementation project, because project activity has no effect on them.
[5] http://www.saharonline.ru/e_evaporator.php?enc=306

Characteristics of sugar beet pulp

As mentioned above, the pulp is a byproduct of sugar production that is a result of diffusion process and sugar-free beet chips. The fresh pulp is usually removed to temporary pulp storage tanks; some plants are equipped with pulp presses for filtrate pressing. When pressed, pulp moisture content decreases to 80%. The resulting pulp comes to pulp pits, from where it is transported to landfills or may be sent for recycling.

Pulp consists of pectin, cellulose, and hemicellulose. There is also a small amount of proteins, minerals and sugar. A small amount of fiber, easy absorption of carbohydrates and proteins make it a very valuable food for cattle, which eats it very well, either fresh, or sour fermented, siloing or dried. Chemical composition of different types of pulp is presented in Table 1.

Table 1. Chemical composition of different types of pulp (Source: Ugagroprom [6]).

Parameter	Pulp, %			
	Fresh	**Pressed**	**Sour**	**Dried**
Crude protein content	1.2-1.5	1.7-1.9	1.3-2.6	7-9
Crude fiber content	3.5-4.5	5.0-7.0	2.8-4.2	19-23
Nitrogen-free extractives content	4.3-6.5	8.5-10.0	2.7-5.8	55-65
Cinder	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 of pulp handling is quick fermentation and putrefaction processes due the high organic matter content, which spoil forage properties of pulp and converts it being useful by-product of sugar production into waste than has to be recycled or disposed. Fresh pulp should be used for feed purposes or conserved only within short period of time[7] after its production. Its short-term fermentation in pulp pits under anaerobic conditions for sour pulp is allowed, but the period of which is about 3 days after its formation. The most common way of pulp preserving is siloing. Warm pulp is packed air-tightly into containers, where lactic acid bacteria grow that produce lactic acid that is a conservant. In this case the term of pulp handling extends up to 4-8 days and more.

Feeding animals with spoiled pulp may cause serious digestive disorders[8]. Thus, fresh sugar beet pulp, which was not immediately used for animal feeding or was not taken under special treatment, inevitably becomes liquid waste production to be disposed at landfills.

Changing of pulp management practices

The project activity involves the introduction of raw pulp processing to increase the term of its suitability for use as cattle feeding by achieving significant reduction of its humidity content due to the introduction of additional equipment and reconstruction of existing drying equipment that have not been operated due to the unsatisfactory technological condition. Consequently, it allows for avoiding of sugar beet pulp spoiling and its removal to landfills, where it would be decomposed along with methane gas generation.

By ensuring a deeper pulp extraction, the plant expands opportunities to use the beneficial beet pulp, which increases the demand, consequently reducing the amount of pulp that could deteriorate. But the shelf life for pulp silage is short as well, so the range of consumers is limited to livestock breeding complexes, located near the sugar plant. To increase the amount of pulp that can be recycled, it is

[6] Kolesnikov M.V. "Storage and use of beet pulp. Chemical composition of pulp". (М.В. Колесніков. «Зберігання та використання жому цукрового буряка. Хімічний склад жому») http://www.ugagroprom.ru/2/
[7] Isaev M.D. "For what you can use the pulp and molasses?"(М.Д. Ісаєв. «Для чого можна використати жом та меласу?») http://agro.tatarstan.ru/rus/file/pub/pub_37228.doc
[8] Kolesnikov M.V. "Storage and use of beet pulp. Chemical composition of pulp". (М.В. Колесніков. «Зберігання та використання жому цукрового буряка. Хімічний склад жому») http://www.ugagroprom.ru/2/

required to reduce its water content to 14% and less. For this purposes the pulp drying and granulation equipment is used. The resulting product is suitable for long-term warehousing and transportation for long distances.

The project activity provides the restoration of pulp during equipment work due to its reconstruction, construction of warehouses for storing of dry product, installation of presses of deeper extraction and setting up logistics for processing the maximum amount of sugar beet pulp. Details on changes of pulp management practices are provided below.

General description of the equipment

Pulp press:

Vertical press “Sangerhausen”, of GH-2 brand, made in Germany. The press allows deeper extraction of water until the content of dry matter in the finished product is 18%.

The press consists of: separator, screw, body, control device, electric drive, nozzle and additional filtration surface. The principle of operation is as follows: fresh pulp enters into the separator, where it is separated from the part of water, which is removed from the separator through the nozzle. Then pulp enters into press chamber, where it is pressed of the rest of water left, which is separated by cylindrical sieve and goes through another nozzle. Water pressing occurs due to decreasing of screw chambers in volume in the direction of pulp displacement.

Special device regulates time of pulp being under press and water pressing degree. It consists of a body press, sieves, cone, rod, spring, brackets, nut, flange, cone and body of screw extractors. The degree of pulp extraction depends on the movement of the cone and sieve either to right, or left, while the gap for pulp output increases or decreases. Pressure on the cone sieve is undertaken by springs, tightening of which regulates pressing degree.

14 presses were commissioned under the project.

Pulp driers

Pulp drying unit of A2-PSA trademark is unit is a horizontal rotating drum with diameter of 2.4 m and a length of 12 m, in the center of which cruciform checkers are installed to overturn pulp during its drying and to ensure better contact with off-gases. One end of the drum is fixed to stationary mixing chamber, and other − to the discharge chamber.

The fresh pulp, pressed to the maximum possible content of dry matter, is supplied to the mixing chamber, where off-gases come from fuel combustion chamber are supplied. Then pulp with the off-gases are mixed by cruciform checkers, dried and moved to the discharge chamber. The fan takes air into combustion and mixing chambers. From the discharge chamber dried pulp falls to a screw, which feeds it into the elevator. Further, pulp gets to the scales, from where it goes to the warehouse.

In the steady mode temperature of off-gases at the inlet to mixing chamber is maintained of 800 ... 900 °C, the temperature of off-gases − 120 ... 140 °C, when evacuating in drying drum − 350 ... 400 Pa. The drum rotates with the known frequency of electric power of 15 kW and allows for adjusting the amount of dried pulp and its humidity. Due to variable speed of drum it is possible to increase the amount of dried pulp in several times with decreasing drying degree to the required minimum.

The drying drums were not under repair since the time of their commissioning, due to which they were stopped in 2000 because of inability to ensure continuous operation. Two existing pulp drying drums were reconstructed under the project.

Pulp drier facilities and dry pulp storages

After the transition to the drying pulp practice, the plant was equipped with special building for dry pulp storage, which allows for relatively constant temperature storage of pulp to prevent ingress of moisture from precipitation. The buildings are heated. Heating system can be used in case of pulp finish drying after pulp drying drum. It is usually used during peak loads.

