Joint implementation monitoring report form

Monitoring period is 01.01.2010 – 31.12.2010

Version 02

Contents:

Section A. General information about the project and monitoring

A.1. Title of the project activity

«Realisation of a complex of energy saving activities at the JSC "Odessa Port Plant"»

A.2. Registration number of the joint implementation project

In the International Transaction Log (ITL) the project has obtained identification number UA1000193.

A.3. Brief description of the project activity

Project activity is aimed at improvement in power efficiency of the plant by the implementation of 3 subprojects. The main purpose of the planned activities implementation for the power efficiency improvement of the production in JSC "OPP" is to decrease natural gas burnt for ammonia production and heat energy generation for production and heating needs of the plant impelling greenhouse gases emissions to reduce.

1. **Installation of waste heat boilers for the flue gases** – as a result of this subproject implementation, during 2001-2004 the waste heat boilers were installed, allowing to recover heat of the flue gases from gas-turbine engines. The main purpose of this activity is to decrease natural gas volumes burnt by the boiler shop of JSC "OPP" to generate heat energy for production and heating needs of the plant. The flue gas heat recovery by waste heat boilers allows to generate steam necessary for urea production and to heat up the water in the network of the plant. This heat energy partly substitutes one that is generated by the boiler shop leading to the reduction of natural gas volumes burnt by the boiler shop for heat energy recovery.

2. **Modernization of two urea production units** – as a result of this subproject implementation, in 2001 a phased modernization of two urea production units started. The aim of the modernization is to install highly efficient equipment permitting to decrease amounts of heat and electric energy used for urea production, at the same time allowing to reduce the amounts of fossil fuel burnt for the energy recovery. Reduction of heat energy volume for the urea production will lead to the decrease in amounts of heat energy generated by the boiler shop and, as a result, reducing consumption of natural gas by the boiler shop. Reduction of the electric power consumption will permit to reduce its consumption from Ukraine's Electricity Transmission Grid leading to the decrease of the burning volume of fossil fuel for electric energy production by power plants in Ukraine.

3. **Modernization of two ammonia production units –** as a result of this subproject implementation, in 2004 a phased modernization of two ammonia production units started. The purpose of modernization is to reduce consumption of natural gas for ammonia production. Natural gas, used for ammonia production, has two functions:

- technological purposes – the natural gas is used directly for the chemical ammonia synthesis providing necessary chemical elements for the process. Data on consumption of technological gas is used to calculate amounts of ammonia produced;

- fuel purposes – this natural gas is necessary to provide required temperatures for chemical synthesis. It is the gas which is planned to reduce in natural gas consumption for ammonia production.

Natural gas consumption reduction was achieved from power efficient equipment installation allowing to reduce the rate of natural gas specific consumption for ammonia production.

A.4. Monitoring period

Commencement date is 01.01.2010
Completion date is 31.12.2010

A.5. Methodologies referred to the project activity

The baseline and monitoring plan for this project were chosen according to "Guidance on criteria for baseline setting and monitoring" (version 02). Correspondently to the document request, the selection of the baseline and monitoring plan can be stated on a certain approach that is used only for a specific project of joint implementation, or on a standard approach with a use of methodologies including small-scaled that are approved by the Joint Implementation Supervisory Committee.

Since this project consists of several subprojects that are aimed at different key factors allowing to reduce greenhouse gas emission, the baseline and the monitoring plan were determinated on the basis of certain approach. According to "Guidance on criteria for baseline setting and monitoring" (version 02) for such projects, based on the certain approach, specific methodological parts can be included into the baseline and monitoring plan determination, that are approved by the Joint Implementation Supervisory Committee. For the baseline and monitoring plan determination of this project, specific elements of consolidated methodology ACM0012 "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" (version 3.2) were use. One of three subprojects, namely "Installation of waste heat boilers for the flue gases", completely conforms with the object of this methodology, therefore, to determine basic emissions and monitoring plan of this subproject, the indicated methodology requirements were used. Subproject "Modernization of two urea production units" presumes calculation of the heat and electric energy consumption for urea production, and methodology ACM0012 "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" (version 3.2) states the requirements for calculation of the heat and electric energy amounts, therefore, specific parts of the indicated methodology were used for this subproject. Monitoring plan approved for the proposed joint implementation project is supposed to provide all the necessary data required for calculation of the emission levels under the basic and design scenarios accordingly to amount of emission reduction in result of the proposed joint implementation project realization, therefore, in order to ascertain the baseline and monitoring plan of the "Modernization of two ammonia production units" subproject , the requirements of "National Cadastre of anthropogenic emissions from the sources and capture by absorbers of greenhouse gases in Ukraine during 1990-2008" (hereinafter National Cadastre of Ukraine) were applied.

A.6. Status of implementation, including project major parts schedule

Table 1 – Status of project implementation during monitoring period under review.

Name of the phase	Commencement date	Completion date
Revamp of low-temperature convection part of the reformer in the ammonia production unit #2	20/05/2008	14/04/2010

The schedule of the implementation is in accordance with PDD version 01.

A.7. Planned deviation and revision of the registered PDD

- approach of emission calculation of “Modernization of two ammonia production units” subproject was changed;

- value of carbon oxidation factor during the natural gas combustion ($OXID_{NG}$) was changed. Data of this parameter in PDD was accepted according to "Key principles of national greenhouse gases inventorying IPCC”, 2006, although, since the indicated document is not yet approved at the parties conference, but is only prepared for the parties conference approval, the factor determined by “Reviewed key principles of national greenhouse gases inventorying IPCC”, 1996 was used for calculation herein;

- only one greenhouse gases emission factor value was used for National Energy Grid System of Ukraine (NEGSU) (unlike PDD), namely: a factor of greenhouse gases emission during consumption reduction or increasing of electric power from NEGSU.

A.8. Planned deviation and revision of the registered monitoring plan

During the reviewed monitoring period no deviation or revision of monitoring plan are considered.

A.9. Official responsible for the monitoring report preparation and presentation

JSC “OPP”

Deputy Chief Engineer, Chief of the technical and production department, Lisovsky L.V.

LLC “Center TEST”

Director, Kolesnikov V.V.

