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

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Annexes

SECTION A. General description of the project

A.1. Title of the project:

"Rehabilitation and technical re-equipment of Starobeshivska thermal power plant of the OJSC "Donbasenergo"

PDD Version: 05, dated: August 05, 2010

Sectoral scope 1: Energy industries (renewable / non-renewable sources).

A.2. Description of the project:

The main goal of the project is decreasing of fuel consumption in the power generation cycle at Starobeshivska thermal power plant (TPP) through implementation of technically available energy saving technologies. The purpose is the facilitation to sustainable development and improvement of ecological situation through fuel saving and corresponding reduction of greenhouse gas and pollution emissions.

Since Starobeshivska TPP itself is not a legal entity according to Ukrainian legislation, and is one of divisions of the Open Joint-Stock Company (OJSC) "Donbasenergo" which is a legal entity, just the last organisation is the Applicant for this project.

Starobeshivska TPP supplies the whole amount of generated electricity to the united state grid of Ukraine.

Situation existing prior to the starting date of the project

Construction of the Starobeshivska power plant was started in 1954 and completed in 1967. 3 turbines ВКТ-100 of 100 MW capacity each and boiler aggregates ТП-12 with steam productivity of 220 t/hour were installed at first, and then 10 power units of 200 MW each were put into operation. Thus, in 1967 the generation equipment of Starobeshivka power plant attained project installed capacity of 2300 MW.

In 1988 by the decision of Ministry of Energy of USSR power units 200 MW due to deterioration of equipment were re-marked into power units of 175 MW (Technical act of re-mark dated 14.08.88 № 181). Planned coal is anthracite with NCV= 5600 Kcal/kg and not more than 20,8% of ash.

Baseline scenario

Starobeshivska TPP burns fuels from different mines, and composition of coal often changes in the boiler operation process, that negatively impacts their overall efficiency. The average efficiency of boiler aggregates which are in operation at Starobeshivska TPP is 82,84%[1]. Current activity of Starobeshivska TPP is characterized by the prolonged worsening of the power generating units operation with continuous lowering of their efficiency because of the shortage of financing for a serious reconstruction.

[1] http://www.de.com.ua/se-sbtes.htm

Thus, the Baseline scenario is: only minimum repair works for support of productivity of power units at the existing level will be made, all equipment will work in the usual mode for a long time, and no emission reduction will take place.

Project scenario

This project initiated in 2007 covers rehabilitation and technical re-equipment of units No. 4 – 13 of Starobeshivska TPP, and employs the increase in fuel consumption efficiency to reduce greenhouse gas emissions relative to current practice. Reduction of fuel consumption is based on implementation of the following activities:

- Replacement of existing coal-fired boiler at the unit №4 with steam productivity of 640 t/hour with the boiler with circulating boiling layer (highly efficient ecologically clean technology for combustion of low-quality fuel and coal-processing plants wastes) with steam productivity of 670 t/hour which burns anthracite slime. The unit installed capacity will be increased from 175 MW_e to 210 MW_e, with planned efficiency increasing from ~83% to 90,3%.
- Rehabilitation and technical re-equipment of the unit №7, including boiler aggregate upgrading with replacement of the steam drum, replacement of smoke exhausters, upgrading of electric equipment, upgrading of control system;
- Upgrading of boilers' burners;
- Partial replacement of furnace water heating screens;
- Replacement of steam lines on the boiler units;
- Re-equipment of the overhead superheaters;
- Improvement of the brickwork envelope of boilers with using of modern materials;
- Improvement of the pipelines heat insulation with using of modern materials;
- Modernization of air heaters.

Project activity is directed on reduction of specific fuel consumption for production of unit of electricity, through implementation of the energy efficiency improving measures at all power units, replacement and reconstruction of fuel combusting and power generating equipment at units No. 4 and 7.

Fuel saving at production of electric power and reduction of energy charges for the own needs of power units will result in reduction of the CO_2 and pollution emissions.

Implementation of the project will provide economic, environmental and social benefits and facilitate to sustainable development of the country. Social impact of the project is positive also since after project implementation the power generation will be more efficient and reliable though tariffs for power supply will not be raised to cover construction costs.

Environmental impact of the project is expected to be very positive as an emission of the greenhouse and toxic gases such as CO_2, SO_x, NO_x, CO and particulate matter will be reduced.

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host Party)	OJSC «Donbasenergo»	No
The Netherlands (ERUs Buyer)	E-Energy B.V.	No

The project is initiated by the partners that distribute their functions in the project as follows:

- ***OJSC «Donbasenergo»:*** the company, which implements this project and manages the Starobeshivska TPP that operates equipment for power generation. As far as this company purchases all necessary inputs, including fuel, electricity, water, etc., it has the primary interest in the reduction of specific fuel consumption that can be achieved by the implementation of the project. Besides, this enterprise has all licenses and permissions, required under Ukrainian legislation, to perform the design and rehabilitation of the equipment. It is responsible for designing, engineering and installation works execution by its own personnel or with the aid of subcontractors. It finances this project and receives profits, thus act as **Supplier** for this project.

Historical details:

OJSC «Donbasenergo» is a large power generating company of Ukraine with the total installed capacity of power plants of 3450 MW.

The company consists of such 11 departments: Starobeshivska TPP, Slovyanska TPP, Electroremont, Donbasenergospetsremont, Donbasenergonaladka, Teploelectroproject, Energotorg, Kurahovkomun-energo, Luhanskkomunenergo, Slovyanskkomunenergo, Donbasenergoavtotrans.

According to the Order of Ministry of Energy and Electrification of Ukraine from 07.02.1996 № 26 to carry out the Decree of the President of Ukraine "On structural reconstruction in the electrical power complex of Ukraine" from 04.04.1995 №282/95, the State enterprise "Donbasenergo" was turned into the State Stock Energy Generating Company and registered by the order of Executive Committee of Horlivka City Council from 21.02.1996 №999-p. The SSEGC "Donbasenergo" has been renamed into the Open Joint-Stock Company "Donbasenergo" by the decision of General meeting of the shareholders from 04.08.1998.

At the company's power plants the power units with the single capacity from 80 to 800 MW are installed.

Power plants are energy generators that sell generated electricity to the Wholesale Electricity Market of Ukraine. Serving structural units are assigned for execution of setting and repair works, project and scientific-research works for power enterprise needs.

- ***E-Energy B.V.:*** the company registered in the Netherlands, is one of subsidiaries belonging to E energija group. It is a purchaser of the emission reductions generated in result of this project's implementation.

Having started its activity in 1994, E energija group has expanded from its first established company Energijos taupymo centras (Energy saving center).

The rising work range and economical-social conditions caused the creation of vertically integrated company's structure, with the separation of group's operation fields. For this purpose, the company E energija UAB, which now is the management company of the whole E energija group, was established.

E energija, UAB is an energy planning and management company, which implements turnkey projects from conceptual development and owns companies generating and supplying energy for industries and residents of the cities.

One of key aims of E energija B.V. specialists is to prepare energy plans to meet energy needs for subsistence and development of alternate energy sources and the increase of energy efficiency at least cost to the economy and environment.

Since 2005 E energija group, one of the first companies in the Baltic countries has been involved in the project development under Kyoto Protocol flexible mechanisms and started trading activities with EU allowances as specified by EU Emission Trading Scheme.

E-Energy B.V. is a company responsible for E energija group carbon credit procurement for its own purposes and all business related with carbon credit trade. E-Energy B.V. is active investor in the market of Eastern European countries in a number of JI projects.

A.4. Technical description of the project:

A.4.1. Location of the project:

The Project is located in Donetsk region, South-East of Ukraine (Fig. A.1.).

Figure A.1. The map of Ukraine with regions and neighboring counties

A.4.1.1. Host Party(ies):

Ukraine.

Ukraine is an Eastern European country that ratified the Kyoto Protocol to UNFCCC on February 4, 2004, and is listed in the Annex 1 to it and is eligible for the Joint Implementation projects.

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

Donetsk region.

Donetsk Region is situated in the south-west of Ukraine. Its area is 26500 km^2 (nearly 4.4% of the whole area of Ukraine), its length from North to South is 270 km, from East to West – 190 km. The population of Donetsk region is 4.7 mln. inhabitants which is 10% of the whole area of Ukraine. It makes the region the most populous in the country. The large population is explained by the existence of a few industrial towns and number of villages around them. The population in the towns is nearly 4.3 mln. inhabitants (91 %), in villages – 0.4 mln. (9 %).

On the South-West and West Donestk region borders with Zaporizzhya and Dnipropetrovsk regions, on the South-West - with Kharkiv region, on the South-East – with Rostov region of Russia Federation. On the South Donetsk region is washed by the Sea of Azov.

A considerable place in the economy of the Donetsk area occupies industry. An area produces fifth part of national volume of industrial products, occupies the first and leading places in Ukraine from the production of a number of basic types of industrial products, from the volume of export. Over 2000 industrial enterprises of metallurgical are here concentrated, chemical industries, energy, heavy engineering and build materials, about 300 deposits of minerals are exploited.

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

Donetsk region, Starobeshivskiy disrict, village Novyj Svit.

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

Starobeshivska TPP is situated on the South-East of Ukraine in 27 km to the South from the city of Donetsk on the left bank of Starobeshevo water reservoir, at the distance of 11 km from Starobeshevo village. The nearest inhabited place is village Novyj Svit. The TPP is connected with the city of Donetsk and other large industrial centers by the railway and highway.

Coordinates: 47°48′00″ N1, 38°00′00″ E1

The thermal power plant is located in the agricultural region and is being the only object of heavy industry in Starobeshivskiy district of Donetsk region.

Starobeshivska TPP as a structural unit is part of the Joint Stock Company “Donbasenergo” which is one of the largest energy generating enterprises of Ukraine and supplies the consumers of Donbas (and of the whole country through the state grid) with electric power, and like other PP of JSC “Donbasenergo” takes part in regulation of frequency and capacity of United Energy Generating System of Ukraine.

Electric power is transferred from the plant buses by the electric main of 220kV to the Donbas Energy System grid, by the electric main of 110 kV to the Donetsk West Power Plant and “Service-Invest”, Ltd.

grid, by the electric main of 35 kV to the Donetsk West Power Plant grid (supply to the consumers of local grid

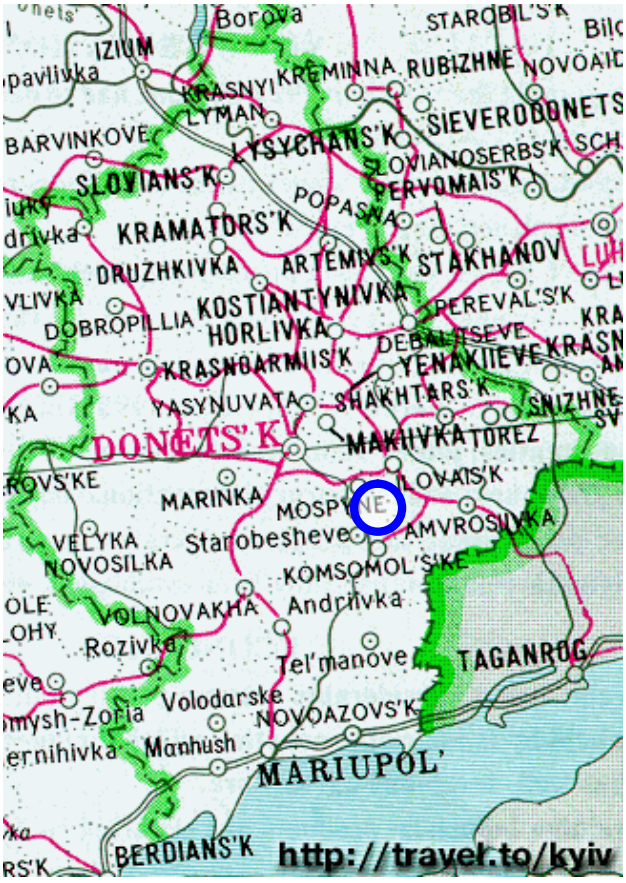

Figure A.2. Location of the Starobeshivska TPP in Donetsk region

Figure A.3. Starobeshivska TPP

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

Since Ukraine does not have the own industrial resources of gas and oil, and, in accordance with Power strategy of Ukraine[2], reduction of natural gas consumption is a priority of state policy, the power production in Ukraine is forced to be oriented mainly at the use of domestic coal. Thus, at Starobeshivska TPP the part of domestic coal is gradually increasing with corresponding reduction of part of natural gas. Also, combustion of the low quality coal and wastes of coal-concentrating is planned at the power unit №4 after its modernization.

