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:

Utilization of biomass for steam and power supply at Peresechansk sunflower oil extraction mill (PSOEM)

JI PDD version number: 1.4

Data of Completion: 20th of April, 2010

A.2. Description of the project:

Purpose of the project

The project predetermines introduction of combined heat and power (CHP) generation facility operating on biomass – sunflower seed husk (SSH) – to provide heat and power demand of PSOEM as opposed to heat supply based on natural gas consumption and electricity consumption from the electricity grid. At the same time, the project brings significant reduction of the amount of biomass which would have been sent to landfill.

Concept of the project

The project is implemented on the area of PSOEM, Peresichna, Dergachiv district, Kharkiv oblast, Ukraine.

PSOEM has been built at the facilities and site of a former and idle feed mill. In terms of ensuring energy supply and sunflower seed husk management, the project intends introduction of combined heat and power (CHP) generation, split up in the following two stages:

Stage I – 2005:

Installation of SSH fired boiler #1 KE-18-22-330GDV to ensure heat supply of the enterprise and utilization of SSH. Installed nominal steam production is 18 t/h and husk combustion is 4.0 t/h. Stage 1 has been aimed to test the technology of SSH burning prior to stage II – CHP option.

Stage II – 2009:

Installation of CHP option consists of the implementation of the following facilities:

- SSH fired boiler #2 - Vyncke steam boiler on sunflower husk JNU-SUS. Installed nominal steam production is 24 t/h and husk combustion is 5.5-6.0 t/h;
- Siemens Steam Turbine TWIN AA46 with capacity addition 2.5 MW.

Expected results of the project:

- The combustion of waste product (SSH) avoids disposal of SSH at the landfill. Hence avoiding emissions of CH_4 - due to no husk decay at the landfill - by approximately **11.7 thousand tonnes** of CO_2e annually (on average over 2008 – 2012);
- Switch to renewable energy source. Avoided emissions of CO_2 of approximately **13.8 thousand tonnes** annually (on average over 2008 – 2012) through substituting natural gas with biomass;

- Generation of carbon neutral electricity. The activity would reduce emissions of CO_2 by about **5.9 thousand tonnes** annually (on the average over 2008 – 2012) due to no electricity consumption from the electricity grid;
- Total reduction of CO_2e emissions during 2008-2012 is **156 950 tonnes**.

Implementation schedule and cost of the project

The first stage of the project has already been implemented utilizing own funds of owner of PSOEM (CJSC "Kolos") and borrowed funds.

Construction and assembly operations for the first stage of the project were carried out during 2004-2005, and will be carried for the second stage during 2008 and 2009[1]. According to *Decision 9/CMP.1* [1], the project may be recognized as a joint implementation project, if its technical implementation began not earlier than in the year 2000.

The total costs of the project implementation amount to UAH 31.6 million, or about Euro 4.8 million.

Grounds for the project implementation

PSOEM has all the required permits and licenses for carrying out its current activities and the project implementation, which is executed in accordance with legislation of Ukraine.

All the technological parameters meet environment protection normative requirements. The project implementation will bring substantial reduction of fossil fuel consumption and mitigation of the negative influence on the environment, including reduction of greenhouse gas emissions.

Revenue from the sale of emissions reduction units (ERUs) will help to overcome both technological and financial barriers faced by the project owners at the project outset. These include:
Technological barriers: The combustion of SSH to provide heat and power at edible oil plants in the Ukraine is not common practice and there is no relevant technical experience of operating the type of technology needed;
Financial barriers: The project requires a significantly higher initial capital outlay compared with the baseline scenario and without ERU sales has a lower Net Present Value – Aggregated Cost (NPV-AC) than the baseline scenario.

A.3. Project participants:

[1]Owners of PSOEM would intend second stage in October-December of 2008, therefore investment calculations are made to take into consideration this start-date of Second stage. Following the world economic crisis and associated problem with credit recourses, start-date of Second stage will be carried in November-December of 2009. Thus, the number of emissions reductions of project is less than the number of emissions reductions in investment calculations.

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A: Ukraine (Host Party)	Legal entity A1: CJSC "Kolos"	NO
	Legal entity A2: LLC 'Peresechansk Sunflower Oil Extraction Mill.'	No
Party B: United Kingdom of Great Britain and Northern Ireland	Legal entity B1: Private company "Camco Carbon Russia Limited"	No

CJSC "Kolos" is the owner of the industrial complex of Peresechansk Sunflower Oil Extraction Mill.

LLC 'Peresechansk Sunflower Oil Extraction Mill.' is a legal entity in the form of a limited liability company. PSOEM is leased by LLC "Peresechansk Sunflower Oil Mill.". The company engaged in economic activity according to the acting legislation of Ukraine. The company's principal activities are processing sunflower seeds, production and sale of unrefined sunflower oil and sunflower cake.

In Ukraine production volumes of unrefined sunflower oil have been growing with average 14.5% of CAGR. Ukraine became a leader of sunflower oil production in season 2006/2007 in the world. Ukrainian sunflower oil is exported to the market of EU, Middle East and North Africa which sets 30% of agriculture export of Ukraine. Sunflower oil extraction mills produced 1,867,000 t of sunflower oil in season 2006/2007. Usually, 70-80% of Ukrainian sunflower oil is set for exporting. In season 2006/2007, the share of Peresechansk SOEM in the output of sunflower oil was 3.5% [10].

Production volumes and associated data are given in the Annex 2.

PSOEM is one of the biggest enterprises around Peresichna. Total number of employees is 318.

Layout is presented in Annex 2.3.

Camco Carbon Russia Limited is a 100% subsidiary of Camco International Ltd. Camco International Limited a Jersey based public company listed on AIM in London. Camco International is the world leading carbon asset developer under both Joint Implementation and the Clean Development Mechanism of the Kyoto Protocol. Camco's project portfolio consists of more than 100 projects, generating altogether over 149 MT CO_2eq. of GHG reductions. Camco operates in Eastern Europe, Africa, China, and Southeast Asia. The company has been actively operating in Russia since 2005.

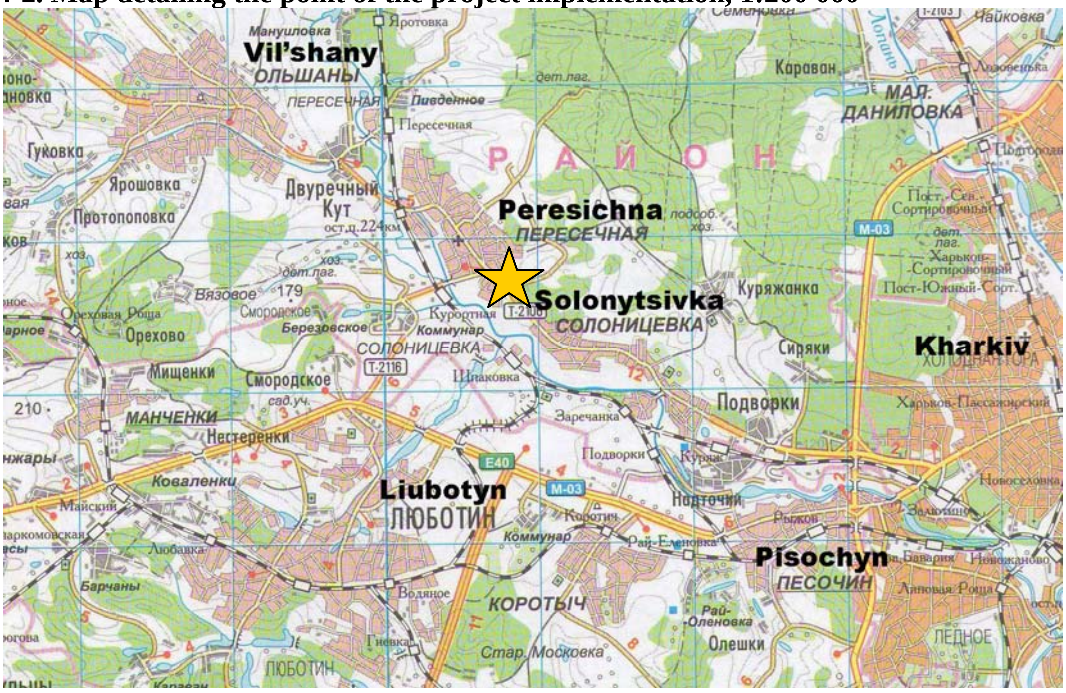
A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located in the village Peresichna, Dergachiv district, Kharkiv oblast, Ukraine.

Fig. A 4-1. Map of Ukraine indicating the region of the project implementation

Fig. A 4-2. Map detailing the point of the project implementation, 1:200 000



A.4.1.1. Host Party:

Ukraine

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

Kharkiv oblast

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

The village Peresichna

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project:

The project is being implemented on the area of PSOEM in the village Peresichna, Dergachiv district, Kharkiv oblast, Ukraine. Coordinates: 50°0'41"N 35°58'7"E

The village Peresichna is a community of Dergachiv district. Peresichna is situated 25 km to the west of Kharkiv and 18 km to the south of Dergachiv. Peresichna has a territory of 0.005 square kilometers and a population of 7176 people.

Two villages Solonytsivka and Berminvody are situated in the near of PSOEM. The soft drinks plant of the Public Corporation 'Berminvody' is the nearest manufacture, which is situated 1.5 km away from PSOEM.