Section B. Key monitoring activities

Key monitoring activities:

- measurement of the heat energy amount from waste heat boilers for the flue gases;
- registering of operational time of waste heat boilers for the flue gases;
- measurement of the power energy consumed by urea production units;
- measurement of the heat energy consumed by urea production units;
- calculation of urea amount produced;
- measurement of the natural gas consumed by ammonia production units;
- calculation of ammonia produced;
- low temperature of the natural gas combustion.

Measurements of the heat energy amount from waste heat boilers for the flue gases, as well as the heat energy consumed by urea production units are taken by sections of heat measurements. Location scheme of heat measurement sections are shown on the figure 1.

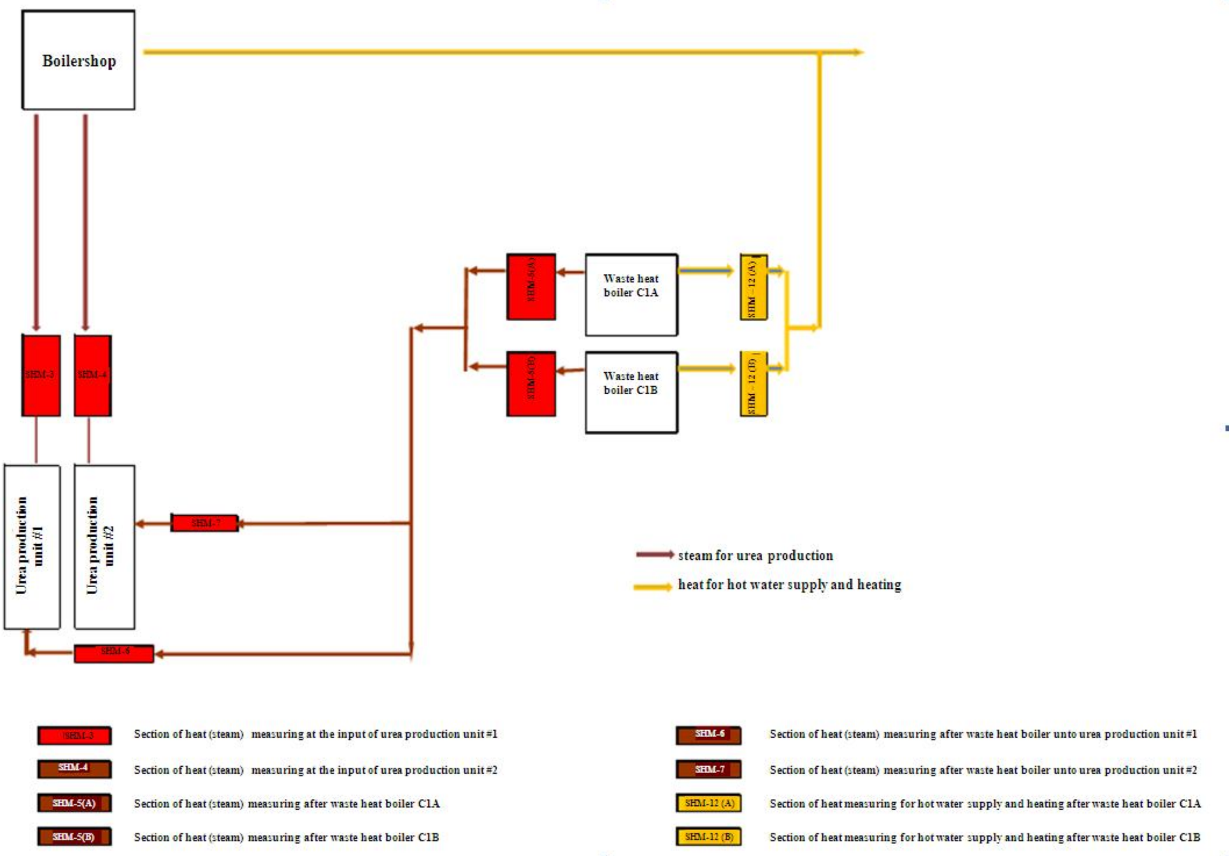

Figure 1 – Location scheme of the sections of heat measurement.

Measurements of the power energy consumed by urea production units are taken by power measurement sections. Location scheme of power measurement sections are shown on the figure 2.

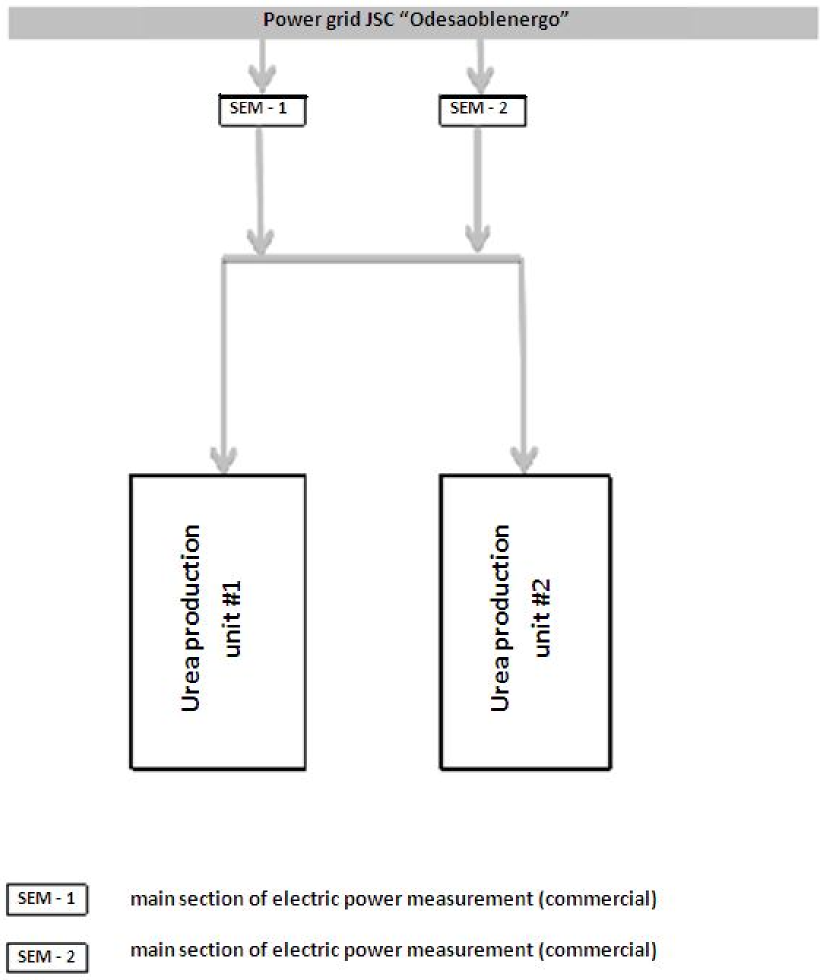

Figure 2 - Location scheme of electric power measurement sections.