[2] http://mpe.kmu.gov.ua/fuel/control/uk/publish/category?cat_id=35086

Power unit №4:

The project of rehabilitation and modernization of power unit №4 of Starobeshivska TPP foresees the replacement of existing coal-fired boiler of 640 t/hour steam productivity with torch method of solid fuel combustion, by the boiler of 670 t/hour steam productivity with ecologically cleaner technology of combustion of low-quality solid fuel in air circulating boiling layer, as well as building of sludge dryer with the capacity of 220 t/h and installation of electric filter behind the boiler.

Technology of air circulating boiling layer is high efficient, enables a wide range of load regulation (40-100 %), does not demand stabilizing gas-oil "lighting" at combustion of the low-reaction high-ash coal.

According to the results of the international tender, the boiler unit of the company Lurgi Lentjes AG (Germany) was accepted and installed, with external cyclone and external heat exchanger of boiling layer. The existing turbo-unit of the DO-200-130 type produced by LMP (Leningrad Metal Plant, Saint-Petersburg, Russia) is used in conjunction with this boiler unit.

Coal (0.05-0.3 mm particles) is fed into the lower part of combustion chamber. Burning is realized in the boiling layer at the temperatures 850-900°C, as well as in the upper space of combustion chamber.

The solid particles leaving combustion chamber are caught in the cyclone and returned into the lower part of combustion chamber by the internal circulation way. Due to multiple circulations of solid particles, the necessary time of their stay in reactionary zone is provided as well as their complete combustion.

For better flue gas cleaning from the dust, installation of the dust separator made by company Alstom Power (Sweden) is installed behind the boiler. The electric filter is used as the basis of dust separator, which allows to reduce the dust concentration in the flue gases to 50 mg/Nm^3 that corresponds to European standards.

For suppression of sulphur oxides formation in the burning process, the fed of limestone into combustion chamber is provided.

For the possibility of using of the wet sludge with humidity up to 22.5% from the ponds- settling reservoirs of concentration plants as a fuel for the boiler with air circulating boiling layer, the sludge dryer of 22 t/hour capacity is installed. Combustion products – the hot flue gases are used as drying agent.

As a result of project the installed capacity of the unit will be increased from 200 MWe (real 175 MWe re-marked due to physical deterioration) to 210 MWe. The life-term of the equipment will be increased by 25 years. The boiler efficiency will rise from 83% to 90.3%.

Power unit № 7

The project of rehabilitation and modernization of power unit №7 of Starobeshivska TPP includes the following measures:

- Modernization of TP-100 boiler aggregate with 640 t/hour steam capacity with replacement of the steam drum.
- Modernization of turbine unit with replacement of the flow part of the low pressure cylinder.
- Modernization of the turbine control system according to the Union for the Coordination of Transmission of Electricity (UCTE) requirements.
- Installation of the condensator ball-cleaning system.
- Modernization of electrical engineering equipment (generator, transformers, switches, etc.).
- Modernization of mills.

- Reconstruction of separators and replacement of dust pipes.
- Construction of electric filter.
- Building of SO_2 gas cleaning system.
- Replacement of smoke exhausters.
- Modernization of the unit control system.

Development of detailed design for technical re-equipment of the power unit, completion of dismantling works and purchase of the equipment is planned to be executed during 2010.

The scheduled term of reconstruction completion is 2012.

Power units №№5, 6, 8-13

The project includes the following measures for improving efficiency of power units №№ 5, 6, 8-13 of Starobeshivska TPP (with schedule of implementation):

Measures	Implementation, year	Unit №
Upgrading of boilers' burners	2008	8
	2009	6
	2010	11
	2011	10
	2012	5
Improvement of the heat insulation and brickwork envelope of boilers with using of modern materials	2008	8
	2009	6
	2010	10
	2011	11
	2012	5
Re-equipment of the primary and secondary superheaters	2008	8
	2009	6
	2010	11
	2011	10
	2012	5
Partial replacement of furnace water heating screens	2008	8
	2009	6

	2010	11
	2011	10
	2012	5
Renovation of the igniting zone of boiler	2008	8
	2009	6
	2010	11
	2011	10
	2012	5
Modernization of pipe air heaters	2008	8
	2009	6
	2010	11
	2011	10
	2012	5
Installation of the condensator ball-cleaning system	2008	8
	2009	6
	2010	11
	2011	10
	2012	5
Replacement of the turbine blades	2009	6,8
	2010	11
	2011	10
	2012	5
Replacement of the high pressure steam lines 5 on the boiler units:	2010	11
	2011	10
	2012	5
Partial replacement of the low pressure steam lines 2, 3, 4 on the boiler units:	2010	11
	2011	10
	1012	5
Modernization of end and diaphragm seals of turbine	2009	6
	2010	11
	2011	10
	2012	5

Table A.1. Measures for improving efficiency of power units of Starobeshivska TPP

The project uses the-state-of-the-art technologies, as well as the technology of the air circulating boiling layer that would be the first example in Ukraine and would result in a significantly better performance than any commonly used technologies in the country. Thus, these technologies are likely not to be substituted by any other technologies within the project period.

Standard periodical training procedures are established at the plant, and staff is qualified enough.

Information on recently performed training of operating staff:

a) Training course by The Coal Energy Technology Institute of National Academy of Sciences of Ukraine, Ministry of Fuel and Energy of Ukraine. Verification of knowledges on "Modern air circulating boiling layer – technology" (Protocol №1 from 10-13.04.2007);

b) Training course by Ministry of Fuel and Energy of Ukraine, Donbas state company for commissioning, setting-up, upgrading and servicing of power stations and electrical networks. Verification of knowledges on "Construction and exploitation of equipment of block 210 MWt with a boiler's air circulating boiling layer and turbine K-200-130" (Protocol №1 from 20.11.2007).

Since the boiler's air circulating boiling layer is quite different from the commonly used technologies in Ukraine, the corresponding initial training of operating staff is envisaged in addition to the usual professional training.

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:

Project activity is directed at reconstruction of power units №№4, 7 and implementation of the measures for energy efficiency improvement at the other power units (№№ 5, 6, 8-13) of Starobeshivska TPP. Implementation of these measures will improve the power efficiency of equipment and will decrease the specific fuel charges for electric energy production. Fuel saving upon power production and reduction of power charges for own needs of power units will result in reduction of the CO_2 emissions.

In absence of the proposed project only minimum repair works for support of productivity of power units at the existing level will be made, all equipment will work in the usual mode for a long time, and no emission reduction will take place.

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

In course of project execution, the following emission reductions are and will be achieved, at the stages of project implementation:

Length of the crediting period is 2009 – 2012 (4 years), according to the first Kyoto Commitment period.

	Years
Length of the crediting period	4
Year	**Estimate of annual emission reductions in tonnes of CO_2 equivalent**
2009	84 818
2010	151 240
2011	191 831
2012	228 404
Total estimated emission reduction over the crediting period (tonnes of CO_2 equivalent)	**656 293**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	164 073

Table A.2. Estimated amount of CO_2e Emission Reductions during the commitment period.

Thus the estimated amount of emission reductions over the crediting period (2009 – 2012) is **656 293** tonnes of CO_2e, the annual average of estimated emission reduction over the crediting period is 164 073 t CO_2e.

More detailed information is provided in the **Appendix A "Calculation of Baseline and Project CO_2e emissions"** (as Excel table).

Description of formulae used to estimate emission reductions is represented in paragraph D.1.4.

A.5. Project approval by the Parties involved:

The project was initiated in 2007.

The main milestones of the project history and approval:

May, 2007 – Extended meeting of the Technical Board of OJSC «Donbasenergo», where the decision for JI project development and realization at Starobeshivska thermal power plant was adopted (Protocol of the extended meeting of the Technical Board of OJSC «Donbasenergo» dated May 16, 2007). This data of May 16, 2007 is defined as the project starting date.

September, 2007 – The agreement between Ministry of fuel and energy of Ukraine and Institute of Gas of National Academy of Sciences of Ukraine and Institute of Engineering Ecology (co-executor) was signed for development of JI project on GHG emission reduction at Starobeshivska power plant of the OJSC «Donbasenergo» (agreement № 01110718000 dated September 21, 2007).

April, 2008 – Emission reduction purchase Contract was signed between OJSC «Donbasenergo» and "E-Energy B.V." (Contract dated April 23, 2008).

May, 2008 – Ministry for Environmental Protection of Ukraine has issued the Letter of Endorsement for the JI project "Rehabilitation and technical re-equipment of Starobeshivska thermal power plant of the OJSC "Donbasenergo" (LoE №6140/11/10-08 dated May 15, 2008).

The project is already supported also by Ministry of fuel and energy of Ukraine and JSC «Donbasenergo». Thus, organizational risk for this project is minimized.

SECTION B. Baseline

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

In accordance with the tasks of the "Power strategy of Ukraine till 2030"[3], Complex governmental program on energy saving of Ukraine[4], and the last events at the natural gas market in Ukraine, the thermal power plants in Ukraine are oriented to consumption of coal of home production. Thus, there is the structural fuel switch at Starobeshivska thermal power plant: increase of part of the more carbon intensive fuel (coal) with taking into account its availability and price, along with the corresponding reduction of part of the less carbon intensive fuel (natural gas). Current activity of Starobeshivska TPP is characterized by the prolonged worsening of the power generating units operation with continuous lowering of their efficiency because of the shortage of financing for a serious reconstruction.

The Project activity is directed to the reduction of the GHG emissions from already long time operating Starobeshivska TPP through its equipment rehabilitation and implementation of measures for energy efficiency improvement, that will lead to the reduction of the specific conditional fuel charges for power production in conditions of increasing part of the higher carbon intensity fuel (coal and/or black oil).

Among the approved CDM baselines and monitoring methodologies, the following methodologies are close to the proposed project:

- the consolidated baseline and monitoring methodology ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*"[5].
- the consolidated baseline and monitoring methodology ACM0011 „*Consolidated baseline methodology for fuel switching from coal and/or petroleum fuels to natural gas in existing power plants for electricity generation*"[6].
- the baseline and monitoring methodology AM0061 "*Methodology for rehabilitation and/or energy efficiency improvement in existing power plants*"[7].

However these methodologies are directed at the use of renewable energy sources (ACM0002) and at switch from the more carbon intensive fuel to the less carbon intensive fuel (ACM0011), that does not correspond to the project activity.