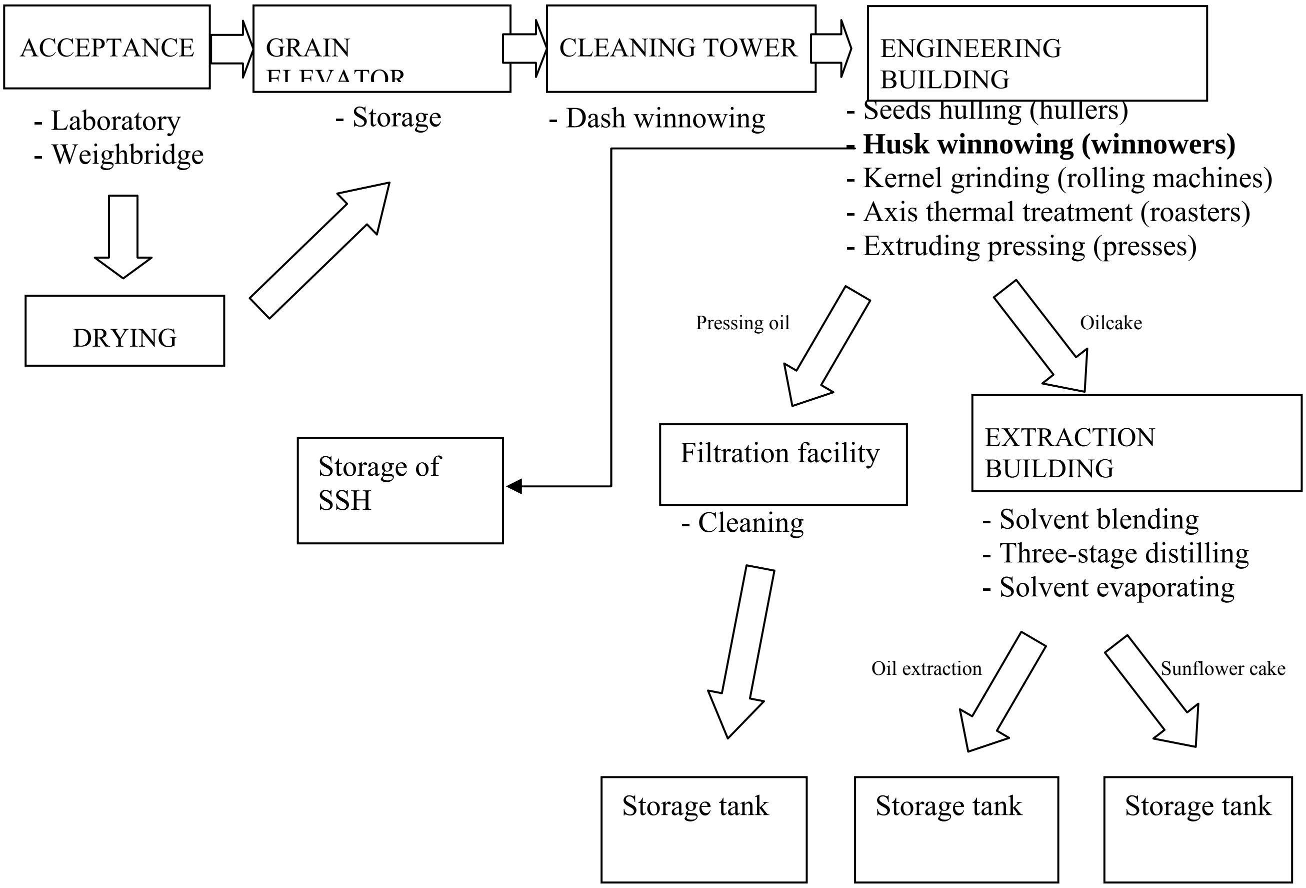
A.4.2. Technologies to be employed, or measures, operations or actions to be implemented by the project:

Production of sunflower oil in general

PSOEM accepts sunflower seeds (SS) from different suppliers and vendors. When sunflower seeds get to sunflower oil extraction mill, every supplied lot with sunflower seeds is weighed. Laboratory of the Enterprise takes samples of sunflower seeds from each supplied lot and defines moisture, husk and impurity (dash) content and other qualitative parameters. Moist sunflower seeds are sent for drying and with other dry sunflower seeds get to grain elevator for storage. From grain elevator sunflower seeds get to hullers where sunflower seed kernel separates from sunflower seed husk (see Fig. A4-3). Sunflower seed husk moves to the storage facility and sunflower seed kernels proceed for grinding on rolling machines, axis thermal treatment and extruding pressing. Extruding pressing process results in two products: oil cake, which goes for extraction process, and pressing oil, which goes for cleaning. Final products move to storage tanks. Sunflower oil production results in approximately 43% of oil, 37% of sunflower cake, 17.5% of SSH and 2.5% of dash.

The process of sunflower oil production requires significant amount of electricity and thermal energy.

Fig. A 4-3. Production of sunflower oil in general



Characteristic of the project technologies

The project consists of the introduction of sunflower husk based combined heat and power supply at PSOEM. Thus there will be very little consumption of fossil fuel (natural gas) and, no purchase of electricity from power grid for own needs of the Enterprise[2].

Stage I:

- Introduction of SSH fired boiler #1 KE-18-22-330GDV.

Stage II:

Introduction of:

- SSH fired boiler #2 - Vyncke steam boiler on sunflower husk;
- Siemens Steam Turbine TWIN AA46.

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[2] small quantities of natural gas used in the project scenario are excluded from calculations since they are insignificant and would also occur in the baseline

Stage I

SSH fired boiler #1 KE-18-22-330GDV.

The Enterprise has already installed one husk fired boiler KE-18-22-330GDV.

Table A 4-1. Technical characteristics of husk fired boiler KE-18-22-330GDV

Parameter	Numerical value
Manufacturer	Close Corporation ‘Biyskenergomash’ (Russia)
SSH calorific value, MJ/kg (kcal/kg)	$Q_H^p = 15,044(3600)$
natural gas calorific value, MJ/kg (kcal/kg)	$Q_H^p = 33,7240(8070)$
Design pressure of steam, MPa (kg/cm^2) In the steam drum In the outgoing collector of steam	2.3 (23) 2.1 (21)
Design temperature steam, ºC	330
Steam production, t/h (kg/s)	18 (5)
SSH firing rate , t/h	4.0
Burner type of fuel	flare-layer
Emission of NOx, mg/m^3	<500
Emission of flying ash, mg/m^3	< 250
Emission of SOx, mg/m^3	<3,800
Load (SSH): 70% 90%	Efficiency: 83% 87%

Stage II:

SSH fired boiler #2 - Vyncke steam boiler on sunflower seed husk JNO-SUS (H2);
The proposed boiler has been specially designed to meet the specific characteristics of sunflower seed husk as a fuel (for example: high volatile matter content, low density, relatively high ash content (>3%), low ash melting point):

1. Dynamic Watercooled Stepgrate (DWS):
    - Completely automatic ash removal;
    - Largest fuel flexibility (allowing for fluctuating calorific values, fuel sizes, moisture contents etc);
    - Low maintenance cost due to the water-cooled nature of the combustion grate;
    - Long lifetime.

Fig. A 4-4. Dynamic Watercooled Stepgrate of husk fired Steam Boiler JNO-SUS

2. A large three-draft radiation part with extra evaporation baffles in the last draft, allowing the flue gasses to cool down below 650 ^{0}C before they enter into the convection part of the boiler.

3. Automatic ash removal at several location in the boiler:
   - At the end of the combustion grate by a water-cooled screw;
   - Between the second and third draft the radiation part, also with a water-cooled screw;
   - Below the economizers

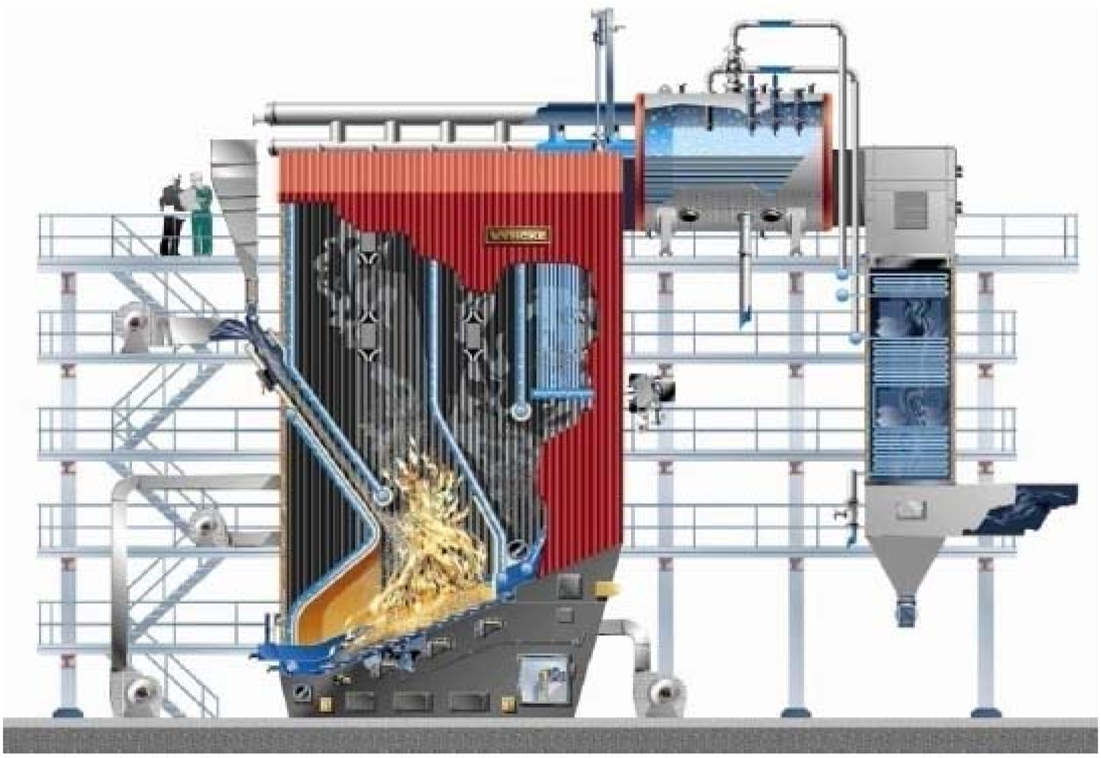
4. Minimal use of refractory lining. The refractory lining is limited to the combustion system and is specifically selected in cooperation with our suppliers. The goal of the installation of the refractory lining is only to increase the radiation heat and hot to protect the boiler, as the whole boiler is water-cooled.

5. On-line cleaning systems at different locations in the heat exchanger:
   - Retractable rotating soot blowers using pressurized air at the entrance of the convection;
   - Fixed rotating soot blowers using pressurized air on the economizer and the superheater;
   - Electro-mechanical knocking system on the evaporation baffles.

Table A 4-2. Technical characteristics of Vyncke Steam Boiler JNO-SUS

Parameter	Numerical value
Manufacturer	Vyncke NV (Belgium)
Boiler capacity, kcal/h	15,152,686
Design pressure of steam, MPa (kg/cm^2) In the cylinder	 2.4 (24)
Design temperature steam, ºC	330
Steam production, t/h (kg/s)	24 (6.6)
Husk combustion weight, t/h	5.5 – 6.0
Feed water temperature, ºC	105
Burner type of fuel	flare-layer
Emission of NOx (calculated as NO_2- max 1% in the fuel), mg/Nm^3	<500
Emission of CO, mg/Nm^3	<250
Emission of flying ash, mg/Nm^3	<3,800
Load (SSH): 70% 90%	Efficiency: 90% 95%

Fig. A 4-5. Vyncke steam boiler on sunflower husk JNO-SUS



Currently the Enterprise purchases electricity from the grid. With the introduction of the beneath mentioned facility the Enterprise will generate necessary volumes of the power locally.

Siemens Steam Turbine TWIN AA46

The TWIN AA46 includes:

1. TWIN Gearbox (DIN 3990)

2. Oil supply unit
3. Automatic nozzle group control
4. Electronical governor SC900
5. STF trip device ST 800
6. Synchronous-Generator: 3170 kVA, 6.3 kV, 50 Hz, IP 44 R
7. Local Panel
8. Control-/Protection Panel

Table A 4-3. Operating points Steam Turbine TWIN AA46

Parameter	Numerical value
Turbine part A	
Intel pressure	24.00 bar
Intel temperature	330 ^{0}C
Exhaust pressure	10.00 bar
Exhaust temperature	254 ^{0}C
Enthalpy	2,950 kJ/kg
Turbine speed	13,210 rpm
Steam flow	24,000 kg/h
Turbine part B	
Intel pressure	9.90 bar
Intel temperature	254 ^{0}C
Exhaust pressure	0.13 bar
Exhaust temperature	51 ^{0}C
Enthalpy	2,481 kJ/kg
Turbine speed	11,375 rpm
Steam flow	14,000 kg/h
Performance	
Outlet speed	1,500 rpm
Electrical Output	2,536 kW

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:

Under the baseline scenario, two gas boilers would have been installed by PSOEM to produce the steam required to operate the processing plant. SSH waste would have been sent to landfill and the electricity needs of the enterprise would have been met through purchasing power from the Ukrainian electricity grid.