Measurements of the natural gas consumed by ammonia production units are taken by gas measuring sections. Location scheme of gas measuring sections are shown on the figure 3.

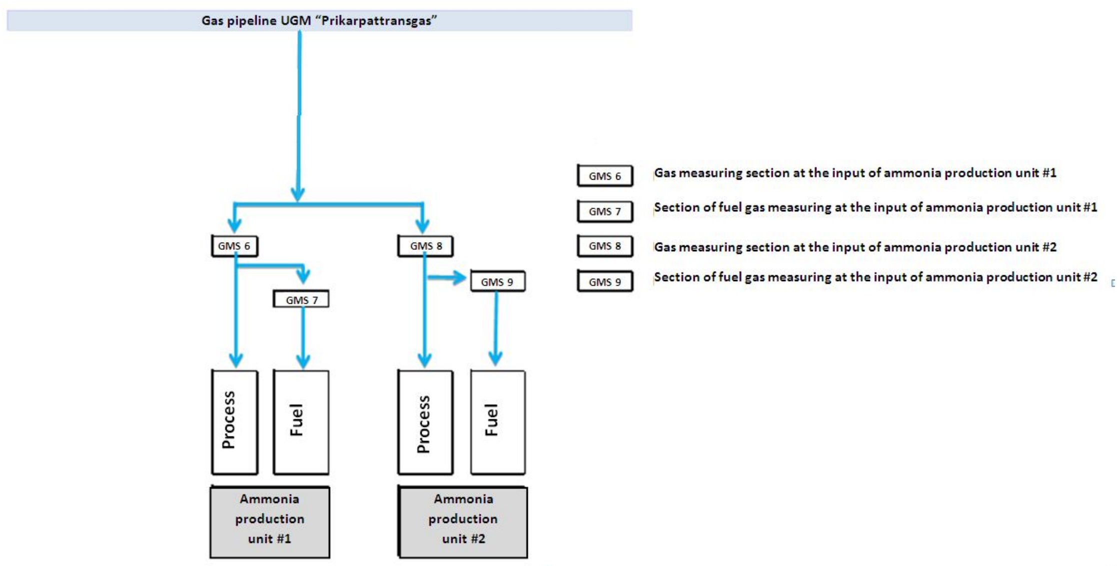

Figure 3 - Location scheme of gas measuring sections.

Registering of operational time of waste heat boilers for the flue gases in the ammonia terminal is equal to operational time of gas-turbine engines. Operational time of gas-turbine engines is controlled by shift manager of the ammonia terminal. Registered results of gas-turbine engines operational time are recorded in technological registers (registration of equipment operational time), afterwards an economist registers data in APM Mechanics software that automatically carries out correspondent calculations to include data into technical and production reports monthly.

Calculation of produced urea and ammonia is conducted according to the "Method of calculating urea output by urea production plant" and to the "Calculation method of ammonia plant productivity in the ammonia production department" relatively.

Measurement of low temperature of the natural gas combustion every month is conducted by technical control department of JSC OPP which is certified by state metrological system entitling to conduct correspondent measurements. Value of low temperature of the natural gas combustion is recorded in technical and production reports in ammonia production.

B.1. Type of monitoring equipment

Monitoring equipment of this project is sections of relating energy resources measurements. The main element of the measurement section is a primary transducer (meter) that is subject to periodic inspection or calibration. Detailed information relating the measurement sections and primary transducers (meters) is drawn below

B.1.1. A table of detailed information concerning measuring equipment (including type, manufacturing number, last inspection date, error information, required replacement or changes):

Related data is drawn in the table 2.