The closest methodology to the proposed project is baseline and monitoring methodology AM0061 «*Methodology for rehabilitation and/or energy efficiency improvement in existing power plants*" (at present the version 02.1 is the last valid)[7]. This methodology is applicable to project activities that implement rehabilitation and/or energy efficiency improvement measures in an existing fossil fuel fired power plant for electricity generation to the grid. The methodology is also applicable to the project activities that along with rehabilitation and/or energy efficiency measures implement a fuel switch, whether

[3] http://mpe.kmu.gov.ua/fuel/control/uk/publish/category?cat_id=35086
[4] http://naer.gov.ua/?p=451 http://naer.gov.ua/wp-content/uploads/2009/11/148.doc
[5] http://cdm.unfccc.int/UserManagement/FileStorage/HGY3TLRFPQVM016WA4I7XCZD92KE5S (ACM0002)
[6] http://cdm.unfccc.int/UserManagement/FileStorage/1WS8W1641K25AZ8E9L80V1RS3TAVWK (ACM0011)
[7] http://cdm.unfccc.int/UserManagement/FileStorage/9K6GRQITX27OVG3CAS2MVDN1IWXJX1 (AM0061)

partial or total, but no emissions reductions, if any, will be credited for the fuel switch.

The following conditions apply:

- The project activity power plant supplies electricity to the electricity grid;
- The project activity is implemented in an existing power plant and does not involve the installation and commissioning of new electricity generation units. The installed power generation capacity of each unit (nameplate capacity) may increase as a result of the project activity but this increase is limited to 15% of the previous existing power generation capacity (nameplate capacity) of the whole plant, i.e. throughout the crediting period the installed power generation capacity of the project activity power plant does not exceed the nameplate power generation capacity of the project activity power plant previous to the implementation of the project activity by more than 15%;
- The existing power plant has an operation history of at least ten years and data on fuel consumption and electricity generation for the most recent five historical years prior to the implementation of the project activity are available;
- Only rehabilitation and/or energy efficiency improvement measures which require capital investment shall be included. Regular maintenance and housekeeping measures cannot be included in the proposed CDM project activity;
- The methodology is applicable if the most plausible baseline scenario is the continuation of the operation of the project activity power plant, continuing to use all power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance.

All these applicability conditions are met in the proposed project. The scheduled increase of installed power generation capacity of the unit #4 is 35 MW that is 20% of its previous existing power generation capacity, but is only about 2% of the whole plant.

However, this methodology also does not completely respond to the conditions of the project activity:

- In accordance with methodology AM0061 emission reductions within the frames of project activity take place on condition that emission factor of the power grid is higher, than emission factor of the power plant. Otherwise, the additional to the average history level production of electric power does not lead to emission reductions. In the Ukrainian conditions the grid emission factor can not be higher than emission factor of a thermal power plant, because thermal power plants produce only less than a half of the total power amount whereas the remaining is produced at the less emitting plants (for example, in 2008 only 37.7 % of electric power were supplied to grid by all TPPs, whereas 47% by nuclear power plants, 5.7% by hydroelectric power plants, and remaining – by CHP, hydroaccumulating plants etc.).
- In accordance with methodology AM0061 power-plant has to work during 8760 hours/year, with exception of time for the power units stops for repair works. Starobeshivska TPP operates during near 4000 hours/year, although has 9 power units of 175 MW_e each, which can operate 7000 hours/year, that is potentially can generate near 11 000 000 MWh of electric power annually, that considerably exceeds the volumes of actual generation. This limitation in the generation of electric power is caused by today's terms of generation of electric power in Ukraine, where the use of thermal power-plants is limited to the mobile mode, that it is conditioned by the «failure» of consumption of electric power in a night-time (from 23.00 till 6.00).
- The methodology AM0061 does not deal with GHG emission reduction in conditions of increase of fuel carbon intensity.

Thus, among the approved CDM baseline and monitoring methodologies there are no suitable for use in the projects of type in question. It is one of the main complications for making JI projects in electric power sector in Ukraine.

In accordance with the paragraph 9(a) of the «*Guidance on criteria for baseline setting and monitoring*» (the valid version 02)[8], the project partners are able to choose the project specific approach to baseline setting and monitoring, to be developed in accordance with Appendix B "*Criteria for baseline setting and monitoring*" to the "*Guidelines for the implementation of Article 6 of the Kyoto Protocol*" ("*JI Guidelines*")[9].

The developer of this JI project (Institute of Engineering Ecology) has elaborated namely such own specific for this project, as well as for possibly other projects of such type in Ukraine, approach for baseline setting and monitoring. Approach and algorithm used for estimation of emission reduction and baseline setting for the proposed JI project are in general the same as in "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"* Option B *(version 02)*[10]. These approach and algorithm determine also the monitoring plan applied in the proposed JI project.

The main approach is based on the permanent measuring of the fuel consumption by power units as well as of supply of electric power to the state grid, with amendments for possible parameters changes in baseline comparing to the reported year. The variable parameters may be the changes in fuel quality, its net caloric value, its carbon intensity, share of fuel types, etc.

This approach in elaborated methodology specific for this project is somewhat similar to the approach used in several JI projects on rehabilitation of the district heating systems in cities and regions of Ukraine, also developed by the Institute of Engineering Ecology ("District Heating System Rehabilitation of Chernihiv Region", "Rehabilitation of the District Heating System in Donetsk Region", "Rehabilitation of the district heating system of Crimea", "Rehabilitation of the District Heating System in Kharkiv City", "District Heating System Rehabilitation in Rivne Region", etc.), that are already determined and verified by accredited independent entities.

The baseline includes CO_2 emissions from fuel combustion by power units of Starobeshivska power plant in course of generation of electric power.

According to the developed approach, the baseline fuel consumption for each reported year shall be adjusted to the amount of electricity produced in this reported year, and corrected for possible changes of fuel quality such as change of its carbon intensity and net caloric value, etc.

The basic assumptions of the baseline methodology are:

- Baseline consumption of tonne of coal equivalent corresponds to annual electricity supplied to the electricity grid by the project activity power plant in year *y* of the crediting period
- Specific fuel consumption in year *y* of crediting period corresponds to the average annual consumption during the most recent three historical years *x* prior to the implementation of the project activity
- Correlations between the baseline consumption of fossil fuels type *i* with various carbon intensity and their net calorific value are the same as in year *y* of the crediting period.

Calculation of the dynamic baseline is based on assumption that ratio of fuels with different carbon intensity in base scenario is the same, as in a reported year. The baseline of the project was calculated in accordance with the main technical and economic index of operation of every power unit of thermal power plant – amount of the specific consumption of conditional fuel for output of unit of electric power.

[8] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[9] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf
[10] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

Data and Parameters which do not require monitoring:

Data / Parameter	***Remaining lifetime of the power equipments***
Data unit	Years
Description	Time when the existing equipment would need to be replaced in the absence of the project activity
Time of determination/monitoring	During determination
Source of data (to be) used	"DONORGRES" Reports
Value of data applied (for ex ante calculations/determinations)	

№ of the power unit	4	5	6	7	8	9	10	11	12	13
The year of putting into operation	1961	1962	1962	1963	1963	1964	1965	1965	1966	1967

Justification of the choice of data or description of measurement methods and procedures (to be) applied	After completion of passport term, set by a factory-manufacturer estimation of remaining lifetime of the power equipment is conducted by the specialized organization "DONORGRES".
QA/QC procedures (to be) applied	«Tool to determine the remaining lifetime of equipment», version 01[11]
Any comment	

Data / Parameter	EL_x
Data unit	GWh
Description	Average annual amount of electricity supplied to the electricity grid by the Starobeshivska TPP during the most recent three years *x* prior to the implementation of the project activity
Time of determination/monitoring	During determination
Source of data (to be) used	Performance parameters of equipment operation (Form №3- tech. Starobeshivska TPP)
Value of data applied (for ex ante calculations/determinations)	

Year	2006	2007	2008
GWt	4 033	3 604	4 298

Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real data of the TPP, that is conservative
QA/QC procedures (to be) applied	
Any comment	

[11] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

Data / Parameter	$FC_{i,x} = FC_{c,x}$
Data unit	tt
Description	Amount of fossil fuel type *i* used in the Starobeshivska TPP in year *x* prior to the implementation of the project activity, where *i* is coal
Time of determination/monitoring	During determination
Source of data (to be) used	«Certificate of movement and remains of fuel» (form № TP-22)
Value of data applied (for ex ante calculations/determinations)	Year: 2006 / 2007 / 2008 tt: 2 116.5 / 1 894.7 / 2 193.2
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real data of the TPP, that is conservative
QA/QC procedures (to be) applied	GDK 34.09.101-2003 Methodological instruction for registration of fuel at power-plants»
Any comment	

Data / Parameter	$FC_{i,x} = FC_{ng,x}$
Data unit	mln. $м^3$
Description	Amount of fossil fuel type *i* used in the Starobeshivska TPP in year *x* prior to the implementation of the project activity, where *i* is natural gas
Time of determination/monitoring	During determination
Source of data (to be) used	«Certificate of movement and remains of fuel» (form № TP-22)
Value of data applied (for ex ante calculations/determinations)	Year: 2006 / 2007 / 2008 mln. $м^3$: 166.0 / 109.7 / 131.5
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real data of the TPP, that is conservative
QA/QC procedures (to be) applied	Certificate of acceptance – handling og gas
Any comment	

Data / Parameter	$FC_{i,x} = FC_{bo,x}$
Data unit	Tt
Description	Amount of fossil fuel type *i* used in the Starobeshivska TPP in year *x* prior to the implementation of the project activity, where *i* is black oil
Time of determination/monitoring	During determination
Source of data (to be) used	«Certificate of movement and remains of fuel» (form № TP-22)

Value of data applied (for ex ante calculations/determinations)	Year	2006	2007	2008	
	tt	6.5	3.4	9.9	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real data of the TPP, that is conservative				
QA/QC procedures (to be) applied	GDK 34.09.101-2003 Methodological instruction for registration of fuel at power-plants»				
Any comment					

Data / Parameter	$NCV_{i,x} = NCV_{c,x}$				
Data unit	TJ/tt				
Description	Weighted average net calorific value for the fossil fuel type *i* used in the Starobeshivska TPP in year *x* prior to the implementation of the project activity, where *i* is coal				
Time of determination/monitoring	During determination				
Source of data (to be) used	Chemical laboratory of TPP, Journal of natural gas efficiency assessment				
Value of data applied (for ex ante calculations/determinations)	Year	2006	2007	2008	
	TJ/tt	20.80	21.65	22.25	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real data of the TPP, that is conservative				
QA/QC procedures (to be) applied	SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»				
Any comment					

Data / Parameter	$NCV_{i,x} = NCV_{ng,x}$				
Data unit	TJ/mln.m^3				
Description	Weighted average net calorific value for the fossil fuel type *i* used in the Starobeshivska TPP in year *x* prior to the implementation of the project activity, where i is coal				
Time of determination/monitoring	During determination				
Source of data (to be) used	Chemical laboratory of TPP, Journal of natural gas efficiency assessment				
Value of data applied (for ex ante calculations/determinations)	Year	2006	2007	2008	
	TJ/mln.m^3	32.83	33.68	33.19	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real data of the TPP, that is conservative				
QA/QC procedures (to be)	SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power				

applied	facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»
Any comment	

Data / Parameter	$NCV_{i,x} = NCV_{bo,x}$
Data unit	TJ/tt
Description	Weighted average net calorific value for the fossil fuel type *i* used in the Starobeshivska TPP in year *x* prior to the implementation of the project activity, where i is black oil
Time of determination/monitoring	During determination
Source of data (to be) used	Chemical laboratory of TPP, Journal of natural gas efficiency assessment
Value of data applied (for ex ante calculations/determinations)	Year: 2006 / 2007 / 2008; TJ/tt: 38.56 / 38.49 / 39.39
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real data of the TPP, that is conservative
QA/QC procedures (to be) applied	SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»
Any comment	

More detailed information is provided in the **Appendix A "Calculation of Baseline and Project CO_2e emissions"** (as Excel table).

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:

The anthropogenic emissions of GHGs will be reduced due to rehabilitation and technical re-equipment of units No. 4 – 13 of Starobeshivska thermal power plant, through the increase in fuel consumption efficiency relative to current practice.