During the implementation of these measures envisaged by the project, the following actions were carried out:

1) Construction of pulp drying facility with the necessary infrastructure and arranging there a dry pulp warehouse.
2) Purchase of press in order to get better pressed pulp: 14 presses of deep extraction GC-2 with production capacity of 12 tons per hour each was commissioned simultaneously;
3) Reconstruction of two pulp drying drums with production capacity of 66.8 tons of dry pulp per day each;
4) Installation of automatization complex to ensure the reliable operation of the complex.

Due to the lack of funds, the project initiated in 2004 was successfully realized only in the end of 2007.

Specifications are listed in the table below.

Project activity was implemented in 3 stages:

Stage 1: construction of pulp drying facility with the necessary infrastructure (transporters, auxiliary systems, pipelines, etc.);
Stage 2: purchasing and gradual commissioning of 14 presses of deep pulp extraction, and their inclusion into the technological scheme of production process;
Stage 3: reconstruction of the pulp drying equipment, transfer it to a new shop and its inclusion into the technological scheme of sugar production process.

Table 2. Specifications of pulp drying complex.

Parameter	Value
Productivity of dry pulp in the initial humidity of 80% and final 18%, t/per day	168
Calorific value of furnace, MW	15
Air pressure to the burner, mm w.g.	90-100
Coolant temperature at the outlet of the furnace, °C	850-900
Fuel type	natural gas
Natural gas consumption, H m^3/h	~350
Drive power of drier body, kW	37-55
Rotating frequency of drier body, rpm	1.25-2.5
Drive power of screw, kW	5.5
Rotating frequency of screw, rpm	12
Drive power of discharge screw, kW	3.0
Rotating frequency of discharge screw, rpm	25

Outcome: comprehensive utilization of own pulp and avoidance the pulp handle practice thorough its disposal to the residential solid waste landfills.

Implementation of the proposed project had a positive impact on the environment, since the amount of waste received for disposal at the landfills was reduced. It should be noted that the reduction of methane emissions generated due to the anaerobic fermentation into waste layer and other gases of pulp decomposition. Business activity of the enterprises involved into joint activity is carried out within the limits of emissions permits for water use and waste disposal.

Currently the project is already implemented. Implementation of the measures to ensure pulp processing with a significant decrease of its moisture content was completed in 2004, when new shop of pulp drying complex was installed. At the same time, the presses of deep pulp extraction were purchased. But, due to lack of funds, the final stage was introduced only in 2007 that involved the reconstruction of the existing pulp drying drums. The ratification of Kyoto Protocol by Ukraine February 4, 2004 and the implementation of JI projects in other sugar factories (outside the project)had an effect on the decision to implement project activities. Below is a schedule of the main stages of project implementation.

Table 3. Project implementation schedule.

Activity	***Dates***
The decision to establish a working group to implement the design decisions and coordinate all aspects related to the project	12/07/2004
Investment stage	12/07/2004 – 31/12/2007
Construction-assembly and administration works, including:	12/07/2004 – 31/12/2007
Construction of pulp drying facility	12/07/2004 – 31/12/2004
Presses installing	01/09/2004 – 31/12/2004
Reconstruction of pulp drying drums	01/03/2007 – 31/10/2007
Involving the new equipment into the technological scheme and installation of automatization complex to ensure the reliable operation of the complex	01/11/2007 – 31/12/2007
Operation stage	01/01/2008 – 31/12/2027
Emission reduction generation	01/01/2008 – 31/12/2027

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, packers, power engineers and mechanics, truck drivers are locally available. Local resources meet project maintenance needs: own and hired workers and repair contractor. Project foresees the need for training. All employees must have a valid certificate of vocational education, and periodically pass safety training and exams. Vocational 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:

PJSC “Gorokhiv Sugar Mill” implements JI project with the following objectives:

- Reduction of greenhouse gas emissions due to recycling of organic waste;
- Development of new technologies of waste management;
- Creation of a closed waste-free production cycle;
- Support to increase livestock forage;
- Improving environmental and social situation in the region.

Emission reductions are achieved by avoiding the generation of methane containing in the landfill gas that occurs after sugar beet pulp disposal at the landfills. After implementation of the project activity, pulp is taken under processing, which prevents its deterioration, prolongs its shelf life as a food for livestock, which could allow its being transported for long distances for the consumer.

In the absence of the proposed project, fresh pulp would lose its valuable feed properties due to the intensive processes of fermentation and putrefaction, which inevitably would have been occurred under conditions of high temperatures of summer season of sugar beet processing. After that, the only way plant could remove it from the area was its disposal to the landfill, where in the process of its decomposition, landfill gas containing methane would release.

Since the project leads to the reduction of greenhouse gas emissions into the atmosphere, such reduction must be taken into account when making a decision on the project realization (refer to Table 3). Emission reductions can be sold as ERUs in the international emission trading market and received funds will improve the financial performance of the project to a level that will enable to make a decision on its implementation.

Detailed description of the baseline and additionality justification is provided in Section B of this PDD.

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

Calculations of emission reductions are provided in the Excel file *20120724_Gorokhiv_ER.xls*

Table 4. Estimated amount of emission reductions during the crediting period

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tons of CO_2 equivalent
Year 2008	258 764
Year 2009	304 269
Year 2010	336 556
Year 2011	353 557
Year 2012	377 083
Total estimated emission reductions over the crediting period (tons of CO_2 equivalent)	**1 630 229**
Annual average of estimated emission reductions over the crediting period (tons of CO_2 equivalent)	**326 046**

Table 5. Estimated amount of emission reductions after the crediting period

	Years
Length of the period after 2012, for which emission reductions are estimated	15
Year	Estimate of annual emission reductions in tons of CO_2 equivalent
Year 2013	396 636
Year 2014	412 886
Year 2015	426 391
Year 2016	437 616
Year 2017	446 944
Year 2018	454 697
Year 2019	461 141
Year 2020	466 496
Year 2021	470 947

Year 2022	474 646
Year 2023	477 721
Year 2024	480 276
Year 2025	482 399
Year 2026	484 164
Year 2027	485 631
Total estimated emission reductions over the provided period (tons of CO_2 equivalent)	**6 858 591**
Annual average of estimated emission reductions over the provided period (tons of CO_2 equivalent)	**457 239**

A.5. Project approval by the Parties involved:

The Letter of Endorsement #3175/23/7 was achieved from the State Environmental Investment Agency of Ukraine on 25/10/2012. 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 chosen approach, in the baseline scenario in the absence of the project the situation would continue: the company would still store sugar beet pulp in pits in the substance as it was produced, with no additional actions aimed at reduction of its moisture content. After filling the pulp pits with pulp, it would be transported and disposed at landfills. This scenario foresees decomposition of organic matter with the generation of landfill gas containing greenhouse gas – methane. This scenario does not require any changes to the technical process of the plant, investment and does not face any barriers.

In accordance with the Guidance on criteria for baseline setting and monitoring (Version 3)[9] (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.

The project participants have selected option *a* - 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[10], using the following step-wise approach:

Stage 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).

Stage 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.

A1: Continuation of existing situation that does not require any additional investment;
A2: Utilization of sugar beet pulp along with the production of biogas;
A3: Preparation of pulp for use as feed for cattle;
A4: Production of beet pectin, pectin glue or dietary fiber from pulp.