Substituting natural gas boilers with dedicated SSH fired boilers, the project reduces GHG emissions through:
- Reducing the amount of husk which would have been sent to landfill;
- Combusting biomass in place of natural gas to generate the steam necessary for plant operation; and
- Generating renewable power from excess steam, substituting electricity which would have been taken from the Ukrainian grid.

Without being registered as a JI project, the project scenario would not have occurred due to technical barriers and the high costs and lower NPV-AC of the biomass boilers compared with the costs of equipment and operation under the baseline scenario:

Technical
Although sunflower oil production is common in Ukraine, using the husks productively for combined heat and power generation is not common practice; indeed there are examples of recent projects failing due to lack of familiarity with the technology [2]. The use of SSH combustion technology poses substantial risks to the enterprise which the provision of carbon revenues helps to mitigate.

Financial
Compared with other fuel options, using sunflower husks involves substantially higher upfront capital costs compared with the baseline scenario and results in a lower Net Present Value.

In addition there are no regulations requiring a reduction in GHG emissions for existing or new facilities or requiring enterprises to make use of sunflower husks.

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

Table A 4-4. Estimated amount of emission reduction before the crediting period

Period before 2008, for which emission reductions are estimated	
Year	Estimate of annual emission reductions in tones of CO_2e
2005	4 855
2006	10 512
2007	15250
Total estimated emission reductions before 2008 (tonnes of CO_2e)	30 618

As per the existing regulation in Ukraine, the project could receive early emission reductions based on the decision of the host country.

Table A 4-5. Estimated amount of emission reduction over the crediting period

Length of the crediting period starting 1 January 2008	5 Years
Year	Estimate of annual emission reductions in tones of CO_2e
2008	19 511
2009	21 812
2010	36 046
2011	38 567
2012	41 014
Total estimated emission reductions over the crediting period (tonnes of CO_2e)	156 950
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2e)	31 390

Table A 4-6. Estimated amount of emission reduction after the crediting period

Period after 2012, for which emission reductions are estimated	
Year	Estimate of annual emission reductions in tones of CO_2e
2013	43 389
2014	45 693
2015	47 929
2016	50 099
2017	52 205
2018	54 249
2019	56 232
2020	58 157
2021	60 025
2022	61 837
Total estimated emission reductions after the crediting period (tonnes of CO_2e)	529 815

Emmission reductions after the Kyoto crediting period as per Regulation of the Cabinet of Ministers of Ukraine No. 1313 of 25 November 2009.

A.5. Project approval by the Parties involved:

The Project Idea Note had been submitted for review of the Ministry of Environment of Ukraine. The Ministry of Environment of Ukraine issued a Letter of Endorsement for this project.

The final PDD will be sent along with the determination report to the Government of Ukraine for the Letter of Approval (LoA), which usually is expected within 30 days after PDD submission.

SECTION B. Baseline

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

The baseline scenarios listed below have been established in accordance with Appendix B of the JI Guidelines[3] and in accordance with the Guidance on Criteria for Baseline Setting and Monitoring by the JISC[4].

The Guidance on Criteria for Baseline Setting and Monitoring established by the JISC states: *'A baseline shall be established on a project-specific basis and/or using a multi-project emission factor, taking into account the project boundary.'*

Further, *'…a baseline can be identified, inter alia:*
- *(a) By using an approved CDM baseline and monitoring methodology. In this case all explanations, descriptions and analyses, inter alia with regard to the identification of a baseline, shall be made in accordance with the methodology chosen;*
- *(b) By identifying and listing plausible future scenarios on the basis of conservative assumptions and identifying the most plausible one*

The baseline is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of greenhouse gases that would occur in the absence of the project[5]. In the case of utilization of biomass for steam and power at PSOEM, in the absence of the project activity, it is necessary to identify feasible scenarios for:

- How power would be generated in the absence of the project activity;
- What would happen to the biomass residues in the absence of the project activity; and
- How the heat would be generated in the absence of the project activity

Feasible scenarios are combined into alternative baseline scenarios. Each aggregated scenario is evaluated to determine which faced the least barriers to implementation at the time the project activity was commissioned and which was the most financially attractive to determine the baseline scenario.

Alternatives to power generation
In absence of the proposed project, reasonable and credible power generation alternatives include:

P1 The proposed project activity not undertaken as a JI project activity;
P2 The continuation of power generation in an existing biomass residue fired power plant at the project site, in the same configuration, without retrofitting and fired with same type of biomass residues as (co-) fired in the project activity;
P3 The generation of power in an existing captive power plant, using only fossil fuels;
P4 The generation of power in the grid;
P5 The installation of a new biomass residue fired power plant, fired with the same type and with same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation than the project plant and therefore with a lower power output than in the project case;

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[3] FCCC/KP/CMP/2005/8/Add.2

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

[5] FCCC/KP/CMP/2005/8/Add.2

P6 The installation of a new biomass residue fired power plant, fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation than the project activity. Therefore, the power output is the same as in the project case;

P7 The retrofitting of an existing biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation than the project plant and therefore with a lower power output than in the project case;

P8 The retrofitting of an existing biomass residue fired power plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation than the project activity;

P9 The installation of a new fossil fired captive power plant at the project site

Specific analysis on the six alternative scenarios in absence of the proposed project is as follows:

P1: Implementation of the project activity without being registered as a JI activity would require additional revenues in order to overcome significant technical and financial barriers (see section B.2.). However, alternative P1 should be considered as a possible alternative to the project activity.

P2: There were no existing biomass residue fired power plants at the project site. Therefore alternative P2 cannot be considered as a realistic baseline alternative for power generation.

P3: There were no existing fossil fuel fired power plants near the project site therefore alternative P3 cannot be considered as a realistic baseline alternative for power generation.

P4: PSOEM is connected to the Ukrainian national electricity grid which has sufficient capacity to meet the demands of the facility at a low power price for the duration of the project. Further, in the initial years of operation (2005-2007) the facility has purchased power from the grid. Alternative P4 can be considered as a feasible alternative to the project scenario.

P5&P6 The production of power from biomass is not common practice in Ukraine (see table B1-1) and would require foreign technology and additional training and expertise. The operation of a new and untried technology was a risky proposition for PSOEM management. Further, the power demands of the plant are relatively small and the cost of electricity is relatively low making the generation of power from biomass a risky, expensive and unrealistic alternative. Alternative scenarios P5 & P6 cannot be considered as a realistic baseline alternative for power generation.

Table B 1-1. Consumption of primary energy sources in Ukraine in 2004, million tonnes of oil equivalent [2], [4]

Oil	Natural gas	Coal	Nuclear power	Hydro	Sunflower seed husk	Total
17.4	63.9	39.4	19.7	2.7	0.1	143.2

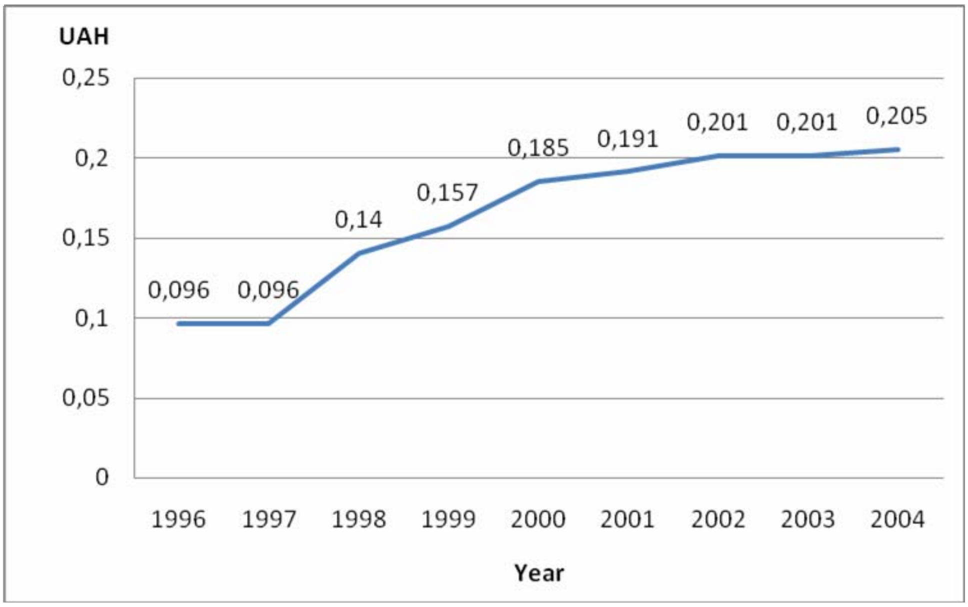
P7&P8 There are no existing biomass power plants near the project site. Alternatives P7 & P8 cannot be considered as a realistic baseline alternative for power generation.

P9 The power demands at the project site are initially small, increasing in later years and would not support the costs of purchasing fossil fuel for the dedicated purpose of generating power. In addition, the price received for electricity sold to the Ukrainian grid was extremely low and would not support the capital and running costs of a dedicated fossil fuel powered plant. Alternative P9 cannot be considered as a realistic baseline alternative for power generation.

Table B 1-2. PSOEM Electricity and Heat Power Needs, and SHH volume

	2005	2006	2007	2008	2009	2010	2011	2012
SSH, tonnes	10 757	21 516	28 602	33 600	33 600	38 500	38 500	38 500
Thermal energy demand, GJ	75 642	151 296	201 120	236 265	236 265	270 720	270 720	270 720
Electricity demand, million KWh	4.10	8.02	8.40	8.40	10.92	10.92	10.92	10.92

Fig B 1-1. Electricity Costs of KWh for sunflower oil industry during 1996-2004 [R2]



Alternatives to heat supply
In absence of the proposed project, reasonable and credible heat supply alternatives include:

H1 The proposed project activity not undertaken as a JI project activity;
H2 The proposed project activity fired with the same type of biomass residues but with a different efficiency of heat generation;
H3 The generation of heat in an existing captive cogeneration plant, using only fossil fuels;
H4 The generation of heat in boilers using the same type of biomass residues;
H5 The continuation of heat generation in an existing biomass residue fired cogeneration plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as in the project activity;
H6 The generation of heat in boilers using fossil fuels;
H7 The use of heat from external sources, such as district heat;
H8 Other heat generation technologies (e.g. heat pumps or solar energy).