Reduction of specific fuel consumption for production of unit of electricity will be achieved through implementation of the energy efficiency improving measures at all power units, replacement and reconstruction of fuel combusting and power generating equipment at units No. 4 and 7. Fuel saving at production of electric power and reduction of energy charges for the own needs of power units will result in reduction of the CO_2 and pollution emissions.

Reduction of fuel consumption is based on implementation of the following activities:

- Replacement of existing coal-fired boiler at the unit №4 with steam productivity of 640 t/hour with the boiler with circulating boiling layer (highly efficient ecologically clean technology for combustion of low-quality fuel and coal-processing plants wastes) with steam productivity of 670 t/hour which burns anthracite slime. The unit installed capacity will be increased from 175 MW_e to 210 MW_e, with planned efficiency increasing from ~83% to 90.3%.
- Rehabilitation and technical re-equipment of the unit №7, including boiler aggregate upgrading with replacement of the steam drum, replacement of smoke exhausters, upgrading of electric equipment, upgrading of control system;
- Upgrading of boilers' burners;
- Partial replacement of furnace water heating screens;
- Replacement of steam lines on the boiler units;
- Re-equipment of the overhead superheaters;
- Improvement of the brickwork envelope of boilers with using of modern materials;
- Improvement of the pipelines heat insulation with using of modern materials;
- Modernization of air heaters.

Additionality of the project

The JI specific approach for baseline setting and monitoring is used in this project, and for demonstration of additionality the approach (c), defined in paragraph 2 of the Annex I to the "Guidance on criteria for baseline setting and monitoring"[12] is used:

(c) Application of the most recent version of the Tool for the demonstration and assessment of additionality" (the most recent Version 05.2)[13] (see Fig. B.1) approved by the CDM Executive Board (allowing for a grace period of two months when the PDD is submitted for publication on the UNFCCC JI website), or any other method for proving additionality approved by the CDM Executive Board.

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

[13] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

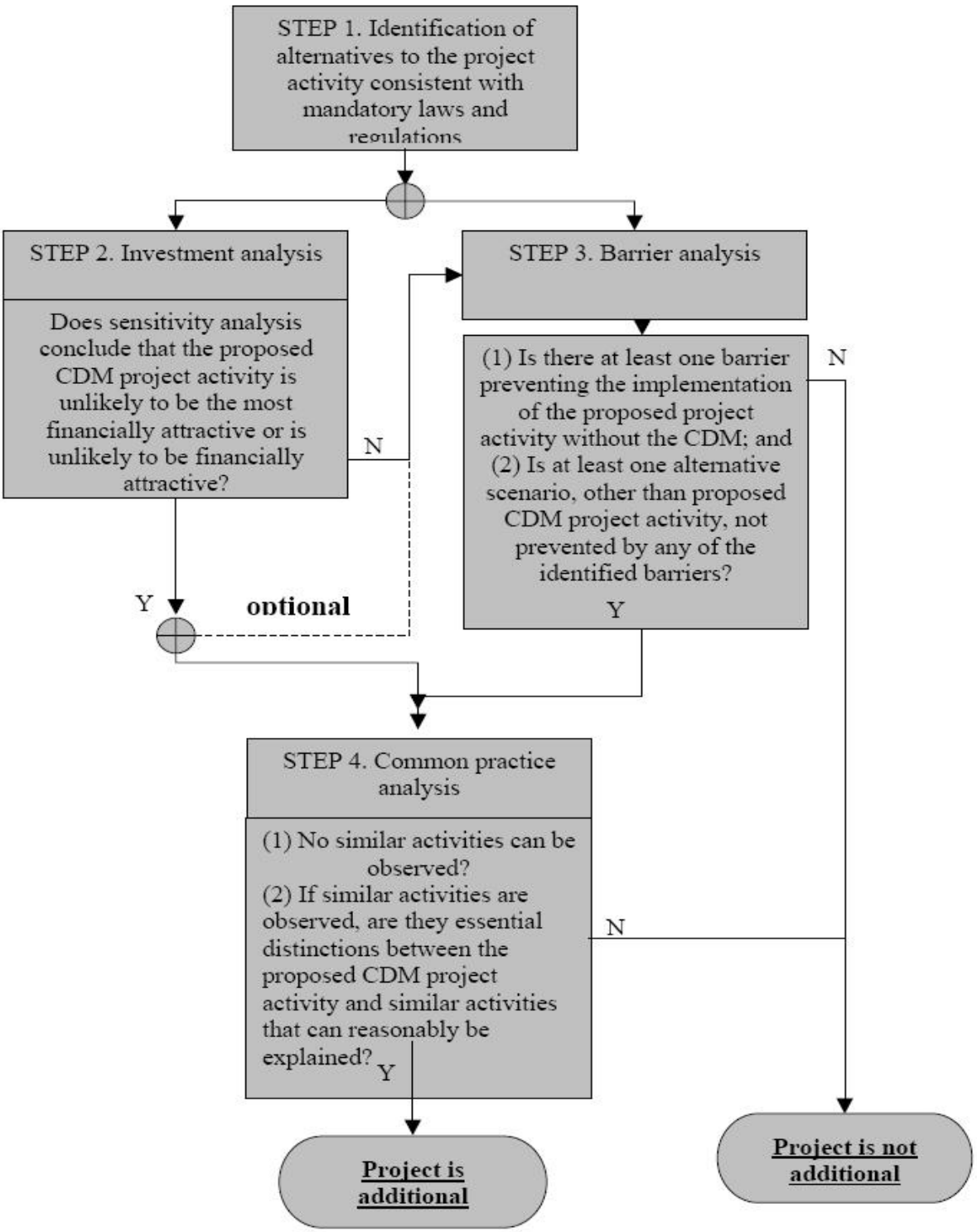

Figure B.1. Steps for demonstration of additionality

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

There are three alternative variants of the baseline scenario for power generation at Starobeshivska TPP alternative to the project activity.

Variant (1) – continuation of the current situation with implementation of minimum repair works for support productivity of the power units at existing level on the verge of general degradation of the TPP.

There are no investment barriers for this scenario, because it does not require any additional investments; there are no technological barriers, because the old equipment is exploited by a skilled personnel and the additional retraining is not needed. This scenario represents the common practice in Ukraine and corresponds to the present state of affairs ("business-as-usual").

Variant (2) – implementation of measures for increasing of the energy efficiency of the power units of the TPP according to the project activity but without using of JI mechanism.

Implementation of measures for increasing of the energy efficiency without using of JI mechanism fully meets the valid legal and regular standards. In this case the investment barrier exists for implementation of such project because this scenario requires additional investments.

Variant (3) – rehabilitation of the whole power plant.

This variant may be the best for environment but requires large investments with long pay-back period, and is rather problematic in Ukraine, especially in conditions of financial crisis. In this case also the investment barrier exists since such project is not investment attractive.

Outcome of Sub-step 1a: Three realistic and credible alternative scenarios to the project activity are identified.

Sub-step 1b. Consistency with mandatory laws and regulations:

All the alternatives to the project outlined in Step 1a above are in compliance with applicable laws and regulations in this field, in particular with the Law of Ukraine "On Electric Power Industry" from 16.10.1997 № 575/97-VR [14], the Law of Ukraine "On Energy saving" from 01.07. 1994 №74/94-VR [15], the Decree of the Cabinet of Ministers of Ukraine from 19.11.2008 № 1446-p: "On adoption of the Conception of the State goal-oriented economic program on energy efficiency for 2010-2015"[16].

Outcome of Sub-step 1b: The alternatives, which are: to continue business-as-usual scenario, to implementation measures for increasing of the energy efficiency without JI mechanism and to rehabilitate the whole power plant, are in compliance with the mandatory laws and regulations.

[14] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?page=1&nreg=575%2F97-%E2%F0

[15] http://www.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=74%2F94-%E2%F0

[16] http://www.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1446-2008-%F0

Hence, the Step 1 is satisfied.

The Baseline scenario (1) is chosen for this project: Continuation of the current situation with implementation of minimum repair works for support productivity of the power units at existing level on the verge of general degradation of the TPP. This scenario represents the common practice in Ukraine and corresponds to the present state of affairs ("business-as-usual").

According to the "*Tool for the demonstration and assessment of additionality"*[17] *(version 5.2)*, for further additionality analysis it is possible to follow the Step 2 or Step 3 (or to complete both of them).

Step 2. Investment analysis

Key assumptions:

1. The analysis is based on the proper information accessible during preparation of version of a 02 of project-technical documentation, that is October, 2009. The analysis is executed with the use of basic currency of Ukraine of hryvnya. Rate of exchange: 1 euro ≈ 11 UAH
2. The period of estimation is limited by the first offered credit period of activity from joint introduction: 2009-2012.

More detailed information is provided in the **Appendix B "Calculation of NPV and IRR"** (as Excel table).

Sub-step 2a. Determine appropriate analysis method

Since offered JI project creates other advantages, except for a profit from realization of the JI mechanism, the simple analysis of charges (Option I) is not here used taking into account the specific of "*Tool for the demonstration and assessment of additionality" (Version 05.2)*[18]. The comparative analysis of investments (Option II) also is not appropriate, as a definite base scenario does not foresee investments. In consideration of it, the developers of project stopped on the comparative analysis of threshold sensitiveness (Option III) as mean, that allows to show and estimate the additionality of offered JI project.

Sub-step 2b. Option I. Apply simple cost analysis

It is not used.

Sub-step 2b. Option II. Apply investment comparison analysis

It is not used.

Sub – step 2b. Option III. Apply benchmark analysis

An indicator for comparison of project IRR is the Without Risk Factor (WRF), which in the proposed case is equal to National Bank of Ukraine Bond Rate. Using only WRF without adding a risk factor (RF) is a conservative approach.

[17] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

[18] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

Sub-step 2c. Calculation and comparison of financial indicators

If only to show the additionality of the offered JI project, for basis the index of internal norm of project profitability (IRR) was taken. On the base of this financial index (IRR) the economical attractiveness of variants was appraised. The rate of discounting 8.5%[19] of the National Bank of Ukraine in July 2010 was used as the basis for comparison (benchmark).

The financial indicators Net Present Value (NPV) and Internal Rate of Return (IRR) were calculated for two variants of project introduction – with the JI mechanism and without it (Appendix B).

To the NPV and IRR project without the use of the JI mechanisms will make:

NPV: - 4.7 million euro,

IRR: 2.1 %.

To the NPV and IRR project with the use of the JI mechanisms will make:

NPV: - 2.8 million euro,

IRR: 3.3 %.

In both cases a project is not investment attractive, so as IRR makes (2.1 % and 3.3 % accordingly), that is much more low from the typical deposit rates of the Ukrainian banks[20] . With the lowering of economic activity the interest rates of the commercial borrowings in Ukraine grew to a great extent and attained 12-13% in Euro/USD[21] and 25-30% for the loans in national currency[22].

The reconstruction of TPP without the external refinancing (grants, subsidies, subventions, and etc.) is not practically possible. The Ukrainian electro-generating companies can not receive the credits of the Ukrainian banks, where the rate of annual return, because of the high risks, certainly makes 25% and anymore[23]. Thus, in a nowadays situation practically only the state financing can be used for this purpose. But the Ukrainian government does not have the enough body of funds for this purpose.

Existent estimations of rate of returning do not allow realizing a project without the sale of carbon units and without the perceptibly long period of recoupment. The use of the JI mechanisms can substantially promote the attractiveness of project. Although a project requires considerable investments, it provides reduction of the pollutions of greenhouse gases that makes a project additional.

Outcome of Sub-step 2c: comparison analysis of threshold sensitivity (Option III) demonstrated that application of JI mechanisms increases the financial attractiveness of the project activity.