Sub-step 1a. Description of alternatives to the project activity

A1: Continuation of existing situation that does not require any additional investment;

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

Fresh sugar beet pulp in that form as it has been produced, without any additional operations aimed at its drying, addition of dry biomass, etc., it would be disposed to pulp pits, where as far as they are filled and decayed, it would be transported to the landfill, where it would be buried respectively to the specified limits on waste disposal. This option did not need any additional investment.

A2: Utilization of sugar beet pulp along with the production of biogas;
This option provides introduction of methane tank to control anaerobic digestion of waste resulting from sugar production with the addition of dry biomass, installation of special equipment for enrichment and purification of the obtained methane and construction of necessary infrastructure for its combustion to generate heat or electricity (boilers or generators). This option also requires constant provision of dry biomass and other additives to intensify the process of fermentation and improve the properties of the material obtained that can be used as a fertilizer. If this application of regenerated material is not possible, as a result of the process less amount of waste will be received, when the potential emission of methane is close to zero, which will be subject to disposal in the repository.

A3: Preparation of pulp for use as feed for cattle;
All kinds of well-preserved pulp can be used as feed for livestock. To extend the period of pulp preservation and to improve its feed value, it is subject to various kinds of processing (siloing, drying, granulation, the enrichment with protein substitutes). This allows for expanding the circle of potential consumers of feed pulp due to increase of distance, where the better pulp could be delivered, and increase the amount of pulp that can be used as feed. This option requires installation of special equipment for pulp drying and granulating and the construction of facilities for warehousing of dry products obtained.

Project participants consider that pulp siloing using their own resources is irrational, because it requires a containers of large volume, in which pulp could be preserved air-tightly for long periods (ensiling process takes 6-8 weeks, after which it can be used); or large areas of storage facilities using large hermetic tubular sheeting up to 350 tons of silage volume. Transportation of siloing pulp over long distances is also complicated, since the pulp being under aerobic conditions rapidly deteriorates[11], thus it would be rational to perform siloing in close proximity to the consumer. However, project participants are interested in using additional pulp presses for deeper extraction of pulp, therefore increasing the amount of fresh pulp that can be potentially realized at livestock complexes.

A4: Production of beet pectin, pectin glue or dietary fiber from pulp;
Sugar beet pulp is one of the most promising raw materials for low esterified pectin production[12], which is widely used in medicine, pharmacology and in confectionery industry due to its bactericidal properties, the ability to form water-soluble films, the ability to bind heavy metal ions. For extraction of pectin from pulp method of hydrolysis with mineral acids are most commonly used.

In addition, pectin glue can be obtained from the pulp, the manufacturing process of which is the conversion of insoluble in cold water and pectin substances arabane into the solution. Glue outcome is 2.5-3% of the fresh pulp weight.

Another promising area in the pulp processing is dietary fibers production – edible parts of plants or similar carbohydrates resistant to digestion and absorption in the small intestine, which are completely or partly fermented in the large intestine. The daily human need in food fibers is 28-38 grams. Applying

[11] Krutko V. "Once more about pulp", Bulletin of Sugar Producers in Ukraine (Крутько В. «Ще раз про жом», Вісник цукровиків України): 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
[12] Donchenko L. "The ability to use secondary resources of sugar production of sugar beets for its further processing" (Донченко Л.В. «Можливість використання вторинних ресурсів виробництва цукру із цукрових буряків для подальшої переробки»): http://www.ugagroprom.ru/1/

modern technologies of fiber production, pulp is used to manufacture the products that can be widely applied in manufacturing of wide range of foods products.

Project participants would consider this alternative implementation as the need to build and equip some enterprise for the production of pectin from fresh or dried pulp. At the time of the decision-making on project, proposals from third parties who are ready to invest in such activities have not been reported.

Outcome of Sub-step 1a: The following realistic and credible alternative scenarios to the project activity have been identified:

A1: Continuation of existing situation that does not require any additional investment;
A2: Utilization of sugar beet pulp along with the production of biogas;
A3: Preparation of pulp for use as feed for cattle;
A4: Production of beet pectin, pectin glue or dietary fiber from pulp.

Sub-step 1b. Compliance with the present legislation.

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

The 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 dated 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 dated 22/06/1999 "On approval of the Statute of the State sanitary and epidemiological surveillance in Ukraine", President of Ukraine Decree # 400/2011 dated 06/04/2011 "On state sanitary-epidemiological service of Ukraine".

According to the provisions of this legislative environment, the company 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[13], and by paying the corresponding fee for waste disposal. In accordance with Instruction on procedure of calculation and payment for environmental pollution tax # 162, approved by the Ministry of Environmental Protection and Nuclear Safety of Ukraine and State Tax Administration of Ukraine dated 19/07/99, in case of over limiting 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 current legislation, provided that the waste management procedures are met.

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

Step 2. Barrier analysis.

At the time of the decision making on the project implementation, sugar industry in Ukraine was in deep crisis [14]. Due to reducing the acreage of sugar beet, shortage of raw materials for processing has arisen, leading to significant underloading capacity of sugar plant. Along with the old obsolete equipment, inefficient industry policy, sugar production at the majority of sugar plants was not profitable; a situation was aggravated with competition from refineries of cane sugar. Consequently, the number of employees of sugar plants in Ukraine sharply reduced. Thus, in 1991 in Ukraine there were 192 sugar plants[15], in 2011, there were already 61[16]. Stagnation of the sugar industry continues in 2012[17], the plants are in a difficult economic situation, government regulation of prices for sugar considerably reduces the profitability of the sugar business in Ukraine.

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

The main barrier that prevents the implementation of project activities is a financial barrier. The total cost of the implemented activities under the project is about 27 112 thousand UAH. This is a significant cost, which PJSC "Gorokhiv Sugar Mill" did not have at the time of making the decision on implementation of the project activities, and they should be involved in capital market.

The project is 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. The following table demonstrates a risk premium for Ukraine[18]:

Table 6. 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.[19] Ukraine is believed to adhere to the right direction in regard to introducing the 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. International companies consider this to be 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.

A1: Continuation of existing situation that does not require any additional investment;
This option does not require any investments necessary to comply with legal requirements and so for there is no financial barrier.

A2: Utilization of sugar beet pulp along with the production of biogas;
Investment required to implement this alternative equals to approximately 80 million UAH for one company.
A3: Preparation of pulp for use as feed for cattle;
Implementation of this alternative requires investment in additional pulp presses, pulp drying equipment, facilities for pulp drying and granulation, construction of facilities for the storage of dry pulp. In addition, the operation of this equipment increases the overall costs of enterprises for fuel and electricity.
A4: Production of beet pectin, pectin glue or dietary fiber from pulp;

[18] Data provided by Aswath Damodaran, Ph.D., Stern School of Business NYU http://pages.stern.nyu.edu/~adamodar/
[19] Foreign Direct Investment in Ukraine – Donbass, Philip Burris, Problems of foreign economic relations development and attraction of foreign investments: regional aspect., ISSN 1991-3524, Donetsk, 2007. p. 507-510

This alternative foresees green field building of the pulp processing plant to pectin, pectin glue or dietary fiber. The volume of necessary investments equals to hundreds of millions UAH. For this alternative financial barrier is the largest.