Specific analysis on the eight alternative scenarios in absence of the proposed project is as follows:

H1 If the proposed project is not undertaken as a JI project activity, it will be faced with the barriers outlined in section B.2. Alternative H1 can be considered as a possible alternative to the project activity

H2 There was no common practice of installing biomass cogeneration units operating at lower efficiencies at the time of project development. Alternative H2 cannot be considered as a realistic baseline alternative for heat supply.

H3 There is no fossil fuel fired cogeneration plant at or around the project site. Alternative H3 cannot be considered as a realistic baseline alternative for heat supply.

H4 Combustion of SSH for heat production is attractive from the point of view of its presence on site and its satisfactory calorific value. However using SSH to produce heat energy in Ukraine in the majority of cases is not efficient not that reliable and often extremely expensive. There were three options open to PSOEM for generating heat from burning SSH:

1. Purchase and retrofit of existing boilers. Gas fired or coal fired boilers may be adjusted to burn SSH by local developers or even by the edible oil production facilities themselves. However, retrofitted boilers:
   a. Are inefficient and consume 2-3 times more SSH compared to best available technology (e.g.Vyncke).;
   b. Are unreliable and require frequent stops for repair and maintenance; and
   c. Provide not substantial quantity and quality of the steam (temperature and pressure) which influences negatively the production process of sunflower oil in general.
2. New boilers, produced in Ukraine and Russia, designed to operate on different kinds on solid fuel (coal, biomass: waste wood, etc). These boilers are more expensive than retrofitted boilers and have similar drawbacks due to the fact that they need to be modified to combust only SSH.
3. Install boilers designed specially to operate on SSH meeting specific characteristics of sunflower seed husk as a fuel. Due to the need to have reliable and high quality steam the cost of the boiler would have been the same as in the project scenario.

Using retrofitted boilers or solid fuel boilers constituted a rather high risk to the project owners given their need for reliable heat supply and a stable heat supply able to produce high quality steam. Edible oil producers often locate in urban areas and close to a back-up heat supply allowing them to use old, less efficient and less reliable technology [2]. PSOEM is not close to an existing heat supply and thus this option was not available to the owners.

Alternative H4, utilizing purposely designed SSH boilers, can be considered as a realistic alternative for heat supply.

H5 There are no existing biomass fired cogeneration plants in the local area. H5 cannot be considered as a realistic baseline alternative for heat supply.

H6 There is no centralized heat supply source at the project site, and to generate high quality, reliable steam, PSOEM investigated purchasing boilers fired with fossil fuel. Given the relatively low prices – a national agreement with Russia provides a favourable pricing regime for natural gas - and security of supply there has been a large increase in the use of boilers fired by natural gas in Ukraine in recent years. Natural gas combustion can be considered a common technology in Ukraine (Table B 1-1). Low sulphur content of natural gas results in a comparatively high, comparing to other fossil fuels, efficiency – around 93%– and natural gas has the highest energy density when compared to other considered fossil fuels (fuel oil and coal) and produces the least greenhouse gases and other pollutants.

Compared with natural gas, the use of coal and fuel oil as fuels for the boiler was not attractive due to the high additional costs related to developing the logistics infrastructure (mainly storage facilities) and transportation charges. Natural gas is an attractive fuel due to its high calorific value, its comparatively low environment impact, pricing and availability – Ukraine has a well-developed natural gas transportation system. Its use is also common in the Ukrainian domestic market. Natural gas prices between 2000 and 2004 [2], [3] show price stability and gas supply contracts with the Russian Federation provided grounds to expect no further serious price change. Ukraine and the Russian Federation signed the Russian-Ukrainian Treaty of Friendship, Cooperation and Partnership and arranged a long-term gas contract for 2003 – 2013 which was signed between the National Joint

Stock Company 'Naftogaz of Ukraine' and Public Corporation 'Gazprom' of Russia on 21.06.2002. In "NPV-AC_Peresechansk_23122009.xls" from 09.08.2004 low price of $50 per 1000 m^3 gas was fixed for the period 2005-2009 [3]; before that the price for natural gas had been very similar [2]. In fact, investors of the Enterprise have been inclined to go with the natural gas combusting which is supported by the executed decision to bring the natural gas pipeline of necessary pressure to the Enterprise location. Learning about possibility of ERU's trading reversed their decision.
Alternative H6 is a realistic baseline alternative for heat supply.

H7 Since there is no district heat supply in local areas, heat sources from external sources such as district heat don't exist, Alternative H7 cannot be considered a realistic baseline alternative for heat supply.

H8 There are no examples of heat generation from heat pumps or solar energy in /around the project site. Further, this type of technology in Ukraine is expensive and there are few examples of industrial facilities using alternative renewable heat sources in the country. Alternative H8 cannot be considered as a realistic baseline alternative for heat supply.

Alternatives to unused biomass

The PSOEM facility will produce large quantities of biomass waste (see table B 1-2) from the extraction of vegetable oils from sunflower seeds. The biomass waste is sunflower seed husks. The plausibility of the following baseline scenarios are evaluated below:

B1 The biomass residues are dumped or left to decay under mainly aerobic conditions. For example, the dumping and decay of biomass residues on fields;
B2 The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields;
B3 The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes;
B4 The biomass residues are used for heat and/or electricity generation at the project site;
B5 The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants;
B6 The biomass residues are used for heat generation in other existing or new boilers at other sites;
B7 The biomass residues are used for other energy purposes, such as the generation of biofuels;
B8 The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes.

Specific analysis of the eight alternatives as they related to the project is presented below:

B1 There are regulations requiring that biomass residue has to be landfilled (Paragraph 3) of Article 17 of the Law of Ukraine On Waste of March 5th, 1998 # 187/98-BP). Alternative B1 cannot be considered as a realistic baseline alternative
B2 It is not allowed in Ukraine to leave a biomass residue to decay in stock-pile or to decay on fields ((Paragraph 3) of Article 17 of the Law of Ukraine On Waste of March 5th, 1998 # 187/98-BP). A landfill site which will take all of the sunflower husk waste produced by PSOEM is situated 15km from the facility. In 2003-2004, the waste disposal price was 5.10 UAH (Euro 0.68) per 1 m^3 [10]. Sending SSH to landfill is common practice in Ukraine due to the low price and ease of disposal. Alternative B2 can be considered as a possible baseline scenario.
B3 There are regulations restricting the open-burning of biomass in Ukraine (Paragraph 3 of Article 33 of the Law of Ukraine On Waste of March 5th, 1998 # 187/98-BP). Alternative B3 cannot be considered as a realistic baseline scenario.
B4 Although sunflower oil production is common in Ukraine, using SSH as a fuel for combined heat and power generation is not common practice and involves technological risks even in the case of SSH being used to produce heat energy only; for example, SSH boiler installation failure at Poltava OEM in 2005 [2]. The management of PSOEM was aware of these risks and considered that achieving

a high quality and reliable steam supply from SSH would require PSOEM to purchase foreign, expensive and best available technology. Alternative B4 can be considered as a feasible alternative scenario.

B5 No sunflower oil production plants in Ukraine have been using SSH to produce heat and power at the time of project development [2]. There are no power generation facilities near to the project site using biomass to produce electricity. Alternative B5 cannot be considered as a realistic baseline scenario.

B6 The nearest manufacturing plant – a soft drink plant - is located 1.5 km from PSOEM. The plant is owned by the Public Corporation 'Berminvody' and doesn't need sunflower husk, as it requires minimum thermal energy to operate. There are no other enterprises around PSOEM of sufficient size which would be able to utilize large quantities of SSH. Transportation of SSH over long distances is not economically sound due to low density of husk (175 kg/m^3). There are no facilities which utilize biomass to produce power near the project site. SSH has 3600-3800 Kcal/kg NCV and it could be used to heat residential properties. Mentioned low density of SSH makes it unsuitable for the use at private households in the surrounding area (it is difficult to transport and store) -- moreover the majority of houses in the only nearby village has the natural gas supply. Alternative B6 cannot be considered as a realistic baseline scenario.

B7 The technology (2nd and 3rd Generation biofuels) to convert SSH into liquid biofuels is currently not commercially viable in Ukraine. For other energy production options see analysis in B6. Alternative B7 cannot be considered a realistic baseline scenario.

B8 SSH is not suitable for use as a fertilizer. The possibility to make biomass pellets from the SSH was considered: in 2005 the highest capacity of pelleting press in Ukraine was 300 kg/hour. For briquetting 38 500 tonnes of sunflower seed husk PSOEM would require at least 15 pelleting presses operating 24 hours a day and all year round without stoppage. Pelleting would also require a lot of space to house the presses and store and keep dry the pellets produced. Pelleting presses have been tested by other sunflower oil extraction mills which have experience problems in equipment reliability and maintenance making commercial operation difficult [2]. Alternative B8 cannot be considered as a realistic baseline scenario.

Conclusion

The above analysis identifies the following feasible alternative scenarios for the generation of power and heat and the disposal of biomass residues:

Power Generation: Alternative P1 or Alternative P4
Heat Generation: Alternative H1 or Alternative H4 or Alternative H6
Biomass Residues: Alternative B2 or Alternative B4

When aggregated together there are three alternative scenarios to the project activity. These are evaluated below to determine the most realistic baseline scenario:

1. *Implementation of the project activity without ERU revenue (P1, H1, B4)*
Without ERU revenue the project faces significant technical and financial barriers. These are detailed under the additionality arguments in Section B.2.

2. *Heat supplied to the project activity from two gas fired boilers, biomass residue sent to landfill and electricity imported from the grid (P4, H6, B2)*
Heat generation from gas fired boilers is common practice in Ukraine and the easy availability of gas, its relatively low price and the need for high quality, reliable heat; the low price of electricity; and the landfilling of the biomass residue was the scenario which faced few technical barriers and required the lowest amount of capital outlay.

3. *Heat supplied to the project activity from biomass boilers and electricity imported from the grid (P4, H4, B4)*
The need for reliable and high quality heat produced from SSH necessitated the use of high quality boiler technology. Given concerns over reliability and performance using retrofitted or modified boilers to burn SSH , PSOEM would have needed to purchase the same boiler as under the project scenario but without purchasing a turbo generator to generate electricity. This approach faced similar technical barriers to the project scenario and, because of the high capital costs of a dedicated SSH boiler and the requirement to continue to import electricity, was more expensive and had a lower NPV-AC than Scenario 2 (see Table B2-3). Hence this scenario is eliminated

Consequently, the baseline scenario for the project is Scenario 2: that the PSOEM facility would continue to purchase power from the grid (Alternative P4); heat would be provided through two dedicated gas fired boilers (one operational and one stand-by) (Alternative H6); and biomass residues would be transported to an existing landfill site (Alternative B2).

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:

In the **baseline scenario** two gas fired boilers (one operational boiler and one stand-by boiler) would be installed to meet thermal energy needs of the Enterprise. The required amount of natural gas is expected to be approximately 8.69 thousand m^3 annually from 2010 and the required amount of electric energy to operate the plant (10.92 million KWh/yr from 2010) will be purchased from national power grid. From 2010, the majority of SSH (38 500 t/yr from 2010) is disposed of at the landfill.