Sub-step 2d. Sensitivity analysis

[19] http://www.bank.gov.ua/Statist/Stat_data/discount_rate.htm

[20] http://www.indexbank.ua/ukr/deposit_standart.php?gclid=CNjdhZqnop0CFYKCzAod41Km1w, www.kreditprombank.com, http://fingid.com/6775_banki-xotyat-dlinnyx-deneg

[21] http://news.finance.ua/ru/~/3/20/all/2009/09/28/172543

[22] http://finance.bigmir.net/useful_articles/credits/83611

[23] http://news.finance.ua/ru/~/3/20/all/2008/07/14/131967

The financial analysis was checked up after two factors of sensitiveness: change of cost of most problems from financial position of fuel – natural gas, and change of the price emission reduction units (ERU) of greenhouse gases.

Dependence of rates of the IRR offered project on three prices variants of cost of natural gas and three variants of the ERU cost is presented in Tabl. B.1. By a base for comparison (benchmark) the typical integral interest rate of the Ukrainian banks was select. Credit interests in Ukraine shall be higher than 16.3%[24] (interest rate of one-year deposits), and this was chosen as interest rate for comparison analysis of this project.

Cost of the realization of natural gas →	200 euro /1000 м^3	250 euro / 1000 м^3	300 euro / 1000 м^3
Cost of realization of URP ↓			
0 euro/t CO_2e	2.09%	2.92%	3.73%
7 euro /t CO_2e	3.35%	4.24%	5.12%
13 euro/t CO_2e	5.10%	6.05%	6.99%

Table B.1. The IRR calculation for different costs of natural gas and ERU

According to the Table B.1, IRR project without enlisted of the Kyoto financing, even for the conservative cost of natural gas in 300 euro/ 1000 м^3, does not achieve a control point (IRR=16.3%) . Since the tariff of 300 euro/ 1000 m^3 considerably exceeds a price at which Starobeshivska TPP purchases natural gas, the additionality of proposed project may be considered as proved.

The mentioned result can be supported by that fact, that IRR during the potential realization ERU, expected for the price of 7 Euro/t CO_2e, and also for the price of 13 Euro /t CO_2e will not attain a benchmark neither in the case of a 250 Euro/ 1000 м^3, nor in the case of a 300 Euro/ 1000 м^3 of natural gas.

Indices of IRR calculation prove the reliability of the results of abovementioned financial analysis.

Outcome of Sub-step 2d: Analysis of sensitivity demonstrated that financial indices of the project are sensitive to the fuel cost. A basic conclusion consists in the higher cost that makes the project more profitable. But, the internal rate of repayment is still low in scenarios even more pessimistic in relation to charges.

Outcome of Step 2. Investment analysis has demonstrated that JI project scarcely will be more financially attractive or financially attractive at all. The project will not be economically profitable for Supplier without the sale of the CO_2 credits that will make implementation of the project impossible. Therefore proceeds of sale of carbon units are important component in the project realization.

Hence, the Step 2 is satisfied.

[24] http://www.bank.gov.ua/

Step 3: Barrier analysis

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed project activity:

Investment barrier:

The investment analysis demonstrates that the internal rate of returning (IRR) will be 2.1% without the ERU sale. The term of project's recoupment is 9.5 years, that is enough risky, taking into account a hard economic climate in Ukraine. Subject to ERU sale, IRR grows to 3.32% with recoupment of approximately 7.6 years. It makes the project more viable, therefore a project will be financially additional.

Technological barrier:

Due to the financial problems, repair works were recently conducted incompletely provided mainly maintenance of equipment in operating condition, often without taking into account economic results. At the same time a lot of knots of equipment need replacement. Introduction of the boiler's air circulating boiling layer is unique technology for Ukraine. Taking into account complexity of this technology, qualification of maintenance staff can be insufficient. The training of these workers is needed in order to overcoming of this obstacle.

Organizational barrier:

Experience in JI projects implementation management including conducting of international negotiations, determination, registration, monitoring verification, etc. is absent.

Outcome of Sub-step 3a: Identified barriers would prevent from implementation of the proposed project activity as well as of the other alternatives – reconstruction without JI mechanism and rehabilitation of the whole TPP.

Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives(except the proposed project activity):

As a result of analysis, the term of recoupment of investments of variant (2) is 9.5 years. Taking into account the financial indexes of variant (3) which requires considerable capital investments (about 170 million euro), and the term of recoupment exceeds 30 years, one may conclude that variants (2) and (3) have the considerable financial obstacles.

More economically viable and realistic scenario without JI mechanisms is the variant (1) with the minimal financial investments within current repairs ("business as usual"). The repair works of power units are conducted at Starobeshivska TPP for support of their productivity. Thus, a variant (1) remains the only real scenario under which existing situation at Starobeshivska TPP may last further.

Minimal annual repair does not result in reduction of basic emissions because the decline of the whole power plant with reduction of efficiency occurs at the same time. This scenario is less attractive for environment for the nearest future (including the first period of obligations for 2008-2012 years), because in the conditions of increase of the share of more intensive carbon fuel the general actual greenhouse gas emissions of power plant will increase. However this scenario is more attractive economically.

Obviously neither financial nor technological obstacles do not interfere with the baseline scenario which would be realized in the absence of proposed JI project. Thus OJSC "Donbasenergo" doesn't have any obstacles for subsequent exploitation of power plant at previous level.

Outcome of Sub-step 3b: Identified barriers can not impede at least one alternative scenario – continuation of «business as usual» activities.

Outcome of Step 3. At least one alternative scenario exists in addition to proposed JI project, which application is not prevented by any stated obstacles. Investment barrier is absent in the alternative scenario (1), whereby only minimal repair works shall be implemented. This scenario shall be considered as the baseline scenario as to proposed project.

Hence, the Step 3 is satisfied.

Step 4: Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

The customary practice for power supply enterprises in Ukraine is implementation of only necessary repair works for the outdated equipment without application of JI mechanisms. Through application of the JI constituent it is possible to obtain additional investments for actual realization of the project measures. At present there are no similar realized projects for rehabilitation and technical re-equipment of TPP through application of JI mechanisms subject to increase of carbon intensive fuel share besides this project.

Sub-step 4b: Discuss any similar Options that are occurring:

Since there are no similar projects in Ukraine, there is no need to discuss any similar project activity.

Outcome of Step 4: Similar activities cannot be observed in Ukraine, thus the proposed project activity is additional.

Hence, the Step 4 is satisfied.

Conclusion:

Proposed project activity is additional.

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

Sources of greenhouse gases and the project boundaries

Since reduction of greenhouse gas emissions is calculated on the basis of change of fuel specific consumption in the course of electric power generating, effectively released to the network, which occur in the course of implementation of the project activity at the power plant, the project boundaries are limited exclusively to the project power plant. This is one more difference of our methodology from the methodology AM0061, wherein the project boundaries cover the whole power supply network.

The project boundaries are outlined by the dashed line. Project boundaries include all sources and emissions affected or controlled by the project (Fig. B.2).

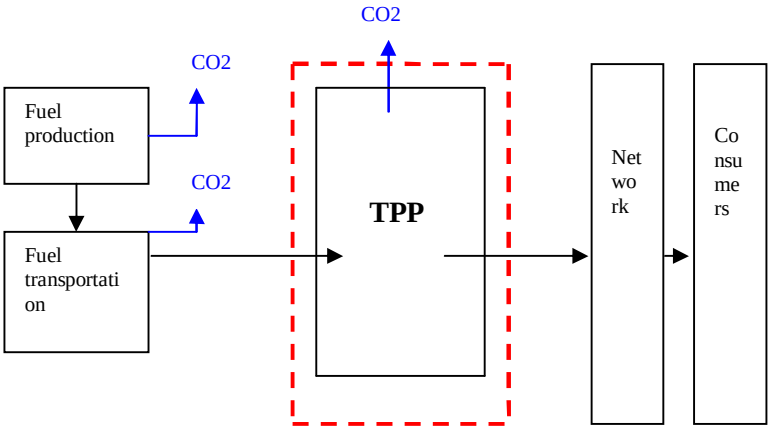

Figure B.2. Diagram of the project boundaries

The project boundaries don't cover the emissions related to fuel production and transportation. The project boundaries shall be invariable for project scenario (Fig. B.2).

The basic aspects affected by the project are the changes in a quantity of consumed fuel. In order to define, what sources must be included into the project boundaries, the following approaches were carried out:

- Sources, unaffected by the project, were excluded
- Sources, affected by the project, were included

Sources of the emissions

Table B.2 demonstrates the sources of the emissions for baseline and project scenarios and provides the explanations in respect of sources included to the project's bounds.

Scenario	Source of emissions	Emissions	Included or excluded	Explanations
Local emissions				
Baseline	Production of electric power for effective delivery to the power system	CO_2	Included	The main emission source
		CH_4	Excluded	Minor source*. Excluded from considerations for simplification. Analysis is conservative.
		N_2O	Excluded	Minor source, practically absent in traditional combustion technology. Excluded from considerations for simplification. Analysis is conservative
		NO_x	Excluded	NO_x is not the immediate-action greenhouse gas
		CO	Excluded	CO is not the immediate-action greenhouse gas
Project	Production of electric power for effective delivery to the power system	CO_2	Included	The main emission source
		CH_4	Excluded	Minor source. Excluded from considerations for simplification. Analysis is conservative.
		N_2O	Included	Will appear after implementation of the combustion technology with air circulating boiling layer at power unit No.4
		NO_x	Excluded	NO_x is not the immediate-action greenhouse gas
		CO	Excluded	CO is not the immediate-action greenhouse gas
Extraneous emissions				
Emissions of CO_2, CH_4, N_2O due to fuel production and transportation		Indirect	Excluded	The project activity doesn't impact the fuel production and transportation. These emission ns are not controlled by the project's developer

*Methane emission is minor source in processes of fuel combustion at Starobeshivska TPP.

Table B.2. Sources of the emissions included to and excluded from the project's bounds

Values of Methane emission factor ***(MEF)*** at combustion of the fuel types used at the TPP are respectively:[25]

Coal = 1 kg CH_4/TJ

Natural gas = 1 kg CH_4/TJ

Black oil = 3 kg CH_4/TJ

[25] 2006 *IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 2.2 page 2.17*

Influence of methane emission is insignificant, therefore it is excluded from consideration.

Within the framework of this Project, leakages may occur when coal, natural gas and black oil are delivered to the Starobeshivska TPP. Their may be caused by:

- Physical losses when natural gas is delivered via the gas transmission system. This leakages are not controlled by the project participants.
- CO_2 emissions that occur as a result of the consumption of fuel when coal and black oil are delivered by railway. This leakages are not controlled by the project participants.

In Baseline scenario fuel is delivered in larger volumes than in the project scenario, therefore there might be more leakages versus the Project activity. This leads to an increase of emission reductions in the project scenario. Accordingly, from the viewpoint of a conservative estimate, such leakages are ignored.

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

Date of baseline setting: 31/03/2008.

Baseline is determined by the Institute of Engineering Ecology, the project's developer, and OJSC "Donbasenergo", the project's supplier (listed in Annex 1).

OJSC «Donbasenergo»
Donestk, Ukraine
Ivanov Sergiy Oleksandrovych
General Director
Telephone: (+38 06234) 5 1370
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e-mail: office@de.com.ua

IEE:
Institute of Engineering Ecology
Kiev, Ukraine.
Sigal Oleksandr Isakovich,
Director, Ph.D.
Telephone: (+38 044) 453 2862
Fax: (+38 044) 456 9262
e-mail: engeco@kw.ua

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of project activity: May 16, 2007

C.2. Expected operational lifetime of the project:

The expected operational lifetime of the project is minimum 20 years (240 month) that is usual nominal operational lifetime of new equipment for boilers and turbines.