Outcome: Thus, the existence of financial barrier would prevent the implementation of the above listed alternatives to the project activity, except A1: "Continuation of existing situation that does not require any additional 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 of sugar production industry;
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 reduction units will be earned only when project activity will eliminate methane emissions from anaerobic decomposition of pulp at landfills and excluding emissions reduction that 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. Default values were used to the extent possible in order to reduce uncertainty and provide conservative data for emission calculations.

Baseline emissions

Baseline emissions come from one major source:

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

Detailed description of the baseline emissions calculation, applied formulas and emission reductions factors are provided in Annex 2 "Baseline information" of this PDD.

Key information and data used to establish the baseline – data on the amount of sugar plant waste (pulp), which would be disposed at the landfill - are provided below in tabular form:

Data/Parameter	W_x
Data unit	t
Description	Sugar production waste (pulp) that would have to be disposed to the landfill
Time of determination/monitoring	To be monitored throughout the monitoring period

Source of data (to be) used	PJSC "Gorokhiv Sugar Mill" reporting data
Value of data applied (for ex ante calculations/determinations)	**2005**: 185 900; **2006**: 189 200; **2007**: 202 100; **2008**: 202 600; **2009**: 209 600; **2010**: 196 600; **2011**: 173 500; **2012**: 150 575
Justification of the choice of data or description of measurement methods	Measured for the plant commercial purposes on site.
QA/QC procedures (to be) applied	According to the project owner policy.
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.

A1: Continuation of existing situation that does not require any additional investment;
A2: Utilization of sugar beet pulp along with the production of biogas;
A3: Preparation of pulp for use as feed for cattle;
A4: Production of beet pectin, pectin glue or dietary fiber from 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:

A1: Continuation of existing situation that does not require any additional 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 6.9 million euro or 70 million UAH, that is twice as much then the project funds required, that is 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

Sub-step 4a: The proposed project activities include the activities listed in section with definitions [20] of the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 04.0.0).

Sub-step 4a(1): Calculation + / 50 percent of production due to proposed project activity.

The sugar mill was constructed under the typical design and capacity, fall in the interval + / -50 percent of plants of the Volyn Region. Total[21] number of sugar plants in the region is 4.

Sub-step 4a(2): Identification of companies that have the same production level within a certain range in the corresponding geographic area.

There are 4 such enterprises in the Volun Region, but there is no publicly available information about waste treatment practices at them. To analyze the common practice, data from the nearest region – Vinnitsa Region - were used, however it is slightly larger in size, but it is in the same climatic zone and has similar agricultural specialization, the companies of this region are in the same legislative field and in the same economic conditions as the Volyn region companies are. There are 12 sugar plants in the region (N_{all}=12).

Sub-step 4a(3): Identification of the plants which use different technology than the project activity among the identified plants.

Only 2 companies utilize pulp, the others bury pulp [22], thus (N_{diff}=10).

Sub-step 4a(4): The following Factor calculation F=1- N_{diff}/N_{all} rendering the number of plants that use the same practice as under the project activity, including all plants that have the same production level as the plant involved in project activity.

F=1- 10/12=0.167

The proposed project activity is considered as common practice in the relevant sector and within a specified geographic area under implementation of both these requirements:

(a) F > 0.2;
(b) N_{all} - N_{diff} > 3.

None of abovementioned requirement applies to the proposed project activity, so it is not a common practice, so we can proceed directly to the outcome of 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:

Project activity is physically limited by plant facilities of PJSC "Gorokhiv Sugar Mill", and equipment listed in Section A.4.2.

The table below shows an overview of all sources of emissions in the baseline and project scenarios. The project boundary is illustrated in accordance with the paragraphs 14, 15, 16 of the Guidance.

[20] Activity aimed at methane emissions reduction.
[21] http://www.rada.com.ua/ukr/RegionsPotential/Ternopil/
[22] Vinnytsia Regional State Administration, Decree # 446 dated 08/11/2006 "On approval of limits on the formation and placement of waste for 2007" http://search.ligazakon.ua/l_doc2.nsf/link1/VI060112.html

Table 7. Sources of emissions in the baseline and project scenarios

	Source	Gas	Included/Excluded	Justification/Explanation
Baseline scenario	Anaerobic fermentation of pulp	CO_2	Excluded	Neglected for simplification. Conservatively.
		CH_4	Included	Main source of emissions.
		N_2O	Excluded	Neglected for simplification. Conservatively.
	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	Anaerobic fermentation of pulp	CO_2	Excluded	Neglected for simplification likewise the baseline scenario.
		CH_4	Included	Main source of emissions.
		N_2O	Excluded	Neglected for simplification likewise the baseline scenario.
	Natural gas consumption by pulp drying units	CO_2	Excluded	Neglected due to the small volume under paragraph 14 the Guidance[23].
		CH_4	Excluded	Neglected for simplification.
		N_2O	Excluded	Neglected for simplification.
	Electricity consumption by pulp drying units	CO_2	Excluded	Neglected due to the small volume under paragraph 14 the Guidance[24].
		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

[23] Annual consumption of natural gas systems by pulp drying complexes is about 550 thousand m^3, which leads to the emission of 1017 tons of CO_2 per year. This is lower than 1% of anthropogenic emissions by sources and less than 2000 tons of CO_2 per year, so this source of emission was not taken into account.

[24] Annual consumption of natural gas systems by pulp drying complexes is about 550 thousand m^3, which leads to the emission of 1017 tons of CO_2 per year. This is lower than 1% of anthropogenic emissions by sources and less than 2000 tons of CO_2 per year, so this source of emission was not taken into account.

transportation in baseline scenario is conservative because it reduces emission reductions due to the project implementation.

Baseline scenario

The basic scenario of the proposed project is a continuation of the existing situation before the project implementation. 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.

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

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

Project scenario

In result of implemented activity, the moisture content of sugar plant waste was significantly reduced, making it possible to transport pulp for use as feed for cattle, which includes its anaerobic fermentation. In the project scenario the sources of emissions are:

- CH_4 emissions due to anaerobic fermentation of pulp (that has not been processed, if this condition is satisfied).

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.

Due to the project implementation, no leakages are expected.

Schematic representation of the project boundaries is illustrated in Figures 4 and 5.