Baseline emissions of CO_2e during the fixed 5 year crediting period (2008-2012) can be summarized as follows:

1. Emission due to natural gas combustion by operational gas fired boilers – ***13 811 tonnes*** of CO_2e per year on average;
2. Emission due to husk decay at the landfill – ***11 709 tonnes*** of CO_2e per year on average;
3. Emission due to purchase of electricity from the grid for own needs – ***5 871 tonnes*** of CO_2e per year on average.

Total baseline scenario emissions for the period 2008-2012 are estimated to be **174 261 tonnes** of CO_2e.

In the **project scenario,** two husk fired boilers (one operational and another stand by one), as well as a turbo-generator are installed to meet thermal and electric energy needs of the Enterprise.

Reduction of GHG emissions under the JI project in comparison with the baseline scenario is ensured by the following:

1. Heat is produced from biomass (sunflower seed husk) instead of natural gas;
2. Power, to meet the plant's needs, is produced on site from biomass (sunflower seed husk) and not supplied from the Ukrainian grid;
3. No disposal of sunflower seeds husk at the landfill

Total estimated reduction of CO_2e emissions under the JI project during 2008-2012 are **156 950 tonnes** of CO_2e**.**

Additionality

Additionality can be demonstrated in accordance with the Guidance On Criteria For Baseline Setting And Monitoring Version 02 using the approach (a):
"Provision of traceable and transparent information showing that the baseline was identified on the basis of conservative assumptions, that the project scenario is not part of the identified baseline scenario and that the project will lead to reductions of anthropogenic emissions by sources or enhancements of net anthropogenic removals by sinks of GHGs".

In considering options for heat and electricity supply and the ongoing management of the facility, PSOEM and its investors sought reliability, simplicity of operation and minimal capital outlay.

Without JI, the investors would not have chosen the project scenario as demonstrated by the following barriers and investment analysis of the project scenario versus the baseline scenario:

1. Barriers to the Implementation of the Project Scenario

Technological barriers

At the time of taking the decision about project implementation there was no combined heat and power production based on utilization of SSH [2] at edible oil processing facilities in Ukraine. Hence, there have been no ready-to-operate technological solutions in this regard. Consequently, there was no relevant technical and professional experience to ensure reliable operation of the technology used in the project activity.

Edible oil production process requires technological steam pressure at the level of maximum 6 bar (roast) and 11 bar (extraction process), while electricity production, based on turbine application, requires steam with pressure of 24 bar [2, turbine characteristics].

That, in addition to the rather complicated technological approach of combined heat and power production, requires specifically trained and experienced staff. Moreover, the required experience should have stemmed from the related industry (edible oil production) to ensure reliability and continuity of operations.

Such experience has been absent in Ukraine; as have specifically designed turn key technological solutions[6].

In the first stage of the project activity PSOEM tested the feasibility of generating high pressure steam (more than 20 bar) from burning SSH through installation and operation of SSH based boiler, with steam characteristics of steam of more than 20 bar. The operation of the first stage allowed PSOEM to train staff and develop experience specifically suited to the technology conditions, both in terms of the SSH management and steam production.

Financial barriers

The capital outlay for the project is more than 10 times greater than the capital outlay under the baseline scenario. (Table B 2-3.)

[6] SSH burning for heat production has been practiced in Ukraine by several edible oil production plants based mainly on gas/fuel oil/coal boilers adjusted to SSH [2]. Such boilers produced up to 11 bar of steam pressure. Their operation showed low efficiency and were accompanied often by failures and breakdowns. Even launching of SSH based firing boiler was a problem. For example, there has been a failure to start the SSH boiler at Poltava Edible Oil Extraction Mill in 2005, due to the lack of relevant experience and unfamiliarity with the technology. As a result, a lot of investment has been sunk in the still idle facility [2].

The implementation of the project scenario required a large amount of capital investment, necessitating bank loans and a reduction in Kolos's own financial resources and thus a reduction in funds available for other short and medium term investment. In comparison, the cost of the baseline scenario was significantly lower and more attractive in the medium term. (Table B 2-1.).

Table B 2-1. Total capital expenses, thousand UAH

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Baseline scenario	547	0	0	0	684	0	0	0	0
Project scenario	7 158	0	0	0	23 495	0	0	0	0

2. Investment Analysis

Financial calculations showed that for the project scenario without ERU sales net present value of the project scenario's aggregate costs (NPV-AC) was UAH 1,934,297 greater than the same indicator in the baseline scenario[7] (see below).

Parameters used in Financial Analysis
The parameters used in the financial analysis are based on figures available to Kolos at the time of project implementation and are detailed in table B 2-2 below:

Table B 2-2. Parameters used in Financial Analysis

Item	**Value**
Natural Gas Price (UAH/m3)	327
Landfill Disposal Price (UAH/ton)	29.12
Husk Transportation Price (UAH/ton)	8.57
Ash Transportation Price (UAH/ton)	8.57
Electricity Price (UAH/KWh)	0.205
Discount Rate	20%
Bank interest Rate	15%
EUR/UAH (2004 Average)	6.6
ERU Price (Euro)	10

Revenues from the sale of edible oil for the PSOEM would be equal in both baseline and project scenario: thus, it is appropriate to evaluate the financial case for the baseline and project scenarios on an aggregate cost and net present value basis. Table B 2-3 demonstrates that:

Table B 2-3. NPV-AC for baseline and project scenario.

	Total capital expenses (UAH)	**NPV-AC** (UAH) till 2012, with 20 % discount rate
Baseline scenario (Scenario 1)	1,230,750	-22,056,259
Alternative scenario (Scenario 3)	20,665,248	-23,376,546
Project scenario (Scenario 2)	30,654,042	-23,990,556

[7] Enterprise' revenues were not taken into account due to the fact that these would have been the same in both variants.

The inclusion of ERU revenues in the financial analysis for the project scenario improves the NPV-AC of the project scenario by 15% and provides Kolos with a large enough incentive to select the project scenario over the baseline scenario.

Sensitivity analysis

The sensitivity analysis of the project was based on 10% upward and downward change in investment, natural gas price and electricity price.

The results of sensitivity analysis are shown in the table B 2-4.

Table B 2-4. Sensitivity Analysis

		Scenario 1	Scenario 3	Scenario 2
Investment change	-10%	-22 235 314	-22 893 284	-23 280 325
	+10%	-22 469 935	-24 421 368	-25 080 811
Natural gas price change	-10%	-21 455 231	-23 632 891	-24 156 133
	+10%	-23 250 019	-23 681 761	-24 205 003
Electricity price change	-10%	-21 596 571	-22 901 272	-23 813 656
	+10%	-23 108 678	-24 413 379	-24 547 480

Common practice analysis

Utilizing SSH for combined heat and power production has not been the common practice in Ukraine at the time of the project development [2]. Two similar project of utilizing for CHP project: Utilization of sunflower seeds husk for steam and power production at the oil extraction plant OJSC 'Kirovogradoliya' and Utilization of Sunflower Seeds Husk for Heat and Power Production at Closed Joint-Stock Company (CJSC) "Pology Oil-Extraction Plant, South-East Ukraine are developing as JI project under the Kyoto Protocol.

Conclusion

The selection of the project scenario faced two significant barriers: a lack of technical expertise and know-how in the installation and operation of SSH cogeneration technology in Ukraine; and the significant capital outlay required to implement the project scenario compared with the baseline scenario. The impact of revenue from ERU sales in improving the NPV-AC of the project provided Kolos with a significant enough incentive to mitigate the technical and economic barriers and implement the project scenario. The project is therefore additional.

In fact, investors of the Enterprise have been inclined to go with the natural gas combusting alternative which is supported by the executed decision to bring the natural gas pipeline of necessary pressure to the Enterprise location. Learning about possibility of ERU's trading reversed their decision.

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

There are the following sources of GHG emissions related to the proposed baseline and project scenarios:

- All sources of emissions that are not influenced by the projects have been excluded;
- All sources of emissions that are influenced by the projects have been included.

Table B 3-1. Sources of emissions included in consideration or excluded of it

	Source	Gas	Incl./ Excl.	Justification/Explanation
Baseline	Gas fired boilers, burning natural gas (compared to the project)	**CO_2**	**Incl.**	**Main source of emissions**
		CH_4	Excl.	Considered negligible. Conservative
		N_2O	Excl.	Considered negligible. Conservative
	Landfilling of biomass waste, anaerobic decomposition of sunflower seed husk (compared to the project)	CO_2	Excl.	Considered negligible. Conservative
		CH_4	**Incl.**	**Main source of emissions**
		N_2O	Excl.	Considered negligible. Conservative
	Electricity consumption	**CO_2**	**Incl.**	**Main source of emissions**
		CH_4	Excl.	Considered negligible. Conservative
		N_2O	Excl.	Considered negligible. Conservative
Project	Husk fired boilers, burning sunflower seed husk	CO_2	Incl.	Considered zero
		CH_4	Excl.	Considered negligible. Conservative
		N_2O	Excl.	Considered negligible. Conservative
	Electricity consumption (till 2009)	**CO_2**	**Incl.**	**Main source of emissions**
		CH_4	Excl.	Considered negligible. Conservative
		N_2O	Excl.	Considered negligible. Conservative

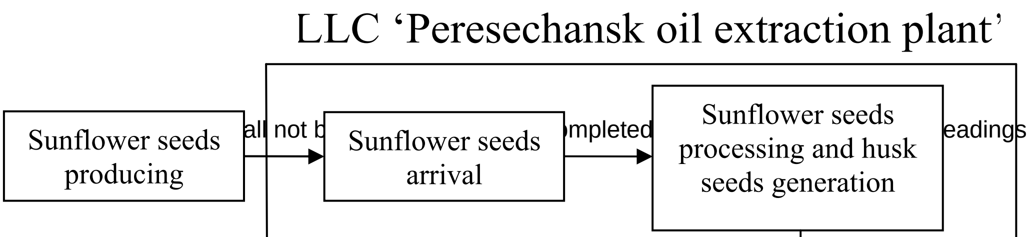
Baseline scenario

Baseline boundary (see Fig. B 3-1. beneath**)** includes operation of two gas fired boilers for heat production. The only fuel for the Enterprise is natural gas. The baseline scenario considers consumption of electricity for own needs of the Enterprise from national power grid. All generated husk is disposed of at the landfill. Such elements as landfill site, power grid and connection to natural gas supply are closely connected with the project but are not included directly in its boundary.

Emissions of CO_2e in the baseline scenario:

1. Natural gas combustion by operational gas fired boilers;
2. Husk decay at the landfill.
3. Purchasing of power from grid for own needs for sunflower seeds processing by the Enterprise.