Table 2

Measurement section (according to the scheme)	Means of measuring equipment (meter, transducer)	Type	Manufacturing number	Technological position	Error	Date of last inspection (calibration)	Date of next inspection (calibration)
1	2	3	4	5	6	7	8
Section of heat (steam) energy measurements at the input of urea production unit #1 SHM-3	Pressure difference transducer	STD-120	701002	1F2004	Accuracy class 0.5	14.10.2010	4th quarter. 2012
	Surplus pressure transducer	STG-674	0797701018	1P2126	Accuracy class 0.5	15.10.2010	4th quarter. 2012
	Resistive temperature transducer	ТСП-1287	01	1T2324	Tolerance class “B”	03.09.2010	3rd quarter. 2012
Section of heat (steam) energy measurements at the input of urea production unit #2 SHM-4	Pressure difference transducer	STD-120	0457006	2F2004	Accuracy class 0.5	27.06.2010	2nd quarter 2012
	Surplus pressure transducer	STG-674	660017	2P2126	Accuracy class 0.5	25.06.2010	2nd quarter 2012
	Resistive temperature transducer	ТСП-1287	02	2T2324	Tolerance class “B”	03.09.2010	3rd quarter. 2012
Section of heat (steam) energy measurements after waster heat boilers unto urea production unit #1 SHM-6	Differential indicator	ST-3000	600904	1F2037	Accuracy class 0.5	14.10.2010	4th quarter. 2012
	Pressure transducer	STG94LR-A10	001003	P2122	Accuracy class 0.5	19.08.2010	3rd quarter. 2012
	Thermoelectric transducer	ТХК-2088	011	1T2391	±2.5 ^{0}C	09.09.2010	3rd quarter. 2012
Section of heat (steam) energy measurements after waster heat boilers unto urea production unit #2 SHM-7	Differential indicator	ST-930	600905	2F2037	Accuracy class 0.5	27.06.2010	2nd quarter 2012
	Pressure transducer	STG94LR-A10	001003	P2122	Accuracy class 0.5	19.08.2010	3rd quarter. 2012
	Thermoelectric transducer	ТХК-2088	022	2T2391	±2.5 ^{0}C	09.09.2010	3rd quarter. 2012
Section of heat(steam) energy measurement after the waste heat boiler C1A SHM-5(A)	Pressure differential indicator	STD-924	985109	WP050A	Accuracy class 0.5	15.07.2010	3rd quarter. 2011
	Pressure transmitter	STG-94L	985032	WP040A	Accuracy class 0.5	13.05.2010	2nd quarter 2011
	Resistive temperature transducer	ТСП-8040P	476	WT060A	Tolerance class “B”	30.08.2010	3rd quarter. 2012
Section of heat(steam) energy measurement after the waste heat boiler C1B SHM-5(B)	Pressure differential indicator	STD-924	985109	WP050	Accuracy class 0.5	15.07.2010	3rd quarter. 2011
	Pressure transmitter	STG-94LR	985028	WP040B	Accuracy class 0.5	10.02.2010	1st quarter 2011
	Resistive temperature transducer	ТСП-8040P	477	WT060B	Tolerance class “B”	30.08.2010	3rd quarter. 2012
Section of heat energy measurement for hot water supply and heating after the waste heat boiler C1A SHM-12 (A)	Pressure differential indicator	STD-930	300301	WP120	Accuracy class 0.5	17.11.2010	4th quarter 2011
	Pressure transmitter	STG-94LR	985041	WP080	Accuracy class 0.5	16.06.2010	2nd quarter 2011
	Resistive temperature transducer	ТСП-8040P	05	WT080	Tolerance class “B”	30.08.2010	3rd quarter. 2012
	Resistive temperature transducer	ТСП-8040P	001	WT010A	Tolerance class “B”	14.02.2011	1st quarter 2013
Section of heat energy measurement for hot water supply and heating after the waste heat boiler C1A SHM-12 (B)	Pressure differential indicator	STD-930	300301	WP120	Accuracy class 0.5	17.11.2010	4th quarter. 2011
	Pressure transmitter	STG-94LR	985041	WP080	Accuracy class 0.5	16.06.2010	2nd quarter 2011
	Resistive temperature transducer	ТСП-8040P	05	WT080	Tolerance class “B”	30.08.2010	3rd quarter. 2012
	Resistive temperature transducer	ТСП-8040P	07	WT010B	Tolerance class “B”	28.01.2011	1st quarter 2013
Main section of electric power measurement (commercial) SEM-1	Power energy meter	AIR-3-AL-C8-T	01005047	Main SD Substation ‘Khimichna' Inlet 2	Accuracy class 0.2	16.12.2008	4th quarter. 2014
Main section of electric power measurement (commercial) SEM-2	Power energy meter	AIR-3-AL-C8-T	01005043	Main SD Substation ‘Khimichna' Inlet 1	Accuracy class 0.2	17.11.2008	4th quarter 2014

1	2	3	4	5	6	7	8
Gas measuring section at the input of the ammonia production unit #1 GMS -6	Natural gas consumption meter	STD 924-E1A	820392	F59	Accuracy class 0.5	15.04.2009	2nd quarter 2011
Fuel gas measuring section at the input of the ammonia production unit #1 GMS -7	Natural gas consumption meter	STD 924	820394	F60	Accuracy class 0.5	14.10.2009	4th quarter 2011
Gas measuring section at the input of the ammonia production unit #2 GMS -8	Natural gas consumption meter	STD 924	820391	2F59	Accuracy class 0.5	09.11.2010	4th quarter. 2012
Fuel gas measuring section at the input of the ammonia production unit #2 GMS -9	Natural gas consumption meter	STD 924	820393	2F60	Accuracy class 0.5	20.07.2010	3rd quarter. 2012
Measuring low temperature of the natural gas combustion	Chromatograph	GC-8A PT	16857	-	3%	11.03.2010	1st quarter 2011

B.1.2. Procedure of inspection (calibration)

Means of measuring equipment, meters and transducers listed in table 2, are subject to periodic inspection or calibration. Data of the inspection procedure (calibration) is shown in table 3.

Table 3

Measuring equipment (meter, transducer, etc.)	Interval between the inspections (calibration), years
Pressure difference transducer STD-120	2
Surplus pressure transducer STG-674	2
Differential indicator ST-3000, ST-930	2
Pressure transducer STG94LR-A10	2
Pressure difference indicator STD-924, STD-930	1
Pressure transmitter STG-94L, STG-94LR	1
Resistive temperature transducer ТСП-1287	2
Thermoelectric transducer ТХК-2088	2
Resistive temperature transducer ТСП-8040Р	2
Power energy meter AIR-3-AL-C8-T	6
Natural gas consumption meter STD 924	2
Natural gas consumption meter STD 924-E1A, STD 924	2
Chromatograph GC-8A PT	1

B.1.3. Participation of third party

SE "Odessastandardmetrology" is authorized body, entitled to conduct inspection and calibration of measuring equipment.

B.2. Data collection (total data of all monitoring period)

Structure of monitoring management is shown in figure 4.

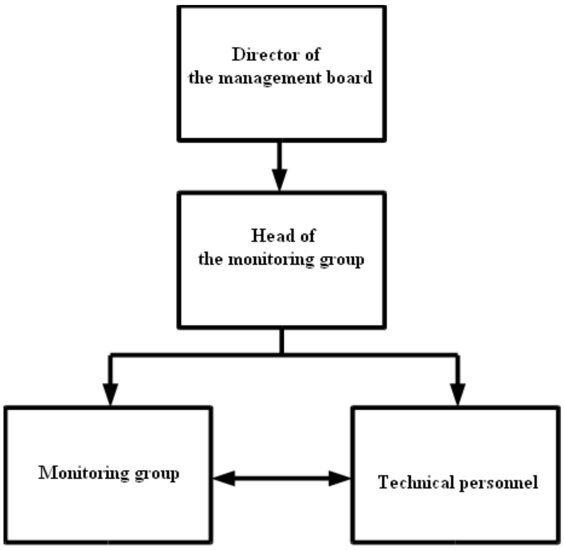

Figure 4 - Management Structure of monitoring and operation

Measurement and data collection from measurement results are the responsibility of technical personnel. The technical personnel deliver the measurement results to monitoring group to organize calculating of units of greenhouse gases emission reduction. The calculation of emission reduction units is performed by joint implementation project developer. The monitoring group is also responsible for data collection that is not subject to measuring, but is to monitoring.