Figure 4. Baseline boundaries

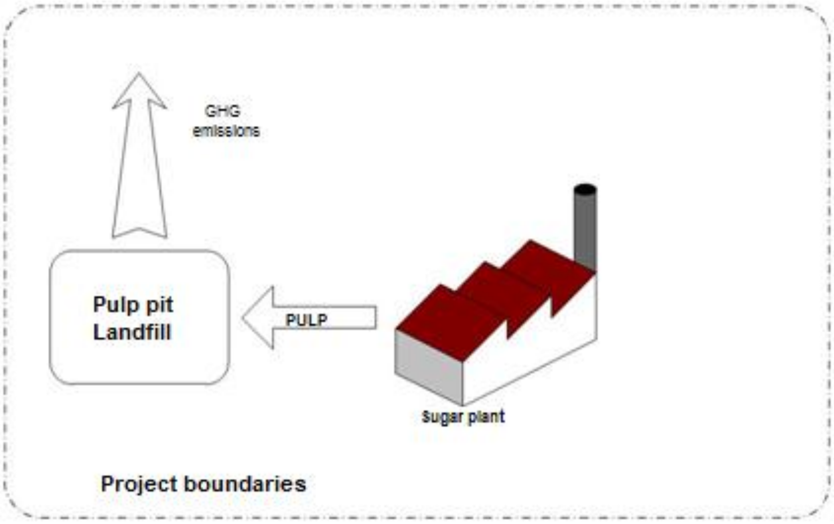
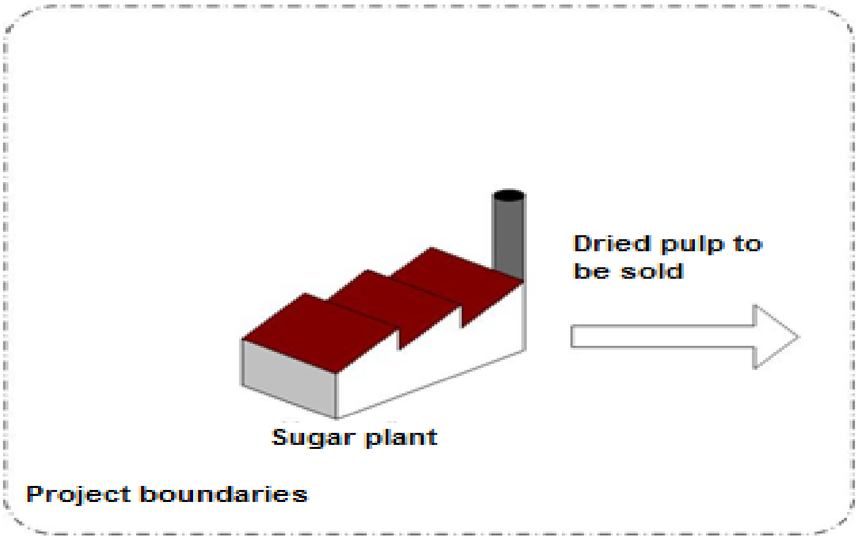


Figure 5. Project boundaries



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: 11/06/2012

Name of person/entity setting the baseline:

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

Contact information:

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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 July 12, 2004. This is the date of the decision making on establishing of a working group to implement the design decisions aimed at changing the pulp handle practice PJSC "Gorokhiv Sugar Mill", as well as coordination of all aspects related to their implementation.

C.2. Expected operational lifetime of the project:

The expected lifetime of the project is estimated to last until the end of 2027. Thus, the operational lifetime of the project will be 20 years or або 240 months.

C.3. Length of the crediting period:

Start of the first crediting period: 01/01/2008.
End of the crediting period: 31/12/2027

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

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

Length of the part of crediting period within the first commitment period of the Kyoto Protocol: 15 years or 180 months (01/01/2013-31/12/2027). Status of emission reductions or enhancements of removals generated under JI projects after the first commitment period under the Kyoto Protocol (extension of the crediting period after 2012) may be determined in accordance with such 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.

To describe the chosen monitoring plan in detail the step-wise approach is used:

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[25] 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 situation before the project implementation. Sugar production waste management practices of PJSC “Gorokhiv Sugar Mill” would remain unchanged, i.e. disposal of sugar beet pulp at the landfills would be continued.

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

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

Project scenario

As a result of implemented activity, the moisture content of PJSC “Gorokhiv Sugar Mill” sugar plant waste was significantly reduced, , making it possible to transport pulp for use as feed for cattle, which includes its anaerobic fermentation.

In the project scenario the sources of emissions are:

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

Emission reductions occur by reducing the amount of methane generated during storage of sugar plant waste (pulp) as the result of a decrease of its amount that is disposed to the landfill.

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

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 responsible person from the management of PJSC "Gorokhiv Sugar Mill", who will create a common database of monitoring parameter values, which are to be transferred 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 its representative.

Measuring devices, data processing and archiving

According to the applied approach for monitoring, the following parameters are to be measured: the amount of pulp, which were not used and were disposed to the landfill; and the amount of sugar plant waste (pulp), which would be disposed at the landfill. The first parameter is determined according to the internal accounting procedures approved by the plant, in their absence, the standard coefficients are used. The data are cross-check with the calculated amount of the pulp produced, which is calculated by multiplying the amount of processed sugar beet pulp by the factor of pulp production per ton of sugar beet, which is deducted from the amount of pulp sold. Sugar production waste (pulp), which would be disposed to the landfill is determined using the truck scales or, in their absence, with the standard factors are used. Agreed values are entered into the waste management reports to be used for the 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.

Waste management reports and other monitoring data required for determination and verification, and any other data relevant to the project activity will be kept at least two years after the last transfer of ERUs. If parameters values are not available that is used to calculate the baseline emissions i.e. the amount of sugar plant waste (pulp) which were not used and were disposed to the landfill − these data are not included. This is conservative.

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 performance 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	P_x Amount of sugar production waste (pulp), which were not sold and were disposed to the landfill	Project owner data	t	m	continuously with monthly totals	100%	Electronic and paper	-
P-2	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-3	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.
P-4	GWP_{CH4} global warming	In accordance with UNFCCC	tCO_2e/tCH_4	e	annually	100%	Electronic and paper	The value of the specified parameter

	potential for methane	decision and Kyoto Protocol						contained in the Excel calculation spreadsheet, attached to the PDD.
P-5	*OX* oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	2006 IPCC[26]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
P-6	*F* volume of methane in the landfill gas	2006 IPCC[27]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
P-7	DOC_f fraction of carbon of organic origin, which can be decomposed	2006 IPCC[28]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
P-8	*MCF* methane conversion factor	2006 IPCC[29]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
P-9	*DOC* Weight fraction of organic origin carbon in the	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[30]. The value of the

[26] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[27] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[28] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14
[29] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14
[30] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13

	beetroot pulp							specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
P-10	*k* Decomposition factor of wastes (beetroot pulp)	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.

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):

Emissions generated after the project activity implementation are calculated as follows:

$$PE_y = PE_{biomass,y},\qquad \text{(Equation 1)}$$

where:

PE_y, Project GHG emissions due to project implementation in period *y*, tCO_2e[32];

$PE_{biomass,y}$ Project methane emissions due to the decomposition of organic waste of the plant *i* at the landfill in the period *y*, tCO_2e.