Real average life-cycle of new power equipment (boilers, turbines, etc.) is about 30-40 years according to the practice in Ukraine. Thus actual operational lifetime of the project may be expected as over 30 years.

C.3. Length of the crediting period:

Production of ERU relates to the first period of obligations and makes 4 years/48 months (January 01, 2009 – December 31, 2012).

Starting date of the crediting period was the expected date of first generated ERUs, namely: January 01, 2009.

The end date of the crediting period is termination of the first period of obligations under the Kyoto protocol, namely: December 31, 2012.

If after the first period of obligations under Kyoto Protocol its validity (or any other analogous documents related to restriction of greenhouse gas emissions) is prolonged, crediting period under the project may be prolonged to the termination of expected operational lifetime of the principal equipment of the project (at least 20 years, 2009-2028).

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

Monitoring plant chosen for proposed JI project is aimed at ensuring of availability of all data necessary for determination of the emission levels under the baseline and project scenarios, and then – volume of emission reduction due to JI project implementation. Proposed monitoring plant meets the "*Guidance on criteria for baseline setting and monitoring*"[26].

Description of the monitoring plan is made with using the following step-wise approach:

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

For this project the a) approach regarding monitoring, defined in the JISC's :Guidance on criteria for baseline setting and monitoring", is chosen.

As it was described in section B.1, the JI specific approach is used for monitoring, with using of approach and algorithm of "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02)*[27].

Step 2. Application of the approach chosen

Detailed description of the application of the approach chosen and monitoring plan is provided in the sections below and in Annex 3 "Monitoring plan".

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

Monitoring of the volume of greenhouse gases generation comes to measurement of fuel consumption, its heat capacity and measurement of effective delivery of the electric power to the network. Other parameters are derived through calculation method or from standard data. Institute of Engineering Ecology, Project's developer, OJSC "Donbasenergo" and Starobeshivska TPP elaborated detailed system of collecting and archiving of all necessary data. Data storage control system includes electronic and paper recording, executed by the staff of production-technical department, fuel-transport workshop, production chemical laboratory and accounting department.

[26] http://ji.unfccc.int/index.html
[27] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

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
1. $FC_{i,,y}$	Fuel consumption	Each power unit			According to[28]: daily, accounting monthly	100%	Electronic and/or paper	
1.1. $FC_{c,y}$	Coal		tt/yr	M				
1.2. $FC_{ng,y}$	Natural gas		mln.m^3/yr	M				
1.3. $FC_{bo,y}$	Black oil		tt/yr	M				
2. $NCV_{i,,y}$	Net calorific value	Each power unit			According to[29]: every five days, accounting monthly	100%	Electronic and/or paper	
2.1. $NCV_{c,y}$	Coal		TJ/ tt	M				

[28] GKD 34.09.101-2003 «Methodical instructions for fuel recording at electric power stations»

[29] SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gas-like fuel at energy objects. Determination of the fuel quality for calculation of unit costs. Methodical instructions»

2.2. $NCV_{ng,y}$	Natural gas		TJ /mln.m^3	M				
2.3. $NCV_{bo,y}$	Black oil		TJ / tt	M				
3. EL_y	Total amount of electricity supplied to the electricity grid	Each power unit	GWh/yr	M	Daily, accounting monthly	100%	Electronic	

Information about the structure of monitoring system and characteristics of metering equipment is given in the Annex 3 – Monitoring Plan.

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

Project emissions PE_y was calculated according to the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"(Version 02)*[30]

$$PE_y = PE_{FC,j,y} \quad (P)$$

CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (P1)$$

[30] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

Where

$PE_{FC,j,y}$ – are the CO_2 emissions from fossil fuel combustion in process *j* during the year *y*, tCO_2/yr

$FC_{i,j,y}$ – is the quantity of fuel type *i* combusted in process *j* during the year *y*, tt (mln.m^3)/yr

$COEF_{i,y}$ – is the CO_2 emission coefficient of fuel type *i* in year *y* , tCO_2/ tt (mln.m^3)

i – are the fuel types combusted in process *j* during the year *y*

y – year of the crediting period

The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i*:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad \text{(P2)}$$

Where

$COEF_{i,y}$ – is the CO_2 emission coefficient of fuel type *i* in year *y* , tCO_2e/tt (mln.m^3)

$NCV_{i,y}$ – is the weighted average net calorific value of the fuel type *i* in year *y*, TJ/tt (mln.m^3)

$EF_{CO2,i,y}$ – is the weighted average CO_2 emission factor of fuel type *i* in year *y*, tCO_2/TJ

i – are the fuel types combusted in process *j* during the year *y*

y – year of the crediting period

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 ©, estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. $FC_{i,x}$	Fuel consumption	Each power unit			According to [31]: daily, accounting monthly	100%	Electronic and/or paper	
1.1. $FC_{c,x}$	Coal		tt/yr	M				
1.2. $FC_{ng,x}$	Natural gas		mln.m^3/yr	M				
1.3. $FC_{bo,x}$	Black oil		tt/yr	M				
2. $NCV_{i,x}$	Net calorific value	Each power unit		Report of the supplier or analytical report of chemical laboratory	According to [32] every five days, accounting monthly	100%	Electronic and/or paper	

[31] GKD 34.09.101-2003 «Methodical instructions for fuel recording at electric power stations"

2.1. $NCV_{c,x}$	Coal		TJ/ tt	M				
2.2. $NCV_{ng,x}$	Natural gas		TJ /mln.m^3	M				
2.3. $NCV_{bo,x}$	Black oil		TJ / tt	M				
3. EL_x	Total amount of electricity supplied to the electricity grid	Each power unit	GWh/yr	M	Daily, accounting monthly	100%	Electronic	

Table of parameters included into the process of ERU monitoring are given in the Annex 3.

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

Baseline emissions BE_y corresponds to the greenhouse gases emissions under the dynamic baseline BE_y^{DYN} .

$$BE_y = BE_y^{DYN} \quad \text{(B)}$$

where

BE_y – baseline emissions in year y of the crediting period, tCO_2e/yr.

BE_y^{DYN} – dynamic baseline emissions due to the combustion of fossil fuels in year y of the crediting period, tCO_2e/yr.

[32] SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gas-like fuel at energy objects. Determination of the fuel quality for calculation of unit costs. Methodical instructions»

y – year of the crediting period.

Dynamic baseline is calculated to the following assumptions:

- Baseline consumption of tonne of coal equivalent corresponds to annual electricity supplied to the electricity grid by the project activity power plant in year *y* of the crediting period (Dynamic baseline consumption of tonne of coal equivalent (**TCE_y^{DYN}**);
- Specific fuel consumption in year *y* of crediting period corresponds to the average annual consumption during the most recent three historical years *x* prior to the implementation of the project activity *($SFC_{AVR,x}$)*;
- Correlation baseline consumption of fossil fuels type *i* with various carbon intensity and their net calorific value are the same as in year *y* of the crediting period.

Calculation of dynamic baseline

Method of dynamic baseline calculation includes the following steps:

Step 1. Dynamic baseline emissions:

$$BE_y^{DYN} = \sum_i (FC_{i,y}^{DYN} \times NCV_{i,y} \times EF_{i,CO2}) \quad \text{(B1)}$$

where

BE_y^{DYN} – dynamic baseline emissions due to the combustion of fossil fuels in year *y* of the crediting period, tCO_2e/yr.

$FC_{i,y}^{DYN}$ – is the quantity of dynamic fossil fuel type *i* used in the project activity power plant in year *y* of the crediting period, tt ($mln.m^3$).

$NCV_{i,y}$ – net calorific value for the fossil fuel type *i* used in the project activity power plant in year *y* of the crediting period, TJ/tt (mln.m^3)

$EF_{i,CO2}$ – CO_2 emission factor for the fossil fuel type *i* used in the project activity power plant in year *y* of the crediting period, tCO_2e/TJ

i – are the fuel types combusted during the year *y*

y – year of the crediting period.

Step 2. Dynamic baseline consumption of fossil fuel $FC_{i,y}^{DYN}$ type *i* used in the project activity power plant in year *y* of the crediting period corresponds to the dynamic baseline consumption of tonne of coal equivalent $TCE_{i,y}^{DYN}$ in year *y* of the crediting period.

Dynamic baseline consumption of fossil fuel $FC_{i,y}^{DYN}$:

$$FC_{i,y}^{DYN} = \sum_i (TCE_{i,y}^{DYN} \times NCV_{i,y}) / 29{,}3 \qquad \text{(B2)}$$

where

$FC_{i,y}^{DYN}$ – is the quantity of dynamic fossil fuel type *i* used in the project activity power plant in year *y* of the crediting period, tt (mln.m^3)

$TCE_{i,y}^{DYN}$ – is the quantity of fuel type *i* in dynamic baseline consumption of tonne of coal equivalent in year *y* of the crediting period, ttce

$NCV_{i,y}$ – net calorific value for the fossil fuel type *i* used in the project activity power plant in year *y* of the crediting period, TJ/tt (mln.m^3)

29,3 – a conventional value of tonne of coal equivalent, TJ/ttce

i – are the fuel types combusted during the year *y*

y – year of the crediting period, yr.

Step 3. Estimation of the correlation of fuels of various types *i* with different carbon intensity in year *y* of the crediting period.

Quantity of fuel type *i* $TCE_{i,y}^{DYN}$ in dynamic baseline consumption of tonne of coal equivalent TCE_{y}^{DYN}:

$$TCE_{i,y}^{DYN} = TCE_{y}^{DYN} \times \sum_{i} tce_{i,y} \qquad \text{(B3)}$$

where

$TCE_{i,y}^{DYN}$ – is the quantity of fuel type *i* in dynamic baseline consumption of tonne of coal equivalent in year *y* of the crediting period, ttce

TCE_{y}^{DYN} – dynamic baseline consumption of tonne of coal equivalent in year *y* of the crediting period, ttce

$tce_{i,y}$ – part of fuel type *i* in the fuel mixture consumption in year *y* of the crediting period.

i – are the fuel types combusted during the year *y*

y – year of the crediting period, yr.

Step 4. Dynamic baseline consumption of tonne of coal equivalent TCE_{y}^{DYN} in year *y* of the crediting period.

Dynamic baseline consumption of tonne of coal equivalent TCE_y^{DYN} in year y of the crediting period is calculated on the assumption that rate of specific fuel consumption SFC_y^{DYN} amounts to average rate of tonne of coal equivalent within the most recent three historical years x prior to the implementation of the project activity $SFC_{AVR,x}$:

$$SFC_y^{DYN} = SFC_{AVR,x},$$

and effective delivery of electric power EL_y^{DYN} corresponds to effective delivery of electric power $EL_{P,y}$ in year y of the crediting period:

$$EL_y^{DYN} = EL_{P,y}$$

Dynamic baseline consumption of tonne of coal equivalent TCE_y^{DYN}:

$$TCE_y^{DYN} = SFC_{AVR,x} \times EL_{P,y,} \quad \text{(B4)}$$

where

TCE_y^{DYN} – dynamic baseline consumption of tonne of coal equivalent in year y of the crediting period, ttce

$SFC_{AVR,x}$ – average annual rate of specific fuel consumption during the most recent three historical years x prior to the implementation of the project activity, ttce / GWh

$EL_{P,y}$ – total amount of electricity supplied to the electricity grid by the project activity power plant in year y of the crediting period, GWh

x – each one of the three most recent years prior to the implementation of the project activity.

y – year of the crediting period, yr.