From monitoring results, correspondent data was determined, that is used for calculation of greenhouse gases emission reduction. Digital value of this data is shown in table 4 in accordance with PDD variables.

Table 4

Title	Variables	Digital value and unit of measurement	
1	2	3	
Amount of heat energy generated by the waste heat boilers for the flue gases	$HG_{boilers}$	Month	Tcal
		January	5,310
		February	7,912
		March	10,501
		April	7,778
		May	10,230
		June	9,333
		July	10,308
		August	9,101
		September	13,340
		October	13,235
		November	9,503
		December	9,379
		Total for 2010	**115,930**
Operational time of the waste heat boilers for the flue gases	$T_{boilers}$	Month	hour
		January	411
		February	673
		March	744
		April	576
		May	744
		June	720
		July	744
		August	744
		September	745
		October	744
		November	673
		December	744
		Total for 2010	**8 262**
Amount of electric power energy consumed by urea production units	EC_{urea}	Month	MW·hour
		January	14 000
		February	12 430
		March	14 580
		April	14 500
		May	14 700
		June	11 560
		July	15 150
		August	15 000
		September	14 500
		October	13 400
		November	15 000
		December	15 500
		Total for 2010	**170 320**

1	2	3		
Amount of heat energy consumed by urea production units	HC_{urea}	Month	Tcal	
			Urea production unit №1	Urea production unit №2
		January	26,824	26,167
		February	23,140	24,857
		March	24,215	30,883
		April	24,378	28,939
		May	23,519	28,132
		June	25,530	22,232
		July	25,854	32,076
		August	25,948	30,050
		September	25,041	32,236
		October	18,158	31,980
		November	24,598	31,501
		December	26,554	32,856
		Total for 2010	**293,759**	**351,909**
Amount of urea produced	P_{urea}	Month	t	
			Urea production unit №1	Urea production unit №2
		January	39 573	39 637
		February	35 824	33 710
		March	39 979	42 441
		April	38 497	41 325
		May	39 667	41 166
		June	36 166	28 799
		July	38 795	41 120
		August	38 872	40 408
		September	38 386	40 362
		October	28 625	43 264
		November	39 770	41 914
		December	40 922	43 494
		Total for 2010	**455 076**	**477 640**
Amount of natural gas consumed by ammonia production units	$FC_{NG,ammonia}$	Month	million. m^3	
			Ammonia production unit №1	Ammonia production unit №2
		January	-	55,211446
		February	20,967012	49,815281
		March	49,725067	53,748242
		April	52,278437	51,609915
		May	53,348440	51,338652
		June	52,314752	52,283416
		July	53,422314	54,000489
		August	54,436787	53,250441
		September	52,788506	52,704466
		October	53,109604	53,590092
		November	51,830955	52,232285
		December	53,260890	53,445781
		Total for 2010	**547,482764**	**633,230506**

<table>
<tr><td>1</td><td>2</td><td colspan="3">3</td></tr>
<tr><td rowspan="15">Amount of ammonia produced</td><td rowspan="15">$P_{ammonia}$</td><td rowspan="2">Month</td><td colspan="2">t</td></tr>
<tr><td>Ammonia production unit №1</td><td>Ammonia production unit №2</td></tr>
<tr><td>January</td><td>-</td><td>52 766</td></tr>
<tr><td>February</td><td>17 893</td><td>47 677</td></tr>
<tr><td>March</td><td>46 689</td><td>52 610</td></tr>
<tr><td>April</td><td>50 032</td><td>50 309</td></tr>
<tr><td>May</td><td>50 905</td><td>48 780</td></tr>
<tr><td>June</td><td>49 168</td><td>50 659</td></tr>
<tr><td>July</td><td>50 446</td><td>51 815</td></tr>
<tr><td>August</td><td>49 302</td><td>47 591</td></tr>
<tr><td>September</td><td>48 768</td><td>50 313</td></tr>
<tr><td>October</td><td>50 774</td><td>52 375</td></tr>
<tr><td>November</td><td>49 599</td><td>50 772</td></tr>
<tr><td>December</td><td>50 870</td><td>51 946</td></tr>
<tr><td>Total for 2010</td><td>514 446</td><td>607 613</td></tr>
<tr><td rowspan="13">Low temperature of the natural gas combustion</td><td rowspan="13">NCV_{NG}</td><td>Month</td><td colspan="2">Tcal/million. m^3</td></tr>
<tr><td>January</td><td colspan="2">8,061</td></tr>
<tr><td>February</td><td colspan="2">8,043</td></tr>
<tr><td>March</td><td colspan="2">8,078</td></tr>
<tr><td>April</td><td colspan="2">8,124</td></tr>
<tr><td>May</td><td colspan="2">8,191</td></tr>
<tr><td>June</td><td colspan="2">8,190</td></tr>
<tr><td>July</td><td colspan="2">8,074</td></tr>
<tr><td>August</td><td colspan="2">8,088</td></tr>
<tr><td>September</td><td colspan="2">8,081</td></tr>
<tr><td>October</td><td colspan="2">8,055</td></tr>
<tr><td>November</td><td colspan="2">8,091</td></tr>
<tr><td>December</td><td colspan="2">8,123</td></tr>
</table>

B.2.1. List of other parameters used for calculation

Other parameters used for calculation of greenhouse gases emission reduction are not subject to measuring. The list of these parameters is shown in table 5. Parameter variables in table 5 are indicated in accordance with PDD variables.