Project methane emissions from decomposition of organic waste at the landfill are calculated as follows:

$$PE_{biomass,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot {}^{16}/_{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} P_x \cdot DOC \cdot e^{-k\cdot(y-x)} \cdot \left(1-e^{-k}\right),\qquad \text{(Equation 2)}$$

where:

$PE_{biomass,y}$ Project methane emissions due to the decomposition of organic waste of the plant *i* at the landfill in the period *y*, tCO_2e;

P_x Amount of sugar production waste (pulp) that was not sold by the plant in period *x* and was disposed at the landfill, t (Parameter P-1);

φ Correction factor to account for model uncertainties, ratio. (Study on modeling landfill gas formation [33]);

f CH_4 fraction captured and utilized at the landfill, fraction [34];

GWP_{CH4} Global warming potential for methane, tCO_2e/tCH_4 (According to the UNFCCC decision and the Kyoto Protocol);

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

[32] 1 tCO_2e = 1 tCO_2

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

[34] Project owner data on the landfill, which in use.

OX Oxidation factor reflects the amount of CH_4 that is oxidised in other material covering the waste, fraction (2006 IPCC[35]);
F Fraction of CH_4, by volume, in generated landfill gas, fraction (2006 IPCC[36]);
DOC_f Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC [37]);
MCF CH_4 correction factor, fraction (2006 IPCC [38]);
DOC Fraction of the degradable organic carbon in the waste of *j*-type (pulp), tC/t of pulp (Data of laboratory research. The result is within the values specified in 2006 IPCC[39]);
k Waste (pulp) decomposition factor, fraction (2006 IPCC [40]);
x Period during the crediting period: $x \in (1; y)$;
y Period 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-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
B-1	W_x Amount of sugar production waste, which would be disposed at the landfill	Project owner data	t	m	continuously with monthly totals	100%	Electronic and paper	-

[35] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.15
[36] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.15
[37] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf, p. 2.14
[38] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.14
[39] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.13
[40] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.17

B-2	*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-3	*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-4	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-5	*OX* oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	2006 IPCC[41]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
B-6	*F* volume of methane in the landfill gas	2006 IPCC[42]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.

[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_3_Ch3_SWDS.pdf , page 3.15

B-7	*DOC_f* fraction of carbon of organic origin, which can be decomposed	2006 IPCC[43]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
B-8	*MCF* methane conversion factor	2006 IPCC[44]	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	*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[45]. The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
B-10	*k* Decomposition factor of wastes (beetroot pulp)	2006 IPCC[46]	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 provides data and parameters to be 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 as follows:

$$BE_y = BE_{biomass,y},$$ (Equation 3)

where:

BE_y Baseline GHG emissions in the period *y*, tCO_2e[47];

[43] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14
[44] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14
[45] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13
[46] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.17

$BE_{biomass,y}$ Baseline CH_4 emissions from degradable organic waste of *i*-plant at the landfill in the period *y*, tCO_2e.

Baseline CH_4 emissions from degradable organic waste at the landfill are calculated as follows:

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

where:

$BE_{biomass,y}$ Baseline CH_4 emissions from degradable organic waste of plant at the landfill in the period *y*, tCO_2e;
W_x Amount of sugar production waste, which would be disposed at the landfill in period *x*, t (Parameter B-1);
φ Correction factor to account for model uncertainties, ratio. (Study on modeling landfill gas formation[48]);
f CH_4 fraction captured and utilized at the landfill, fraction[49];
GWP_{CH4} Global warming potential for methane, tCO_2e/tCH_4 (According to the UNFCCC Decision and the Kyoto Protocol);
OX Oxidation factor reflects the amount of CH_4 that is oxidized in other material covering the waste, fraction (2006 IPCC[50]);
F Fraction of CH_4 by volume, in generated landfill gas, fraction (2006 IPCC[51]);
DOC_f Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC[52]);
MCF CH_4 correction factor, fraction (2006 IPCC[53]);
DOC Fraction of the degradable organic carbon in the waste of *j*-type (pulp), tC/t of pulp (Data of laboratory research. The result is within the values specified in 2006 IPCC[54]);
k Waste (pulp) decomposition factor, fraction (2006 IPCC[55]);
x Period during the crediting period: $x \in (1; y)$;
y Period 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

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

[47] 1 tCO_2e = 1 tCO_2.
[48] Oonk, H., Weenk, A., Coops, O., Luning, L., 1994. Validation of landfill gas formation models; EWAB 9427; NOVEM, Utrecht, The Netherlands.
[49] Project owner data on the landfill, which in use.
[50] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.15
[51] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.15
[52] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf, p. 2.14
[53] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.14
[54] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.13
[55] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.17

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 emissions are expected due the project implementation.

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):

Leakage in year y is calculated as follows:

$$LE_y = 0, \qquad \text{(Equation 5)}$$

where

LE_y Leakage due to the project realization in 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):

The annual emission reductions are calculated as follows:

$$ER_y = BE_y - LE_y - PE_y$$ (Equation 6)

where:

ER_y Emission reduction under JI project in period *y*, tCO_2e;
LE_y Leakage due to the project realization in period *y*, tCO_2e;
BE_y Baseline emissions in period *y*, tCO_2e;
PE_y Project emissions in 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:

Collection and archiving of the information on the environmental impacts of the project will be done based on the approved EIA in accordance with the Host Party legislation (refer to 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 P_x Amount of sugar plant waste (pulp), which were not sold and were disposed to the landfill	Low	The parameter is determined according to internal accounting procedures approved at the plant. The data are cross-check with the calculated amount of the pulp produced, which is calculated by multiplying the amount of processed sugar beet pulp by the rate of formation per ton of sugar beet, which is deducted from the amount of pulp sold. Calibration interval of automobile weight is 1 year. More information will be provided in the monitoring report.
D.1.1.3. – ID P-1 Wx Amount of sugar production waste, which would be disposed at the landfill	Low	The parameter is defined through the use of truck scales, and the impossibility of their use – the standard coefficients of weight pulp per volume unit of the vehicle body. Calibration interval of automobile weight is 1 year. More information will be provided in the monitoring report.
D.1.1.1. – ID P-2 D.1.1.3. – ID B-2 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-3 D.1.1.3. – ID B-3 *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-4 D.1.1.3. – ID B-4 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-5 D.1.1.3. – ID B-5 *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-6 D.1.1.3. – ID B-6 *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-7 D.1.1.3. – ID B-7 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-8 D.1.1.3. – ID B-8 *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-9 D.1.1.3. – ID B-9 *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-10 D.1.1.3. – ID B-10 *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:

PJSC "Gorokhiv Sugar Mill" is a project owner. Sugar plant management headed by the Director will be responsible for performance monitoring, data collection, registration, visualization, archiving of monitoring data, and periodic inspection of measuring devices. A responsible person from PJSC "Gorokhiv Sugar Mill" will control this process. Detailed structure of responsible person's interaction will be provided in the Monitoring Report to the initial and the first verification. The following block diagram demonstrates principal scheme of data flow.