Fig. B 3-1. Baseline scenario boundary



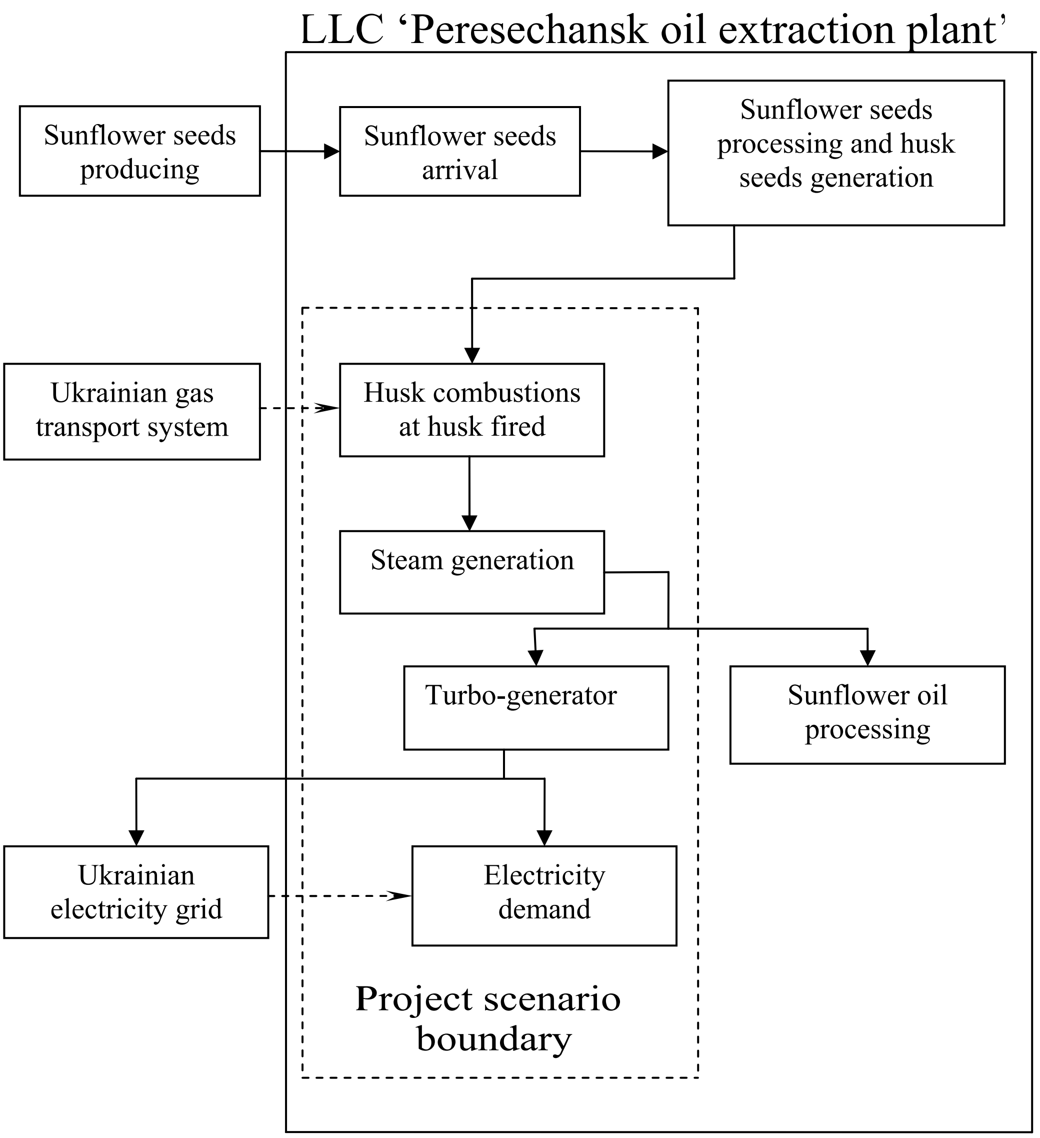
Project scenario

Project boundary (see Fig. B 3-2. beneath**)** includes operation of two husk fired boilers and turbo-generator for heat production and electric energy generation for own needs. Majority of generated husk is combusted for steam generation.

Reduction of CO_2e by JI project in comparison with baseline scenario.

1. Total replacement of natural gas combustion by sunflower husk combustion. Natural gas from Ukrainian gas transport system is used as reserve fuel;
2. Total satisfaction of own needs in electricity. Ukrainian electricity grid is used as reserve energy supply;
3. Sunflower seeds husk disposed at the landfill. Insignificant quantity of husk could be allocated at the landfill.

Fig. B 3-2. Project scenario boundary



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: June 20th, 2008
Baseline information is developed by the specialists of "Camco Carbon Russia Limited";
Contact person: Oleksander Baskov;
E-mail: Project.participant.ru@camcoglobal.com
"Camco Carbon Russia Limited" is a project participant listed in Annex 1.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The SSH Byisk boiler contract was signed at 26 February 2004.
The mill was constructed and production started in April 2005.
Startup of husk fired boiler N2 –October-November 2009.
Startup of turbo-generator – December 2009.

C.2. Expected operational lifetime of the project:

The lifetime of husk fired boiler and turbo-generator is at least 20 years, thus operational lifetime of the project is from 2005 to 2025.

C.3. Length of the crediting period:

Start of crediting period: 26 February 2004

From February 2004 till December 2012:

- For the period to December 2007 Early Credits will be claimed to be transferred through Article 17 of the Kyoto Protocol (IET)
- For the period January 2008 till December 2012 credits will be transferred through Article 6 of the Kyoto protocol (JI)
- For the period after 2012 Late Credits will be claimed to be transferred through Regulation of the Cabinet of Ministers of Ukraine No. 1313 of 25 November 2009.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The monitoring plan will serve to trace Project Emissions, Baseline Emissions and to calculate Emission Reductions in accordance with the gathered data fixed by direct measurement of specific related parameters through the application of technical devices and calculations.

The monitoring reports must be delivered by the contractual party to an accrediting independent entity (AIE) at regular intervals. This entity examines the reports. Monitoring data must be kept for at least 2 years after the end of the crediting period or the last transfer of ERUs.

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
M-1. V_{ng}	Quantity of natural gas consumed as reserve fuel	Gas flow meter “Universal -2”, #3211 (storage counter).	m^3	m	continuously	100%	Electronic and paper	
M-2 NCV_{ng}	Net calorific value	Supplier (Certificate of natural gas)	GJ/thousand m^3	m	monthly	100%	Electronic and paper	

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 of CO_2e in project scenario:

1. Emission due to natural gas combustion as reserve fuel during the period of sunflower seeds processing by the Enterprise.

$$PEy = PE_{ng,y} \quad (D.1)$$

where $PE_{ng,y}$ is CO_2 emission due to natural gas combustion under the project scenario over a year y, t CO_2;

$$PE_{ng,\,y} = V_{ng} \times NCV_{ng} \times EF_{CO2\ ng\ combustion} \times 10^{-3} \quad (D.2)$$

where V_{ng} - Quantity of natural gas consumed as reserve fuel, thousand m^3 *(M-1 from table D.1.1.1)*

NCV_{ng} is the net calorific value of natural gas, GJ/thousand m^3. According to the Certificate of natural gas which is provided by natural gas supplier. (M-2 from table D.1.1.1)

$EF_{CO2\ ng\ combustion}$ is the emission factor for natural gas, kg CO_2/GJ. According to the data of IPCC [5], and with allowance for the oxidized carbon fraction of 0.995, this factor is assumed constant and equal to

$$EF_{CO2\ ng\ combustion} = 56.1 \times 0.995 = 55.8\ kg\ CO_2/GJ$$

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
M-3. $M_{landfill\_husk}$	Mass of husk leaving the Enterprise directed to landfill	Entrance/Exit (truck) weighbridge AUTO #987	tonnes	m	continuously	100%	Electronic and paper	
M-4. N_{gener}	Quantity of electric power generated by the Enterprise with the further breakdown to the amount of electricity consumed by the enterprise and the amount exported to the power grid	Meter or wattmeter after generator on power point and at the export spot	*MWh*	m	continuously	100%	Electronic and paper	
M-5. m_{seeds}	Mass of sunflower seeds feeding sunflower seeds processing	inventory taking	tonnes	c	monthly	100%	Electronic and paper	
M-6. $f_{husk\ content}$	husk content in seeds (netto) (husk content in clean seeds)	Laboratory scales (Procedure #39/Л SSH content estimation)	% (t husk/ t seed)	e	monthly	100%	Electronic and paper	

Continue of Table D.1.1.3.

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
M-7, Q_{heat}	Net quantity of generated heat	Meter of steam CGN 961	GJ	m	continuously	100%	Electronic and paper	

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

Emissions of CO_2e are broken into three items in the baseline scenario:

1. Emission due to natural gas combustion by gas fired boiler during the period of sunflower seeds processing by the Enterprise.

2. Additional CH_4 emission due to husk decay at the landfill.

3. Emission due to consumption of power from grid for own Enterprise's needs.

The Baseline Emissions are identified as following:

$$BEy = BE_{ng,y} + \Delta BE_{dump,y} + \Delta BE_{elec\_cons,y} \qquad (D.3)$$

where $BE_{ng,y}$ is CO_2 emission due to natural gas combustion under the baseline scenario over a year y, tonnes CO_2;

$\Delta BE_{dump,\,y}$ is additional CH_4 emission due to husk decay at the landfill over a year y, compared to the project scenario, tonnes of CO_2e;

$\Delta BE_{elec,y}$ is additional CO_2 emission due to consumption from power grid over a year y, compared to the project scenario, tonnes of CO_2e.

$$BE_{ng,\,y} = Q_{heat,y} \times E_{CO2\ ng\ combustion} / GB_{efficiency} \qquad (D.4)$$

Prior the installation of the steam meter installation (Feb 2005 – Apr 2009)

where $Q_{heat,y}$ – Net quantity of heat generated from firing biomass in the project plant.

$$Q_{heat,y} = m_{steam}\,(h_{steam} - h_{feed\_water}) \qquad (D.5)$$

Where m_{steam} is mass flows of steam, tonnes (Data of PSOEM [6]);

h_{steam} – enthalpy of the steam generated by the project cogeneration plant. Determined based on the temperature (t_{steam}) and the pressure (p_{steam}) of steam, KJ/kg (Data of PSOEM [6]);

h_{feed_water} - enthalpy of the feed water. Determined based on the temperature (t_{feed_water}), KJ/kg (Data of PSOEM [6]);

$E_{CO2\ ng\ combustion}$ - is the emission factor for natural gas, kg CO_2/GJ. According to the data of IPCC [R3], and with allowance for the oxidized carbon fraction of 0.995, this factor is assumed constant and equal to $EF_{CO2,NG} = 56.1 \times 0.995 = 55.8$ kg CO_2/GJ.