Table 5

Title	Variables	Digital value and unit of measurement	Data source
1	2	3	4
A factor of NEGSU emission for the projects of reduction or increasing of electric power consumption	$EF_{co2,elec}$	0,896 t $CO_{2\ e}$/MW hour	Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5)
Electric capacity of the equipment to sustain operational mode of one waste heat boiler for flue gases	$W_{boilers}$	0,0888 MW	Registration certificate of the equipment
Power efficiency (ECE) of the plant boiler shop	η_{boiler}	87%	"Instrument for determination of basic efficiency of heat/electric energy generation systems" (version 01)
Factor of carbon oxidation during the natural gas combustion	$OXID_{NG}$	0,995	"Key principles of national greenhouse gases inventorying IPCC, 1996"

1	2	3	4
Carbon content in natural gas	W_{NG}	15,3 t C/TJ	"National Cadastre of Ukraine"
Specific electric power consumption for urea production according to the baseline	$SEC_{urea,elec,b}$	0,1935 MW·hour/t	For this parameter, a fixed value was accepted, which was based on historical data of urea production units operation within 3 years until the project activities began
Specific heat energy consumption for urea production according to the baseline	$SEC_{urea,term,b}$	$0{,}8242 \cdot 10^{-3}$ Tcal/t	For this parameter, a fixed value was accepted, which was based on historical data of urea production units operation within 3 years until the project activities began
Specific natural gas consumption for ammonia production according to the baseline	$SEC_{ammonia,b}$	1 156 m^3/t – for ammonia production unit #1; 1 147 $м^3$/т – for ammonia production unit #2	For this parameter, a fixed value was accepted, which was based on historical data of urea production units operation within 3 years until the project activities began

B.2.2 Leakage data

Not applied for this project

B.2.3. Environmental impact

Proposed introductions into existing scheme of the production will positively influence on the environment, owning to reduction of the energy resources for the production, leading to a decrease of the greenhouse gases emission and pollution of the atmosphere.

Emission will reduce due to this project realization, namely:

- the subproject "Installation of waste heat boilers for the flue gases" will allow to reduce amount of natural gas burnt for heat energy generation in boiler shop of the plant, thus decreasing greenhouse gases emissions and pollution of the atmosphere;

- the subproject "Modernization of two urea production units" will allow to reduce specific electric and heat energy consumption for production of one ton of urea. The decrease of specific heat energy consumption will result in reduction of natural gas burnt in the boiler shop for heat energy generation, thus decreasing greenhouse gases emissions and pollution of the atmosphere. The reduction of specific electric power consumption will result in a decrease of electric power supplied by Electricity Transmission Grid of Ukraine, reducing the amount of fossil fuel for electric power generation at power plants of Ukraine;

- the subproject "Modernization of two ammonia production units" will allow to reduce natural gas consumption for ammonia production, thus decreasing greenhouse gases emissions and pollution of the atmosphere.

Emissions reduction achieved due to this project implementation doesn't have any negative impact on the environment of Ukraine and does not influence on greenhouse gases emissions abroad.

According to the requirements of the Ukrainian legislation in force, namely the law of Ukraine "On environmental protection" №1264-XII dated 25.06.1991 and DBN A.2.2-1, the implementation of this project does not demand ecological assessment and thereafter elaboration of EIA.

B.2.4. Data processing and archiving

Measuring and primary archiving the results are the responsibility of technical personnel. The technical personnel submit measurements results to the monitoring group to organize work for estimation of greenhouse gases emissions reduction. The calculation of emission reduction units is performed by joint implementation project developer. The functions of the monitoring group also include collection of non-measured data which are also subject to the monitoring. The monitoring group is obliged to make a back up copy of monitoring data which should be stored apart from the main data to avoid their loss in case of force majeure situation, which can cause the monitoring data loss.

All information about monitoring data and corrective measures are to be archived for future verification of emissions reduction level. The head of the monitoring group is responsible for preparation and archiving of monitoring reports. The director of the management board analyses summarized monitoring data and relevant documentation from time to time.

Figure 5 shows a scheme of collecting and archiving of monitoring data.

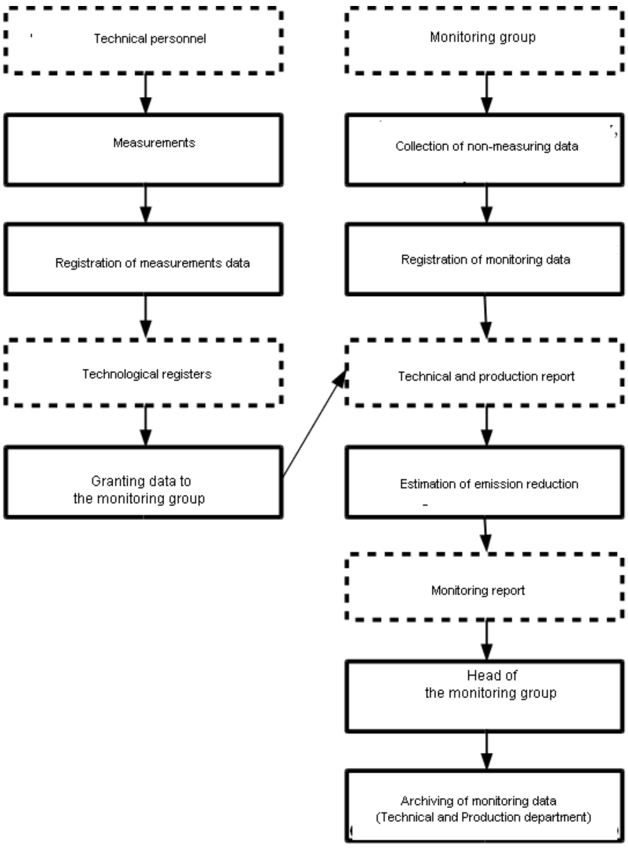

Figure 5 - Scheme of collecting and archiving of monitoring data.

B.2.5. Registration of emergency situations and process accidents

During reviewed monitoring period the following incidents were registered on the equipment, used for the project:

19.02.2010 – an emergency stop of main and subsidiary equipment in the urea production unit #1 and #2 occurred due to electric power drop in the external grid and 110 kV power line "Centrolit – Khimichna-Ammiachna" shutdown;
13.03.2010 – syn-gas compressor in ammonia production unit #1 stopped due to failure of controlling systems for turbine regulating valves;
15.04.2010 – syn-gas compressor in ammonia production unit #2 stopped for leakage elimination in turbine drains;
02.05.2010 – urea production unit #2 stopped for elimination of ammonium carbonate solution leakage in gas HP pipeline thermal pocket;
24.05.2010 – a stop of the process air compressor in ammonia production unit #2 due to drive failure of controlling systems for turbine regulating valves;
06.06.2010 - an emergency stop of main and subsidiary equipment in the urea production unit #2 occurred due to electric power drop in the external grid and 110 kV power line "Centrolit – Khimichna-Ammiachna" shutdown;
08.06.2010 – urea production unit #1 stopped in connection with emission through flanged joint of the top cover of the HP compressor;
09.07.2010 - an emergency stop of main and subsidiary equipment in the urea production unit #1 occurred due to electric power drop in the electrical power grid;
31.07.2010 - an emergency stop of the ammonia production unit #2 due to rupture of the locking part of FC-37 valve;
21.11.2010 – an emergency stop of syn-gas compressor in ammonia production unit #2 due to failure of controlling system drive of turbine regulating valves;
24.12.2010 – a failure of constant power supply unit UPS 2 in ammonia production unit #2 due to inventor break;
30.12.2010 – urea production unit #1 stopped in order to change brushes in the synchronic electric motor of centrifugal compressor.