Since the monitoring plan does not provide any input of specific data collection procedures, and reduction of greenhouse gas emissions will be calculated using the standardized reporting data, the person from PJSC "Gorokhiv Sugar Mill" will be responsible for sending requests to relevant plant divisions, the responses processing and making of a common database for monitoring parameters of the project. On the basis of the consolidated database and primary documents (internal production plant accounts and records of electricity consumption) JI project consultant will prepare Monitoring Reports.

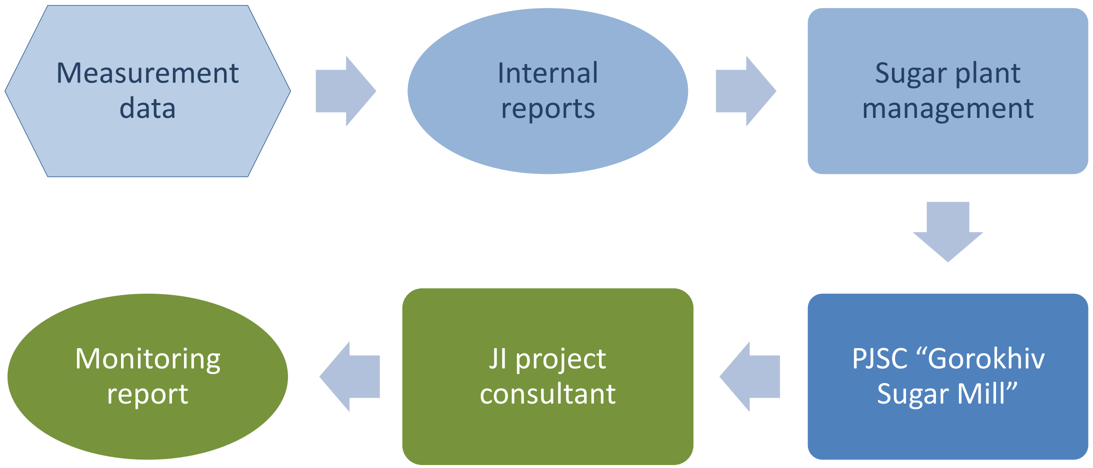

Figure 6. Monitoring flow chart

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

Monitoring plant is to be performed by PJSC "Gorokhiv Sugar Mill", 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
Address: of.2, bld 1 Panasa Myrnoho str., Kyiv, Ukraine, 01011
Phone: +38 044 280 2350
Fax: +38 044 280 2350

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 8. Estimated project emissions during the first crediting period

	Units	2008	2009	2010	2011	2012	Total
Project emissions from anaerobic fermentation of pulp	tCO_2e	0	0	0	0	0	**0**
Total project emissions during the first crediting period	tCO_2e	**0**	**0**	**0**	**0**	**0**	**0**

Table 9. Estimated project emissions after the first crediting period (2013-2027)

Year	Units	Project emissions from anaerobic fermentation of pulp
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
Total project emissions after the first crediting period	**tCO_2e**	**0**

E.2. Estimated leakage:

Table 10. Estimated leakage during the first crediting period

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

Table 11. Estimated leakage after the first crediting period (2013-2027)

Year	Units	Leakage from anaerobic fermentation of pulp
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
Estimated leakage after the first crediting period	**tCO_2e**	**0**

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

Table 12. 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_2e	**0**	**0**	**0**	**0**	**0**	**0**

Table 13. Estimated total project emissions after the first crediting period (2013-2027)

Year	**Units**	**Project emissions from anaerobic fermentation of pulp**
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
Total project emissions after the first crediting period	**tCO_2e**	**0**

E.4. Estimated baseline emissions:

Calculation results are provided in the Table below. The calculation itself is provided in the Excel file "*20120724_Gorokhiv_ER.xls"*, provided together with the PDD.

Table 14. Estimated baseline emissions during the first crediting period

	Units	2008	2009	2010	2011	2012	Total
Baseline emissions from anaerobic fermentation of pulp	tCO_2e	**258 764**	**304 269**	**336 556**	**353 557**	**377 083**	**1 630 229**
Total baseline emissions during the first crediting period	tCO_2e	**258 764**	**304 269**	**336 556**	**353 557**	**377 083**	**1 630 229**

Table 15. Estimated baseline emissions after the first crediting period (2013-2027)

Year	Units	Baseline emissions from anaerobic fermentation of pulp
2013	tCO_2e	396 636
2014	tCO_2e	412 886
2015	tCO_2e	426 391
2016	tCO_2e	437 616
2017	tCO_2e	446 944
2018	tCO_2e	454 697
2019	tCO_2e	461 141
2020	tCO_2e	466 496
2021	tCO_2e	470 947
2022	tCO_2e	474 646
2023	tCO_2e	477 721
2024	tCO_2e	480 276
2025	tCO_2e	482 399
2026	tCO_2e	484 164
2027	tCO_2e	485 631
Total baseline emissions after the first crediting period	$\mathbf{tCO_2e}$	**6 858 591**

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

Calculation results are provided in the Table below. The calculation itself is provided in the Excel file "*20120724_Gorokhiv_ER.xls"* provided together with the PDD.

Table 16. Estimated emission reductions during the first crediting period

	Units	2008	2009	2010	2011	2012	Total
Emission reductions during the first crediting period	tCO_2e	**258 764**	**304 269**	**336 556**	**353 557**	**377 083**	**1 630 229**

Table 17. Estimated emission reductions after the first crediting period (2013-2027)

Year	Units	Emission reductions from anaerobic fermentation of pulp
2013	tCO_2e	396 636
2014	tCO_2e	412 886
2015	tCO_2e	426 391
2016	tCO_2e	437 616
2017	tCO_2e	446 944
2018	tCO_2e	454 697
2019	tCO_2e	461 141
2020	tCO_2e	466 496
2021	tCO_2e	470 947
2022	tCO_2e	474 646
2023	tCO_2e	477 721
2024	tCO_2e	480 276
2025	tCO_2e	482 399
2026	tCO_2e	484 164
2027	tCO_2e	485 631
Estimated emission reductions after the first crediting period	**tCO_2e**	**6 858 591**

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

Table 18. Estimated balance of emissions under the proposed project during the first crediting period

Year	Estimated project emissions (tons of CO_2 equivalent)	Estimated leakage (tons of CO_2 equivalent)	Estimated baseline emissions (tons of CO_2 equivalent)	Estimated emission reductions (tons of CO_2 equivalent)
Year 2008	0	0	258 764	258 764
Year 2009	0	0	304 269	304 269
Year 2010	0	0	336 556	336 556
Year 2011	0	0	353 557	353 557
Year 2012	0	0	377 083	377 083
Total (tons of CO_2 equivalent)	**0**	**0**	**1 630 229**	**1 630 229**

Table 19. Estimated balance of emissions under the proposed project after the first crediting period

Year	Estimated project emissions (tons of CO_2 equivalent)	Estimated leakage (tons of CO_2 equivalent)	Estimated baseline emissions (tons of CO_2 equivalent)	Estimated emission reductions (tons of CO_2 equivalent)
Year 2013	0	0	396 636	396 636
Year 2014	0	0	412 886	412 886
Year 2015	0	0	426 391	426 391
Year 2016	0	0	437 616	437 616
Year 2017	0	0	446 944	446 944

Year 2018	0	0	454 697	454 697
Year 2019	0	0	461 141	461 141
Year 2020	0	0	466 496	466 496
Year 2021	0	0	470 947	470 947
Year 2022	0	0	474 646	474 646
Year 2023	0	0	477 721	477 721
Year 2024	0	0	480 276	480 276
Year 2025	0	0	482 399	482 399
Year 2026	0	0	484 164	484 164
Year 2027	0	0	485 631	485 631
Total (tons of CO_2 equivalent)	**0**	**0**	**6 858 591**	**6 858 591**

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[56] (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.