$GB_{efficiency} = 0.93$ efficiency for gas boiler;

After steam meter installation (May 2009 – 2012)

where $Q_{heat,y}$ – Net quantity of heat generated from firing biomass in the project plant, GJ. (*M-7 from the table D 1.1.3.*);

$$\Delta BE_{dump,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot \left(1-e^{-k_j}\right) \quad \text{(D.6)}$$

The calculation is based on "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"

Where: $BE_{CH4,SWDS,y}$– Methane emissions avoided during the year *y* from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y (tCO_2e);
φ – Model correction factor to account for model uncertainties (0.9);
f – Fraction of methane captured at the landfill and flared, combusted or used in another manner;
GWP_{CH4} – Global Warming Potential (GWP) of methane, valid for the relevant commitment period;

OX – Oxidation factor (reflecting the amount of methane from landfill that is oxidised in the soil or other material covering the waste);
F – Fraction of methane in the landfill gas (volume fraction) (0.5);
DOC_f – Fraction of degradable organic carbon (DOC) that can decompose;
MCF – Methane correction factor;
$W_{j,x}$ – Amount of organic waste type *j* prevented from disposal in the lanfill in the year *x* (tons);

$$W_{j,x} = \Sigma_i [m_{seeds\_arrive} \times f_{\text{husk content}}] - M_{landfill\ husk} \text{ in year x;} \quad \text{(D.9)}$$

where *i* –day number

m_{seeds_arrive} – Mass of sunflower seeds feeding sunflower seeds processing during the day, t (*M-5 from table D.1.1.3.*);

$f_{\text{husk content}}$ –monthly husk content in seeds, % (t husk/t seeds) (*M-6 from table D.1.1.3.*);

$M_{landfill\ husk}$ – Mass of husk leaving the Enterprise to the landfill, t (*M-3 from table D.1.1.3.*);

DOC_j – Fraction of degradable organic carbon (by weight) in the waste type *j*;
k_j – Decay rate for the waste type *j*;
j – Waste type category (index);
x – Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y);
y – Year for which methane emissions are calculated

$$\Delta BE_{\text{elec cons},y} = N_{gener,\,y} \times EF_{CO2,y} \quad \text{(D.11)}$$

where $N_{gener,\,y}$ – Quantity of electric power generated by the Enterprise, MWh/yr (M-4 from the table D.1.1.3);
$EF_{CO2,y}$ – Emission factor for electricity of Ukrainian grid, tCO2e/MWh.
For JI projects reducing electricity consumption from Ukrainian electricity grid
$EF_{CO2,y}$ = 0.896 tCO2e/MWh [7];

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

This option is not applied to monitoring the project

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

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):

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

The leakages under the project were taken equal to zero.

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):

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):

$REy = (BE_y) - (PE_y)$

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:

Occupational safety, health and environment administration is operating at the enterprise. The administration's activities are guided by the acting legislation, orders and instructions of the Director General, prescriptions of the State environmental monitoring service of the Committee on natural resources of the Kharkiv Region..

The data obtained by the analytical laboratory are processed and brought together in monthly and annual reports, which specify all the required itemized data, including those for the sections affected by the Project.

Besides, the enterprise files reports by the following official annual statistical forms:

- 2-tp (air) *Data on protection of atmospheric air*, which contains information on amounts of trapped and neutralized atmospheric pollutants, itemized emissions of specific pollutants, number of emission sources, measures on reduction of emissions into the atmosphere, emissions from particular groups of pollution sources;

- 2-tp (water resources) *Data on water use*, which presents information on consumption of water from natural sources, discharge of waste water, and content of pollutants in it, capacity of treatment facilities, etc.;

- 2-tp (waste) *Data on formation, use, neutralization, transportation and placement of industrial and household waste*, which presents the annual balance of waste flow, by waste types and hazard classes.

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.

Table D.1.1.1 M-1	*low*	*Devices used: gas flow meter Universal-2, #3211 (storage counter).* *- accuracy of gas flow meter is 0.2%;* *- once durin two years gas flow meter is certified by state authorized laboratory.*
Table D.1.1.1 M-2	*low*	*Supplier's data*
Table D.1.1.3 M-3	*low*	*(Truck) Weighbridge AUTO #987 at the Enterprise entrance/exit.* *Accuracy is 30kg* *Equipment will be calibrated annually by the equipment supplier on site.*
Table D.1.1.3 M-4	*low*	*Devices used: electrometer (wattmeter). Calibrated every 6 years*
Table D.1.1.3 M-5	*low*	*Inventory taking*
Table D.1.1.3 M-6	*low*	*Devices used: Laboratory scales.* *Accuracy is 0.5%* *Calibrated annually*
Table D.1.1.3 M-7	*low*	*Devices used Steam meter CGN 96.* *Accuracy is 0.05%* *Calibrated annually*

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

No special operational and management structure will be applied in implementing the monitoring plan at the Enterprise. All necessary data will collected by the occupational safety, health and environment administration, by the energy service, and by the laboratory. Collection of information required for calculations of reductions of GHG emissions as a result of the project is performed in accordance with the procedure common for the enterprise.

Initial data will be submitted by the occupational safety, health and environment administration, by the energy service, and by the laboratory of the Enterprise. Calculations of reduction of emissions will be prepared by specialists of Joint Implementation Team, Kyiv.

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

Monitoring plan is developed by the specialists of "Camco Carbon Russia Limited";

Contact person: Oleksander Baskov;
E-mail: Project.participant.ru@camcoglobal.com
“Camco Carbon Russia Limited” is a project participant listed in Annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Project emissions			2005	2006	2007	Total
1	Husk decay	[tCO_2e/yr]	0	0	0	0
2	Natural gas combustion	[tCO_2/yr]	0	0	0	0
3	Electricity consumption	[tCO_2/yr]	3 674	7 186	7 526	18 386
	Total	[tCO_2/yr]	3 674	7 186	7 526	18 386
	Total 2005-2007	[tCO_2]	18 386			

Project emissions			2008	2009	2010	2011	2012	Total
1	Husk decay	[tCO_2e/yr]	0	0	0	0	0	0
2	Natural gas combustion	[tCO_2/yr]	0	0	0	0	0	0
3	Electricity consumption	[tCO_2/yr]	7 526	9 784	0	0	0	17 311
	Total	[tCO_2/yr]	7 526	9 784	0	0	0	17 311
	Total 2008-2012	[tCO_2]	17 311					

Project emissions			2013	2014	2015	2016	2017
1	Husk decay	[tCO_2e/yr]	0	0	0	0	0
2	Natural gas combustion	[tCO_2/yr]	0	0	0	0	0
3	Electricity consumption	[tCO_2/yr]	0	0	0	0	0
	Total	[tCO_2/yr]	0	0	0	0	0

Project emissions			2018	2019	2020	2021	2022	Total
1	Husk decay	[tCO_2e/yr]	0	0	0	0	0	0
2	Natural gas combustion	[tCO_2/yr]	0	0	0	0	0	0
3	Electricity consumption	[tCO_2/yr]	0	0	0	0	0	0
	Total	[tCO_2/yr]	0	0	0	0	0	0
	Total 2013-2022	[tCO_2]	0					

E.2. Estimated leakage:

The leakages under the project were taken equal to zero.

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

Project emissions			2005	2006	2007	Total
1	Husk decay	[tCO_2e/yr]	0	0	0	0
2	Natural gas combustion	[tCO_2/yr]	0	0	0	0
3	Electricity consumption	[tCO_2/yr]	3 674	7 186	7 526	18 386
	Total	[tCO_2/yr]	3 674	7 186	7 526	18 386
	Total 2005-2007	[tCO_2]	18 368			

Project emissions			2008	2009	2010	2011	2012	Total
1	Husk decay	[tCO_2e/yr]	0	0	0	0	0	0
2	Natural gas combustion	[tCO_2/yr]	0	0	0	0	0	0
3	Electricity consumption	[tCO_2/yr]	7 526	9 784	0	0	0	17 311
	Total	[tCO_2/yr]	7 526	9 784	0	0	0	17 311
	Total 2008-2012	[tCO_2]	17 311					

Project emissions			2013	2014	2015	2016	2017
1	Husk decay	[tCO_2e/yr]	0	0	0	0	0
2	Natural gas combustion	[tCO_2/yr]	0	0	0	0	0
3	Electricity consumption	[tCO_2/yr]	0	0	0	0	0
	Total	[tCO_2/yr]	0	0	0	0	0

Project emissions			2018	2019	2020	2021	2022	Total
1	Husk decay	[tCO_2e/yr]	0	0	0	0	0	0
2	Natural gas combustion	[tCO_2/yr]	0	0	0	0	0	0
3	Electricity consumption	[tCO_2/yr]	0	0	0	0	0	0
	Total	[tCO_2/yr]	0	0	0	0	0	0
	Total 2013-2022	[tCO_2]	0					

E.4. Estimated baseline emissions:

	Baseline emissions		2005	2006	2007	Total
1	Husk decay	[tCO_2e/yr]	801	2 380	4 440	7 621
2	Natural gas combustion	[tCO_2/yr]	4 054	8 132	10 811	22 997
3	Electricity consumption	[tCO_2/yr]	3 674	7 186	7 526	18 386
	Total	[tCO_2/yr]	8 528	17 698	22 777	49 003
	Total 2005-2007	[tCO_2]	49 003			

	Baseline emissions		2008	2009	2010	2011	2012	Total
1	Husk decay	[tCO_2e/yr]	16 678	16 678	16 678	16 678	16 678	58 543
2	Natural gas combustion	[tCO_2/yr]	12 700	12 700	14 552	14 552	14 552	69 054
3	Electricity consumption	[tCO_2/yr]	7 526	9 784	9 784	9 784	9 784	46 664
	Total	[tCO_2/yr]	27 037	31 596	36 046	38 567	41 014	174 261
	Total 2008-2012	[tCO_2]	174 261					

	Baseline emissions		2013	2014	2015	2016	2017
1	Husk decay	[tCO_2e/yr]	19 053	21 357	23 593	25 763	27 869
2	Natural gas combustion	[tCO_2/yr]	14 552	14 552	14 552	14 552	14 552
3	Electricity consumption	[tCO_2/yr]	9 784	9 784	9 784	9 784	9 784
	Total	[tCO_2/yr]	43 389	45 693	47 929	50 099	52 205

	Baseline emissions		2018	2019	2020	2021	2022	Total
1	Husk decay	[tCO_2e/yr]	29 913	31 896	33 821	35 689	37 501	286 456
2	Natural gas combustion	[tCO_2/yr]	14 552	14 552	14 552	14 552	14 552	145 516
3	Electricity consumption	[tCO_2/yr]	9 784	9 784	9 784	9 784	9 784	97 843
	Total	[tCO_2/yr]	54 249	56 232	58 157	60 025	61 837	529 815
	Total 2013-2022	[tCO_2]	529 815					

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

Reductions of the project	2005	2006	2007	Total

1	Husk decay	[tCO_2e/yr]	801	2 380	4 440	7 621
2	Natural gas combustion	[tCO_2/yr]	4 054	8 132	10 811	22 997
3	Electricity consumption	[tCO_2/yr]	0	0	0	0
	Total	[tCO_2/yr]	4 855	10 512	15 250	30 618
	Total 2005-207	[tCO_2]	30 618			