Average annual rate of specific fuel consumption $SFC_{AVR,x}$:

$$SFC_{AVR,x} = TCE_{AVR,x} / EL_{AVR,x} \quad \text{(B4.1)}$$

where

$SFC_{AVR,x}$ – average annual rate of specific fuel consumption during the most recent three historical years *x* prior to the implementation of the project activity, ttce / GWh

$TCE_{AVR,x}$ – average consumption of tonne of coal equivalent during the most recent three historical years *x* prior to the implementation of the project activity, ttce

$EL_{AVR,x}$ – average annual amount of electricity supplied to the electricity grid by the Starobeshivska TPP during the most recent three historical years *x* prior to the implementation of the project activity, GWh

Average consumption of tonne of coal equivalent $TCE_{AVR,x}$:

$$TCE_{AVR,x} = \sum_{x} (\sum_{i}(FC_{i,x} \times NCV_{i,x})/29,3)/3 \qquad \text{(B4.1.1)}$$

where

$TCE_{AVR,x}$ – average consumption of tonne of coal equivalent during the most recent three years *x* prior to the implementation of the project activity, ttce

$FC_{i,x}$ – is the quantity of fossil fuel type *i* used in year *x* prior to the implementation of the project activity, tt (mln.m^3).

$NCV_{i,x}$ – net calorific value for the fossil fuel type *i* used in year *x* prior to the implementation of the project activity, TJ/ tt (mln.m^3).

i – are the fuel types combusted during the year *x* before the project implementation.

x – each one of the three most recent years prior to the implementation of the project activity, yr.

Volume of effectively delivered electric power $EL_{AVR,x}$:

$$EL_{AVR,x} = \sum_{x} EL_{x} /3 \quad \text{(B4.1.2)}$$

where

$EL_{AVR,x}$ – average annual amount of electricity supplied to the electricity grid by the Starobeshivska TPP during the most recent three historical years x prior to the implementation of the project activity, GWh

EL_{x} – annual amount of electricity supplied to the electricity grid by the Starobeshivska TPP during the most recent three historical years x prior to the implementation of the project activity, GWh

x – each one of the three most recent years prior to the implementation of the project activity, yr.

Step 5. Part of fuel of i type in fuel mixture combusted:

$$tce_{i,y} = \sum_{i} TCE_{i,y} / TCE_{y}, \quad \text{(B5)}$$

where

$tce_{i,y}$ – part of fuel of i type in fuel mixture combusted in the reporting year y.

$TCE_{i,y}$ – is the quantity of fuel type i consumption of tonne of coal equivalent in year y of the crediting period, ttce

TCE_{y} – consumption of tonne of coal equivalent in year y of the crediting period, ttce

i – are the fuel types combusted during the year y

y – year of the crediting period, yr.

The quantity of fuel type *i* consumption of tonne of coal equivalent:

$$TCE_{i,y} = \sum_{i} (FC_{i,y} \times NCV_{i,y})/29,3 \quad \text{(B5.1)}$$

where

$TCE_{i,y}$ – is the quantity of fuel type *i* consumption of tonne of coal equivalent in year *y* of the crediting period, ttce

$FC_{i,y}$ – is the quantity of fuel type *i* combusted during the year *y*, tt (mln.m^3)/yr

$NCV_{i,y}$ – net calorific value for the fossil fuel type *i* used in the project activity power plant in year *y* of the crediting period, TJ/tt (mln.m^3)

i – are the fuel types combusted during the year *y*

y – year of the crediting period, yr.

Consumption of tonne of coal equivalent in year *y* of the crediting period:

$$TCE_y = \sum_{i} TCE_{i,y} \quad \text{(B5.2)}$$

More detailed information is provided in the **Appendix A "Calculation of Baseline and Project CO_2e emissions"** (as Excel table).

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

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

This Table is left blank on purpose.

There are no data which would be collected for project emission reduction monitoring, since emission reductions will be calculated under the formula given in the section **D.1.2.2.**

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):

Total reduction of emissions from the project:

$$ER_y = BE_y - PE_y \quad \text{(R)}$$

where

ER_y – emission reduction units, tCO_2e

BE_y – baseline emissions, tCO_2

PE_y – project emissions, tCO_2e

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

No leakage are expected.

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

This Table is left blank on purpose.

All accidental leakage of emissions (for example caused by leakages in pipelines, etc.) in accordance with the TPP requirements must be removed as soon as possible by own staff and/or specialized teams.

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

No leakage is expected.

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):

Since the leakage is not detected for this project, the final equation shall be the following:

$$ER_y = BE_y - PE_y \quad \text{(R)}$$

де

ER_y – emission reduction units, tCO_2e

BE_y – baseline emissions, tCO_2

PE_y – project emissions, tCO_2e

More detailed information is provided in the **Appendix 1 "Calculation of Baseline and Project CO_2e emissions"** (as Excel table).

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:

The maximal environmental impact of the activity of the Starobeshivska TPP is determined according to the following documents:

- Permit No.1424555400-3 as of 2008/12/26 for emission of contaminants into the atmospheric air by stationary sources. Valid till: 2015/12/26. (Ministry of environment protection of Ukraine).
- Permit No. Ukr-Don-3776 as of 2008/12/22 for special water consumption by Starobeshivska TPP. Valid till: 2012/01/01 (State Department of Environment Protection in Donetsk region).
- Permit No.37.05 as of 2008/09/25 for waste disposal in 2009. Valid till:2010/01/01. (State Department of Environment Protection in Donetsk region).

The usual activity of Starobeshivska TPP does not cause any exceeding of these limits, and the project activity will lead to the weakening of its negative environmental impact.

Information on the environmental impacts of the project is monitored and archived by the special department on environmental protection at the Starobeshivska TPP headed by Georgy Bilyy, in accordance with the internal TPP's procedures.

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.
Electric power amount usefully supplied to power supply network	Low	Measuring instruments must be calibrated according to national regulations[33]
Coal amount consumed by power unit	Low	Measuring instruments must be calibrated according to national regulations
Natural gas amount consumed by power unit	Low	Measuring instruments must be calibrated according to national regulations
Black oil amount consumed by power unit	Low	Measuring instruments must be calibrated according to national regulations [34]
Quality of fuel (net calorific value)	Low	Measuring instruments must be calibrated according to national regulations
Guarantees of quality measurements	Low	Measuring instruments must be calibrated according to national regulations[35]

The data from the belt-conveyer weighter (for coal) are controlled after installation and regularly controlled and calibrated in accordance with the service instruction of the producer. All defects should be rectified with the consequent calibration.

The data from reservoir (for black oil) are regularly controlled and calibrated in accordance with the service instruction of the producer. All defects should be rectified with the consequent calibration.

[33] State Standards of Ukraine №2708:2006 "The Metrology. Check of facilities of measuring instruments.

[34] SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»

[35] http://www.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=113%2F98-%E2%F0

The gas meter is controlled and calibrated by the gas supplying company in accordance with it's procedures and current legislation. The defected meter should be replaced.

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

Project management

All responsibility for management and implementation of the project is vested on General Director "Donbasenergo" PJSC Mr. Ivanov Sergiy Olexandrovych.

Responsibility of data collection

General Director OJSC "Donbasenergo" Mr. Ivanov Sergiy Olexandrovych appointed the responsible persons for implementation and process of monitoring at Starobeshivska TPP:

- Sidorchenko Natalia Grigoriivna, Department of investment project management and capital construction OJSC "Donbasenergo"
- Bekerov Valeriy Ametovich, Deputy chief engineer on operation Starobeshivska TPP.

They are responsible for supervision of data collection, measurement, verification and registration of data and its storage.

The structure of administration and management of the project includes the following departments of Supplier: production technical department, fuel transportation shop, production chemical laboratory, electric power shop.

Eventual impediments and errors in project implementation must be determined and solved by responsible personnel of OJSC "Donbasenergo".

Detailed information is provided in Annex 3.

Pavliuk Nonna Yuriivna, senior scientific researcher at the Institute of Engineering Ecology, is responsible for development of baseline and monitoring methodology, and data processing according to methodology, and for preparation of Monitoring Report; support and coordination of verification process.

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

The monitoring plan is established by the Institute of Engineering Ecology, the project developer, OJSC"Donbasenergo", the project participant – supplier and Starobeshivska TPP, the project executor.

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SECTION E. Estimation of greenhouse gas emission reductions

Project Carbon Emission Factors are assumed equal to the Baseline Carbon Emission Factors CO_2e.

E.1. Estimated project emissions:

Calculations of the project GHG emissions are based on fuel consumption calculated according to the specifications in the approved technical plans. Monitoring of emission reductions will be made based on actual fuel consumption. The quality of coal, black oil and natural gas NCV in the years 2010-2012 accepted in power strategy of development of the Starobeshivska TPP.

The quality of coal, black oil and natural gas NCV in the years 2006-2009 accepted in accordance with the real information from Starobeshivska TPP.

Project emissions		2009	2010	2011	2012
Project emissions of power units #5-13	tCO_2e/yr	5 141 195	5 510 982	5 809 927	6 133 382
Project emissions of power units #4	tCO_2e/yr		564	564	564
Total:		5 141 195	5 511 547	5 810 491	6 133 946
Total	tCO_2e	22 597 179			

Table E.1. CO_2e Project emissions after project implementation

E.2. Estimated leakage:

We assume that possible leakage is negligible comparing to the total emissions. These leakages are not under control of project developer (see Section B.3). Thus, we do not include them in calculations**.**

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

Total project emissions and leakage		2009	2010	2011	2012
Total project emissions	tCO_2e/yr	5 141 195	5 511 547	5 810 491	6 133 946
Leakage	tCO_2e/yr				
Total project emissions and leakage	tCO_2e/yr	5 141 195	5 511 547	5 810 491	6 133 946
Total	tCO_2e	22 597 179			

Table E.2. CO_2e Project emissions and leakage after project implementation

E.4. Estimated baseline emissions:

Calculations of the baseline GHG emissions are strictly based on the actual fuel consumption, without using any assumptions.

Baseline emissions		2009	2010	2011	2012
ERUs	t CO_2e/yr	5 226 013	5 662 787	6 002 322	6 362 350
Total	t CO_2e	23 253 472			

Table E.4. Baseline CO_2e emissions

More detailed information is provided in the **Appendix A "Calculation of Baseline and Project CO_2e emissions"** (as Excel table).

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

Emissions Reduction		2009	2010	2011	2012
ERUs	tCO_2e/yr	84 818	151 240	191 831	228 404
Total: 2009-2012	tCO_2e	656 293			

Table E.5. Expected reduction of CO_2e emissions

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)
2009	5 141 195		5 226 013	84 818
2010	5 511 547		5 662 787	151 240
2011	5 810 491		6 002 322	191 831
2012	6 133 946		6 362 350	228 404
Total: 2009 - 2012	**22 597 179**		**23 253 472**	**656 293**

Table E.6. Expected CO_2e emissions

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:

Pursuant to the Ukrainian legislation, projects of new building, reconstruction and technical re-equipment, of industrial and civil objects should include Environmental Impact Assessment (EIA), basic requirements to which are resulted in the State Building Norms of Ukraine A.2.2-1-2003.

OJSC "Donbasenergo", and namely Starobeshivska TPP, has the necessary Environmental Impact Assessments of its activity in accordance with the Ukrainian legislation.

In general, the project implementation will have positive effect on the environment.