The full scope EIA in accordance with the Ukrainian legislation is not required for this project.

Implementation of the project activity also has a positive social impact through removing of the concentrated odor coming from pulp pits and improving working conditions at sugar plant.

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 not identified.

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 impact on the environment compared to the its current condition. Thus, in general, the impact of the reconstruction is small.

[56] *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

Project owner:

Organisation:	Public Joint Stock Company “Gorokhiv Sugar Mill”
Street/P.O.Box:	Nezalezhnosti Str.
Building:	building 13
City:	Marianivka Town, Gorokhivskiy District
State/Region:	Volyn Region
Postal code:	45744
Country:	Ukraine
Phone:	+38 0337990162
Fax:	+38 0337990162
E-mail:	-
URL:	-
EDRPOU Code (Code in the State Unified Register of Companies and Enterprises of Ukraine):	00372641
KVED[57] types of economic activities:	10.81 Sugar manufacturing 46.19 Intermediation in consumer goods trading 46.36 Wholesale of sugar, chocolate and sugar confectionery 47.11 Retail trading in non-specialized stores mainly by food, beverages and tobacco 56.29 Supply of other meals 56.30 Serving beverages
Represented by:	
Title:	Chairman of the Board
Salutation:	-
Last name:	Prytuliuk
Middle name:	Pavlovych
First name:	Anatoliy
Department:	-
Phone (direct):	+38 0337990162
Fax (direct):	+38 0337990162
Mobile:	-
Personal e-mail:	-

[57]The specified activities under the classification of economic activities DK 009:2005, valid to 31/12/2012 by order of the State Committee of Ukraine for technical regulation and consumer policy # 457 dtd. 11/10/2010. Available for reference: http://zakon.nau.ua/doc/?code=v0457609-10. Last reference 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
Fax (direct):	0038 044 2802350
Mobile:	0038 067 7770596
Personal e-mail:	nataliya.vasylieva@mtinvest.com.ua

Annex 2

BASELINE INFORMATION

To set a baseline scenario and calculate baseline emissions the specific approach of JI projects are used in accordance with paragraph 9 of the Guidelines on criteria for baseline setting and monitoring (Version 3). To develop methods of calculating emissions based on data, IPCC methodologies are used for preparation of National GHG inventories.
Baseline emissions are calculated as follows:

$$BE_y = BE_{biomass,y},$$

where:

BE_y	Baseline GHG emissions in the period y, tCO_2e[58];
$BE_{biomass,y}$	Baseline CH_4 emissions from degradable organic waste of plant at the landfill in the period y, tCO_2e.

Baseline CH_4 emissions from degradable organic waste at the landfill[59] are calculated as follows[60]:

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

where:

$BE_{biomass,y}$	Baseline CH_4 emissions from degradable organic waste of plant at the landfill in the period y, tCO_2e.
W_x	Amount of sugar production waste, which would be disposed at the landfill in period x, t (Ex-post for 2005-2011; 2012-2027 – ex-ante);
φ	Correction factor to account for model uncertainties, ratio. (Study on modeling landfill gas formation [61]);
f	CH_4 fraction captured and utilized at the landfill, fraction [62];
GWP_{CH4}	Global warming potential for methane, tCO_2e/tCH_4 (According to the UNFCCC Decision and the Kyoto Protocol);
OX	Oxidation factor reflects the amount of CH_4 that is oxidized in other material covering the waste, fraction (2006 IPCC [63]);
F	Fraction of CH_4 by volume, in generated landfill gas, fraction (2006 IPCC [64]);
DOC_f	Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC [65]);
MCF	CH_4 correction factor, fraction (2006 IPCC [66]);

[58] 1 tCO_2e = 1 tCO_2.

[59] 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.

[60] 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.

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

[62] Project owner data on the landfill, which in use.

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

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

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

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

DOC	Fraction of the degradable organic carbon in the waste of *j*-type (pulp), tC/t of pulp (Data of laboratory research. The result is within the values specified in 2006 IPCC [67]);
k	Waste (pulp) decomposition factor, fraction (2006 IPCC [68]);
x	Period during the crediting period: $x \in (1; y)$;
y	Period for which methane emissions are calculated.

Key information and data used to establish the baseline – data on the amount of sugar plant waste (pulp), which would be disposed at the landfill - are provided below in tabular form:

<table>
<tr><td>Data/Parameter</td><td colspan="4">W_x</td></tr>
<tr><td>Data unit</td><td colspan="4">t</td></tr>
<tr><td>Description</td><td colspan="4">Sugar production waste (pulp) that would have to be disposed to the landfill</td></tr>
<tr><td>Time of determination/monitoring</td><td colspan="4">To be monitored throughout the monitoring period</td></tr>
<tr><td>Source of data (to be) used</td><td colspan="4">PJSC “Gorokhiv Sugar Mill” reporting data</td></tr>
<tr><td rowspan="4">Value of data applied (for ex ante calculations/determinations)</td><td>2005</td><td>2006</td><td>2007</td><td>2008</td></tr>
<tr><td>185 900</td><td>189 200</td><td>202 100</td><td>202 600</td></tr>
<tr><td>2009</td><td>2010</td><td>2011</td><td>2012</td></tr>
<tr><td>209 600</td><td>196 600</td><td>173 500</td><td>150 575</td></tr>
<tr><td>Justification of the choice of data or description of measurement methods</td><td colspan="4">Measured for the plant commercial purposes on site.</td></tr>
<tr><td>QA/QC procedures (to be) applied</td><td colspan="4">According to the project owner policy.</td></tr>
<tr><td>Any comment</td><td colspan="4">No</td></tr>
</table>

[67] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.13
[68] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf, p. 3.17

Annex 3

MONITORING PLAN

Monitoring plan is provided in Section D of this PDD.

У цьому документі прошито, пронумеровано

та скріплено печаткою 52 аркушів

Голова правління

ПАТ «Горохівський цукровий завод» ____________ А.П. Притулюк

(підпис)

МП