Reductions of the project			2008	2009	2010	2011	2012	Total
1	Husk decay	[tCO_2e/yr]	16 678	16 678	16 678	16 678	16 678	58 543
2	Natural gas combustion	[tCO_2/yr]	12 700	12 700	14 552	14 552	14 552	69 054
3	Electricity consumption	[tCO_2/yr]	0	0	9 784	9 784	9 784	29 353
	Total	[tCO_2/yr]	19 511	21 812	36 046	38 567	41 014	156 950
	Total 2008-2012	[tCO_2]	156 950					

Reductions of the project			2013	2014	2015	2016	2017
1	Husk decay	[tCO_2e/yr]	19 053	21 357	23 593	25 763	27 869
2	Natural gas combustion	[tCO_2/yr]	14 552	14 552	14 552	14 552	14 552
3	Electricity consumption	[tCO_2/yr]	9 784	9 784	9 784	9 784	9 784
	Total	[tCO_2/yr]	43 389	45 693	47 929	50 099	52 205

Reductions of the project			2018	2019	2020	2021	2022	Total
1	Husk decay	[tCO_2e/yr]	29 913	31 896	33 821	35 689	37 501	286 456
2	Natural gas combustion	[tCO_2/yr]	14 552	14 552	14 552	14 552	14 552	145 516
3	Electricity consumption	[tCO_2/yr]	9 784	9 784	9 784	9 784	9 784	97 843
	Total	[tCO_2/yr]	54 249	56 232	58 157	60 025	61 837	529 815
	Total 2013-2022	[tCO_2]	529 815					

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

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent

2005	3 674	0	8 528	4 855
2006	7 186	0	17 698	10 512
2007	7 526	0	22 777	15 250
Total tonnes of CO_2e	18 368	0	49 003	30 618

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent
2008	7 526	0	27 037	19 511
2009	9 784	0	31 596	21 812
2010	0	0	36 046	36 046
2011	0	0	38 567	38 567
2012	0	0	41 014	41 014
Total tonnes of CO_2e	17 311	0	174 261	156 950

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent
2013	0	0	43389	43389
2014	0	0	45693	45693
2015	0	0	47929	47929
2016	0	0	50099	50099
2017	0	0	52205	52205
2018	0	0	54249	54249
2019	0	0	56232	56232
2020	0	0	58157	58157
2021	0	0	60025	60025
2022	0	0	61837	61837
Total tonnes of CO_2e	0	0	529 815	529 815

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 project has been subject to a formal environmental impact assessments or OVNS undertaken in accordance with the applicable legislation and regulations of Ukraine. These include: the Laws of

Ukraine “On Protection of Environment”, “On Ecological Expertise”, “On Protection of Atmospheric Air”, “On Wastes”, “On Ensuring Sanitary and Epidemic Welfare of the Population”, and “On Local Councils and Local Government”, as well as the applicable Water Code, Land Code, and Forest Code.

Before the start of the project implementation the Enterprise received all the required conclusions of the state ecology examinations.

Project territory does not belong to the reserve territory. There are no fauna and flora species mentioned on Red Lists present on the area of the project location. Husk fired boilers and turbo-generator emissions will not be evaluated against potential environmental impacts according to the Ukrainian legislation. The project will be located totally within the land boundary of the Enterprise territory and will not require any additional land. Husk fired boilers and a turbo-generator are not water pollution source.

The only fuel for CHP plant is husk. Combustion of biomass doesn't add to the total emission of carbon dioxide as long as the burned biomass doesn’t exceed the renewed production. Therefore the project brings greenhouse gases reduction – 175 542 tonnes of CO_2e, waste reduction – 182 700 tonnes of SSH during 2008-2012 and the reduction of electricity consumption from national power grid – 43.68 million KWh.

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:

Total environmental impacts of project scenario in comparison with baseline scenario will be positive.

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 during the determination procedure.

REFERENCES

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[2] Analysis of SSH consumption. Ukrainian Research Institute for Oils and Fats, Kharkiv, 01 Jul 2008.

[3] Public Letter from the Prime Minister of Ukraine Yuliya Tymoshenko to the President of Ukraine Victor Yuschenko/.20.02.2006. http://www.topicnews.net/n_1506.htm - Access mode, 24 Jun 2008

[4] BP Statistical Review of World Energy June 2005 http://www.bp.com/liveassets/bp_internet/switzerland/corporate_switzerland/STAGING/local_assets/downloads_pdfs/s/statistical_review_of_world_energy_2005.pdf - Access mode, 13 Feb 2009

[5] IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan. http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html - Access mode, 13 Feb 2009

[6] Letter of steam consumption from PSOEM, 10 Jun 2008.

[7] Ukraine - Assessment of new calculation of CEF. TÜV SÜD Industrie Service GmbH, 17 Aug 2007

[8] The Letter From the Ministry of Environment of Ukraine (relative to husk dispose on a landfill), 21 Apr 2009.

[9] Questionnaire of PSOEM, 15 Feb 2007.

[10] The letter about costs of waste disposing at the nearest landfill to PSOEM, 31 Mar 2008.

[11] The Law of Ukraine On Waste of March 5th, 1998 # 187/98- http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=187%2F98-%E2%F0 - Access mode, 13 Feb 2009

ABBREVIATIONS

PSOEM	-	The industrial complex of Peresechansk Sunflower Oil Extraction Mill
Kolos	-	CJSC “Kolos”
The Enterprise	-	LLC ‘Peresechansk Sunflower Oil Extraction Mill.’
SSH	-	Sunflower Seed Husk
SS	-	Sunflower Seeds
CAGR	-	Compound Annual Growth Rate
NCV	-	Net Calorific Value
NPV-AC	-	Net Present Value – Aggregated Cost
GHG	-	Green House Gases

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	LLC ‘Peresechansk oil extraction mill.’
Street/P.O.Box:	Centralna str
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URL:	
Represented by:	
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Annex 2

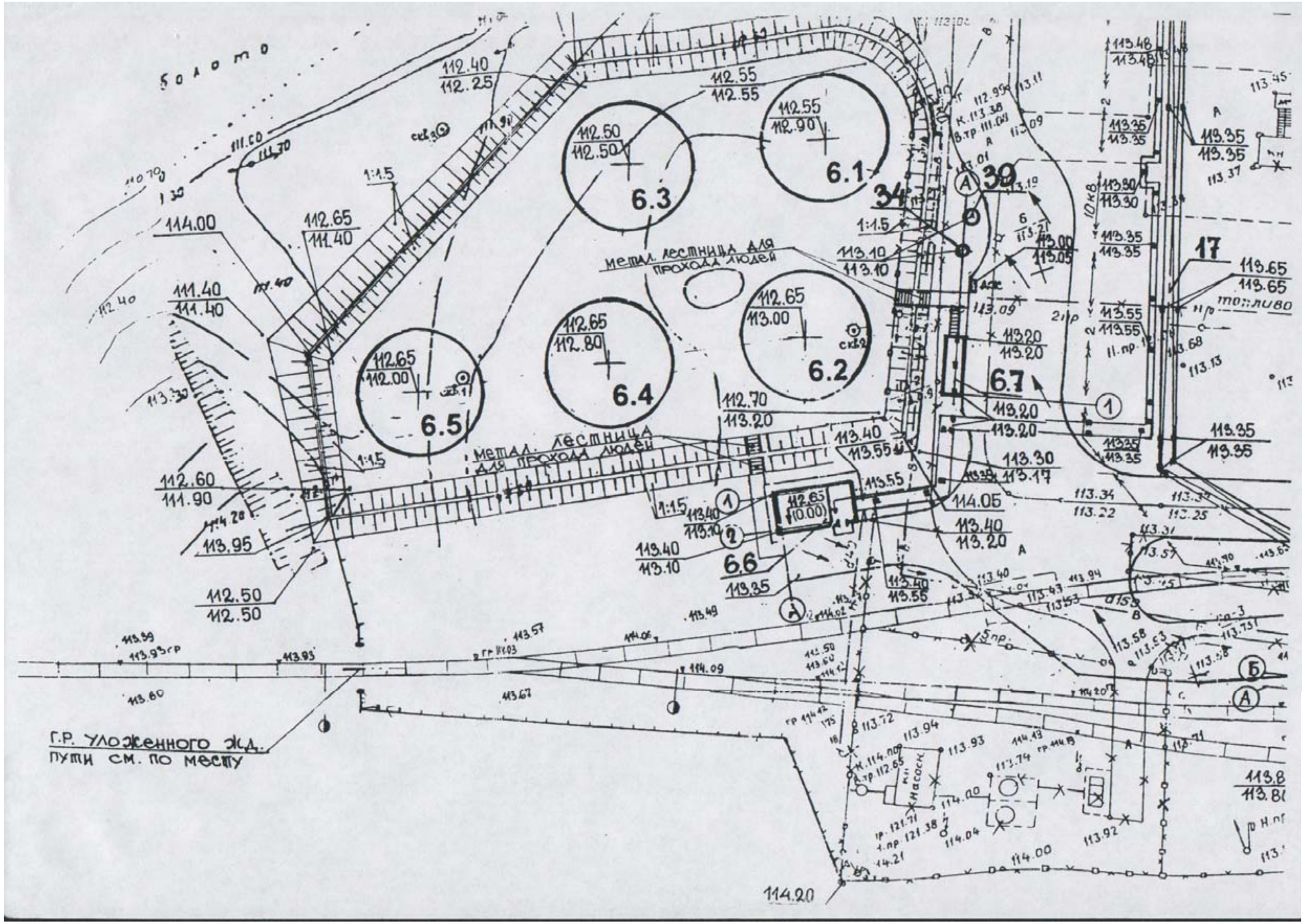
BASELINE INFORMATION

Production volumes and associated data [9]

#	Data	2005	2006	2007	2008	2009	2010	2011	2012
1	Sunflower oil, tons	26,430	52,870	70,280	82,560	82,560	94,600	94,600	94,600
2	Sunflower cake, tons	22,750	45,490	60,470	71,040	71,040	81,400	81,400	81,400
3	Sunflower seeds, tons	61,470	122,950	163,440	192,000	192,000	220,000	220,000	220,000
4	Generated sunflower seed husk, tones	10,758	21,516	28,603	33,600	33,600	38,500	38,500	38,500
5	Enterprise thermal energy demand, GJ	75,416	151,296	201,120	236,265	236,265	270,720	270,720	270,720
6	Electricity consumption, million KWh	4.1	8.02	8.4	8.4	10.92	10.92	10.92	10.92

For more detailed information related to the baseline and project scenarios, please, consider the attached Excel file "NPV-AC_Peresechansk.xls", spreadsheets "Baseline Scenario (Scenario 1)" and "Project Scenario (Scenario 2)".

Annex 2.3.
Layout of PSOEM



Annex 3

MONITORING PLAN

See section D.

Annex 4

Investment analysis

The analysis, in the form of net present value aggregated costs calculation and comparison, is given in the attached Excel file "NPV-AC_Peresechansk.xls".