All the abovementioned events were timely eliminated by the technical personnel of JSC "OPP".

Section C. Quality assurance and quality control measures

C.1. Registered procedure and management plan

C.1.1. Role and obligation

The structure of the monitoring group, its functions and obligations identified by order of the Director of JSC "OPP" #282 dated 19.07.2010. Before the order was issued, the technical and production department had responsibilities of the monitoring group and the obligations of the head of the monitoring group were performed by the chief of the technical and production department.

The director of the JSC "OPP" appoints personnel for operation and maintenance of technical equipment needed for the project. Their functions also include registration of all data necessary for monitoring. The head of the monitoring group of fuel supply system operational data is deputy chief engineer – head of technical and production department of the JSC "OPP". The monitoring is conducted in close collaboration with technical personnel and will include the monitoring itself and also analysis and archiving of all data determined in the previous section. The functions of monitoring group will also include the work organization for estimation of emissions reduction level. The calculation of emission reduction units is performed by joint implementation project developer. Periodic data on energy sources consumption will be analyzed according to relevant registered data obtained from the technical personnel to approve data credibility. In case of inequality of these data the cause of its appearance must be found in collaboration with the technical personnel. If the discrepancy of monitoring data is found, monitoring system of relevant data must be corrected.

The head of the monitoring group is responsible for preparation and archiving of monitoring reports. The director analyses general monitoring data and relevant documentation from time to time.

Technical personnel record the results of measurements in the relevant registers and submit them to the monitoring group to organize work for estimation of greenhouse gases emissions reduction. The calculation of emission reduction units is performed by joint implementation project developer. The functions of the monitoring group also include collection of non-measured data which are also subject to the monitoring. The monitoring group registers the monitoring data in the technical and production reports.

The monitoring data is kept during the whole crediting period and 2 year after the last charge of emission reduction unit.

C.1.2. Training

Technical personnel of JSC "OPP" have been prepared to operate new equipment and to conduct relevant preventive activities.

C.2. Measures of the internal audit and control

JSC "OPP" personnel are under periodic exams for knowing of safety and health requirements. Means of the measuring equipment (meters, transducers) used for monitoring are subject to periodic inspection (calibration).

The responsibility for keeping measuring equipment (meters, transducers) in proper condition and timely repairs, inspections (calibrations) is taken by chief metrologist of JSC "OPP".

While the measuring equipment (meters, transducers) is being under repairing, the monitoring data is collected by accessory (duplicated) measurement section of the relevant energy resources. Owning to availability of accessory (duplicated) measurement section there is no risk of lack of monitoring data required for calculation of emission reduction.

Section D. Estimation of greenhouse gases

D.1. Project emissions

The project scenario emissions are calculated by the following formula:

$PE_y = PE_{boilers,y} + PE_{urea,y} + PE_{ammonia,y}$,

where,
PE_y – emission level during a year according to the project scenario, t $CO_{2\ e}$;
$PE_{boilers,y}$ – emission level during a year according to the project scenario of subproject "Installation of waste heat boilers for flue gases", t $CO_{2\ e}$;
$PE_{urea,y}$ – emission level during a year according to the project scenario of subproject "Modernization of two urea production units", t $CO_{2\ e}$;
$PE_{ammonia,y}$ – emission level during a year according to the project scenario of subproject "Modernization of two ammonia production units", t $CO_{2\ e}$.

$PE_{boilers,y} = EC_{boilers} \cdot EF_{co2,elec}$,

where,
$EC_{boilers}$ – electric power needed for maintaining operational modes of waste heat boilers for flue gases, MW·hour;
$EF_{co2,elec}$ – factor of NEGSU emissions for the projects of reduction or increasing of electric power consumption, t $CO_{2\ e}$/MW·hour.

$EC_{boilers} = W_{boilers} \cdot T_{boilers}$,

where,
$W_{boilers}$ – electric capacity of the equipment to sustain operational mode of one waste heat boiler for flue gases, MW;
$T_{boilers}$ – operational time of waste heat boilers for flue gases, year.

$PE_{urea,y} = PE_{urea,elec,y} + PE_{urea,term,y}$,

where,
$PE_{urea,elec,y}$ – emissions caused by electric power consumption according to the project scenario, t $CO_{2\ e}$;
$PE_{urea,term,y}$ –emissions caused by heat energy consumption according to the project scenario, t $CO_{2\ e}$.

$PE_{urea,elec,y} = EC_{urea} \cdot EF_{co2,elec}$,

where,
EC_{urea} – amount of electric power consumed by urea production units,MW hour;
$EF_{co2,elec}$ – factor of NEGSU emissions for the projects of reduction or increasing of electric power consumption, t $CO_{2\ e}$/MW·hour.

$PE_{urea,term,y} = HC_{urea} \cdot 4{,}1868 \cdot EF_{co2,NG}/\eta_{boiler}$,

where,
HC_{urea} – amount of heat energy consumed by urea production units, Tcal;
$EF_{co2,NG}$ – emission factor for natural gas combustion, t $CO_{2\ e}$/TJ;

η_{boiler} – power efficiency (Efficiency Factor) of the boiler shop.
4,1868 – standard rate for conversion of Tcak into TJ, TJ/Tcal.

$EF_{co2,NG} = OXID_{NG} \cdot W_{NG} \cdot 44/12$,

where,
$OXID_{NG}$ – factor of carbon oxidation during the natural gas combustion;
W_{NG} – carbon content of natural gas, t C/TJ;
44/12 – stoichiometric ratio between molecular masses of carbon dioxide and carbon, t CO_2/t C.

$PE_{ammonia,y} = FC_{NG,ammonia} \cdot NCV_{NG} \cdot 4,1868 \cdot EF_{co2,NG}$,

where:
$FC_{NG,ammonia}$ – amount of natural gas consumed by ammonia production units, million м^3;
NCV_{NG} – low temperature of the natural gas combustion, Tcal/million m^3;

$EF_{co2,NG}$ – emission factor for natural gas combustion, t $CO_{2\ e}$/TJ;
4,1868 – standard rate for conversion of Tcak into TJ, TJ/Tcal.

The monitoring data for project emission calculation for reviewed monitoring period is shown in the table 4 and 5 herein.

The project scenario emission for the reviewed monitoring period is shown in table 6.

Table 6

Month	Amount of emission under project scenario, t CO_{2e}
January	130 825
February	157 134
March	223 267
April	224 605
May	227 505
June	223 451
July	231 895
August	232 093
September	227 668
October	226 396
November	225 338
December	232 476
Total for 2010	**2 562 653**

D.2. Basic emissions

Baseline emissions are calculated by the following formula:

$BE_y = BE_{boilers,y} + BE_{urea,y} + BE_{ammonia,y}$,

where:
BE_y – emissions during a year according to the baseline, t $CO_{2\ e}$;
$BE_{boilers,y}$ – emissions during a year according to the baseline of “Installation of waste heat boilers for flue gases” subproject, t $CO_{2\ e}$;
$BE_{urea,y}$ – emissions during a year according to the baseline of “Modernization of two urea production units” subproject, t $CO_{2\ e}$;
$BE_{ammonia,y}$ – emissions during a year according to the baseline of “Modernization of two ammonia production units” subproject, t $CO_{2\ e}$.

$BE_{boilers,y} = HG_{boilers}\ 4{,}1868 \cdot EF_{co2,NG}/\eta_{boiler}$,

where:
$HG_{boilers}$ – amount of heat energy generated by waste heat boilers for flue gases, Tcal;
$EF_{co2,NG}$ – emission factor of natural gas combustion, t $CO_{2\ e}$/TJ;
η_{boiler} – power efficiency (Efficiency Factor) of the boiler shop.
4,1868 – standard factor for conversion of Tcal into TJ, TJ/Tcal.

$EF_{co2,NG} = OXID_{NG} \cdot W_{NG} \cdot 44/12$,

where:
$OXID_{NG}$ – factor of carbon oxidation during the natural gas combustion;
W_{NG} –carbon content of natural gas, t C/TJ;
44/12 – stoichiometric ratio between molecular masses of carbon dioxide and carbon, t CO_2/t C.

$BE_{urea,y} = BE_{urea,elec,y} + BE_{urea,term,y}$,

where:
$BE_{urea,elec,y}$ – emissions caused by electric power consumption according to the baseline scenario, t $CO_{2\ e}$;
$BE_{urea,term,y}$ – emissions caused by heat energy consumption according to the baseline scenario, t $CO_{2\ e}$.

$BE_{urea,elec,y} = EC_{urea} \cdot EF_{co2,elec}$,

where:
EC_{urea} – amount of electric power consumed by urea production units, MW hour;
$EF_{co2,elec}$ – factor of NEGSU emissions for the projects of reduction or increasing of electric power consumption, t $CO_{2\ e}$/MW·hour.

$EC_{urea} = P_{urea} \cdot SEC_{urea,elec,b}$,

where:
P_{urea} – amount of produced urea, t;
$SEC_{urea,elec,b}$ – specific electric power consumption for urea production according to the baseline, MW·hour/t.

$BE_{urea,term,y} = HC_{urea,b} \cdot EF_{co2,NG}/\eta_{boiler}$,

where:
$HC_{urea,b}$ – amount of heat energy consumed by urea production units, TJ;
$EF_{co2,NG}$ – emission factor of natural gas combustion, t $CO_{2\ e}$/TJ;
η_{boiler} – power efficiency (Efficiency Factor) of the boiler shop.

$HC_{urea,b} = P_{urea} \cdot SEC_{urea,term,b} \cdot 4{,}1868$,

where:
P_{urea} – amount of produced urea, t;
$SEC_{urea,term,b}$ – specific heat energy consumption for urea production according to the baseline, Tcal/t;
4,1868 – standard rate for conversion Tcal into TJ, TJ/Tcal.

$EF_{co2,NG} = OXID_{NG} \cdot W_{NG} \cdot 44/12$,

where:
$OXID_{NG}$ – factor of carbon oxidation during the natural gas combustion;
W_{NG} –carbon content of natural gas, t C/TJ;
44/12 – stoichiometric ratio between molecular masses of carbon dioxide and carbon, t CO_2/t C.

$BE_{ammonia,y} = FC_{NG,ammonia} \cdot NCV_{NG} \cdot 4{,}1868 \cdot EF_{co2,NG}$,

where:
$FC_{NG,ammonia}$ – amount of natural gas consumed by ammonia production units, million м^3;
NCV_{NG} – low temperature of the natural gas combustion, Tcal/million m^3;

$EF_{co2,NG}$ – emission factor for natural gas combustion, t $CO_{2\,e}$/TJ;
4,1868 – standard rate for conversion of Tcak into TJ, TJ/Tcal.

$FC_{NG,ammonia} = P_{ammonia} \cdot SEC_{ammonia,b}$,

where:
$P_{ammonia}$ – amount of produced ammonia, t;
$SEC_{ammonia,b}$ – specific natural gas consumption for ammonia production, m^3/t.

The monitoring data of baseline emission calculation for reviewed monitoring period is shown in the table 4 and 5 herein.

The baseline emissions for the reviewed monitoring period are shown in table 7.

Table 7

Month	Amount of emission under baseline scenario, t CO_{2e}
January	146 714
February	171 247
March	251 173
April	252 970
May	254 412
June	248 162
July	256 500
August	244 652
September	250 128
October	255 517
November	253 336
December	260 591
Total for 2010	**2 845 402**

D.3. Leakage

Not applied for this project

D.4. Emission reduction for the reviewed monitoring period

Emission reduction for the reviewed monitoring period is shown in the table 8.

Table 8

Month	Amount of emission reduction units, t CO_{2e}
January	15 889
February	14 113
March	27 906
April	28 365
May	26 907
June	24 711
July	24 605
August	12 559
September	22 460
October	29 121
November	27 998
December	28 115
Total for 2010	**282 749**