1. Project implementation will enable to reduce direct CO_{2e} emissions by approximately 650 thou. tons in the period 2009-2012 due to increase of energy equipment efficiency. It will be achieved by installation of modern boiler equipment at the unit №4 and modernization of energy equipment of units №№5,6,8-13.
2. Due to the use of more environmental friendly technologies of combustion at the unit №4, installation of electric filter and system of toxic substances emissions monitoring at the power unit №4, the emissions will reduce to the European norms[36]

   NO_x: 600-900 to 200 mg/nm^3;

   SO_2: 3000-5000 to 200 mg/nm^3;

   Dust: 2000-4000 to 50 mg/nm^3.
3. Due to technical re-equipment of the power unit No 7, installation of the system for purification smoke fumes from dust and sulfur dioxin, the emissions will reduce to the European norms[37]

   SO_2: 3000-5000 to 200-400 mg/nm^3;

   Dust: 2000-4000 to 50 mg/nm^3.
4. The environmental pollution will be reduced due to the use of existing huge clutters of wastes in the wastes water reservoirs of concentration plants (slimes) as a fuel in the boilers of air circulating boiling layer and due to recycling of such wastes as coke-ashy wastes which are the output raw material for building materials.

Since the usual activity of Starobeshivska TPP does not cause any transboundary environmental impacts (environmental impacts are in limits of permissions), and the project activity will lead to the weakening of its negative environmental impact, any transboundary environmental impacts of the project are not expected and are not considered in the analysis.

[36] Reconstruction of Starobeshivska TPP of "Donbasenergo" PJSC. Power unit No 4 Project. Section 6. Estimation of Environmental impact. Developed by **Iurgi lentjes AG, Germany**

[37] Technical re-equipment of power unit No 7, Feasibility study, corrected. Book 3. Estimation of Environmental impact. 59-1006-TEO 3, Developed by: **DPI NDI "Teploelectroproekt" "Donbasenergo" PJSC.**

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:

Impact on water medium

Impact on water resources will be the same as in the baseline scenario. The existing technology of heat generation run at the objects of "Donbasenergo" PJSC foresees discharging of waste water to the sewage grid with obligatory chemical control in accordance to Water Code of Ukraine, GOST 28.74-82 "Hygienic regulations and quality control", SNiP 4630-92 on determining maximum concentration limits for internal water bodies. Wastewater will not be discharged to the open water bodies. This is confirmed by State Direction of natural environment protection in Donetsk region (Permit NO Ukr-Don -3776 dd. 2008/12/22 for special use of Starobeshivsta TPP. Valid till 2012/01/01).

Effects on ambient air

The project implementation will have positive effect on ambient air:

1) Reduction of NO_x, SO_x, CO and solid particles due to application of more environmental friendly clean coal energy technologies and fuel consumption reduction;

2) Reduction of fuel consumption for electricity production and power generation for own needs of power unit will lead to the air pollutants emissions reduction.

3) Emissions reduction per the unit of fuel with the same load on the power units.

This is confirmed by the Ministry of natural environment protection of Ukraine (Permit №1424555400-3 dd. 2008/12/26 for pollutant emissions in ambient air by stationary sources. Valid till: 2015/12/26).

Effects on land use

There is no impact on the land/soil.

Relevant regulation is the sphere of land use is presented by the Land Code of Ukraine. National technological practice/standard: GOST 17.4.1.02.-83 "Protection of Nature, Soils. Classification of chemical substances for pollution control".

Effects on biodiversity

There is no impact on biodiversity.

Waste generation, their treatment and disposal

There is waste generation, their treatment and disposal. In the process of project implementation the generation of waste will occur after disassembling of physically and morally obsolete equipment, burners, pipes, etc. Also there some construction waste will be formed due to dismantling of boiler etc.

Positive effect on the environment will have:

- use of existing huge clutters of wastes in the wastes water reservoirs of concentration plants (slimes) as a fuel at the boilers of air circulating boiling layer;

This is confirmed by State Direction of natural environment protection in Donetsk region (Permit No 37.05 dd.2008/09/25 for waste placement in 2009. Valid till 2010/01/01).

SECTION G. Stakeholders' comments

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

The Stakeholders' comments are presented in the following publications:

«Statement of environmental consequences of equipment modernization at power unit No 7 at Starobeshivska TPP" (Newspaper "Golos Energetika" №28 (2414) dd. 2005/07/29).

«Statement of Starobeshivska TPP intention to get permits for pollutant emissions from boiler unit of air circulating boiling layer at the power unit No 4 " (Newspaper "Golos Energetika №20 (2554) dd 2008/06/13).

Project «Reconstruction and technical re-equipment of Starobeshivska TPP of "Donbasenergo" PJSC was presented at XVIII International conference „Problems of ecology and operation of energy facilities" (Yalta, June 10-14, 2008), and at XIX International conference „Problems of ecology and operation of energy facilities" (Yalta, June 8-12, 2009), where it was comprehensively discussed by the representatives of generating companies and potential investors.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Partner - Supplier:

Organisation:	Public Joint-Stock Company “Donbasenergo”
Street/P.O.Box:	Lenina avenue
Building:	11
City:	Horlivka
State/Region:	Donetsk
Postal code:	84601
Country:	Ukraine
Phone:	+38(06242) 9-72-59
Fax:	+38(06242) 9-72-62
E-mail:	office@de.com.ua
URL:	www.de.com.ua
Represented by:	
Title:	Director General
Salutation:	Mr.
Last name:	Ivanov
Middle name:	Olexandrovych
First name:	Sergiy
Department:	
Phone (direct):	+38(06234) 5 13 70
Fax (direct):	+38(06238) 8 58 11
Mobile:	
Personal e-mail:	

Partner - Purchaser:

Organisation:	E-Energy B.V.
Street/P.O.Box:	Strawinskylaan
Building:	1143 C-11
City:	Amsterdam
State/Region:	
Postal code:	
Country:	The Netherlands
Phone:	(+370 5) 268 59 89
Fax:	(+370 5) 268 59 88
E-mail:	a.strolia@e-energija.lt
URL:	www.e-energy.eu
Represented by:	
Title:	Head of Climate Change department
Salutation:	Mr.
Last name:	Strolia
Middle name:	
First name:	Arturas
Department:	Climate Change department
Phone (direct):	(+370 5) 268 59 88
Fax (direct):	
Mobile:	
Personal e-mail:	

Annex 2

BASELINE INFORMATION

Baseline is combined, where historical emissions and dynamic base line are used as baseline for consumption of fuel. Dynamic base line is set using average consumption of fuel during 2007, 2006 and 2007 years, multiplied on fuel mixture used for increase of production capacity. The reason to use project fuel mixture is that activity under the project influences only total fuel consumption and does not influence directly a composition of fuel mixture. Fuel mixture is determined only by cost and availability of fuel, and therefore changes in comparison with historical parameters.

The basic assumptions of the baseline methodology are:

- Baseline consumption of tone of coal equivalent corresponds to annual electricity supplied to the electricity grid by the project activity power plant in year *y* of the crediting period
- Specific fuel consumption in year *y* of crediting period corresponds to the average annual consumption during the most recent three historical years *x* prior to the implementation of the project activity
- Correlations between the baseline consumption of fossil fuels type *i* with various carbon intensity and their net calorific value are the same as in year *y* of the crediting period.

Calculation of the dynamic baseline is based on assumption that ratio of fuels with different carbon intensity in base scenario is the same, as in a reported year.

№	Emissions factor	Variable	Unit	Value	Information source
1	Coal combustion	$\boldsymbol{EF}_{c,CO2}$	tCO_2/TJ	98,3 (taken as „Anthracite")	*2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 2.2*
2	Natural gas combustion	$\boldsymbol{EF}_{ng,CO2}$	tCO_2/TJ	56,1	*2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 2.2*
3	Black oil combustion	$\boldsymbol{EF}_{bo,CO2}$	tCO_2/TJ	77,4	*2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 2.2*
4	Low-grade coal (sludge) combustion	$\boldsymbol{EF}_{s,CO2}$	tCO_2/TJ	0,005	*2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Table 2.2*

Table An.2.1. Emission factors used in PDD

Annex 3

MONITORING PLAN

1. Determination of all potential emission sources within the limits of the project

2. Collection of information on greenhouse gas emissions within the limits of the project during "credit" period.

3. Assessment of project realization schedule.

4. Collection of information on measuring equipment, verification date.

5. Collection and archiving of information on project activity impact on the environment.

6. Archiving of data.

7. Determination of structure responsible for project monitoring.

8. Analysis of personnel training organization.

Data and parameters of monitoring:

Data / Parameter	$EL_{P,y}$
Data unit	GWh
Description	Annual amount of electricity supplied to the electricity grid from TPP
Time of determination/monitoring	Monitored during crediting period
Source of data (to be) used	Meters of electric powerю Data is summarized in «Performance parameters of equipment operation» (Form №3- tech. Starobeshivska TPP)
Value of data applied[38] (for ex ante calculations/determinations)	

Year	2009	2010	2011	2012
GWt	4375	4719	5002	5302

Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real expectations of the project, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier
Any comment	natural gas in the BF

Data / Parameter	$FC_{c,y}$
Data unit	Tt
Description	Annual consumption of Coal by TPP

[38] Strategy of development of Starobeshivska TPP

Time of determination/monitoring	Monitored during crediting period
Source of data (to be) used	«Certificate of movement and remains of fuel» (form № TP-22)
Value of data applied[38] (for ex ante calculations/determinations)	Year: 2009 | 2010 | 2011 | 2012 Tt: 2 242.0 | 2 588.5 | 2 742.0 | 2 907.4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real expectations of the project, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier
Any comment	Coal is purchased under invoices. Consumption of coal is measured by weight.

Data / Parameter	$FC_{ng,y}$
Data unit	mln.m^3
Description	Annual consumption of Natural gas by TPP
Time of determination/monitoring	Monitored during crediting period
Source of data (to be) used	«Certificate of movement and remains of fuel» (form № TP-22)
Value of data applied[38] (for ex ante calculations/determinations)	Year: 2009 | 2010 | 2011 | 2012 mln.m^3: 58.0 | 62.4 | 66.1 | 70.1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real expectations of the project, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier
Any comment	Gas meters

Data / Parameter	$FC_{s,y}$
Data unit	Tt
Description	Annual consumption of Low-grade coal (sludge) by TPP
Time of determination/monitoring	Monitored during crediting period
Source of data (to be) used	«Certificate of movement and remains of fuel» (form № TP-22)
Value of data applied[38] (for ex ante calculations/determinations)	Year: 2010 | 2011 | 2012 Tt: 18.8 | 18.8 | 18.8
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real expectations of the project, that is conservative
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier
Any comment	Coal is purchased under invoices. Consumption of coal is measured by weight.

Data / Parameter	$FC_{bo,y}$				
Data unit	Tt				
Description	Annual consumption of Black oil by TPP				
Time of determination/monitoring	Monitored during crediting period				
Source of data (to be) used	«Certificate of movement and remains of fuel» (form № TP-22)				
Value of data applied[38] (for ex ante calculations/determinations)	Year	2009	2010	2011	2012
	Tt	37.0	5.3	5.6	5.9
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are only two ways to determine this parameter for the purpose of estimation of ERUs. One of them is based on the maximum capacity of Starobeshivska TPP. The second way which was applied is based on real expectations of the project, that is conservative				
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier				
Any comment	Black oil is purchased invoices. Consumption of black oil is measured every 5 days by measuring reservoirs, and then is recalculated by weight.				

Data / Parameter	$NCV_{c,y}$				
Data unit	TJ/tt				
Description	Coal efficiency used by TPP during year *y* of credit period				
Time of determination/monitoring	Monitored during crediting period				
Source of data (to be) used	Report of TPP chemical laboratory				
Value of data applied[38] (for ex ante calculations/determinations)	Year	2009	2010	2011	2012
	TJ/tt	22.65	20.98	20.98	20.98
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurement every 5 days				
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier				
Any comment	SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»				

Data / Parameter	$NCV_{ng,y}$				
Data unit	TJ/mln.m^3				
Description	Natural gas fuel used by TPP during year *y* of credit period				
Time of determination/monitoring	Monitored during crediting period				
Source of data (to be) used	Report of TPP chemical laboratory				
Value of data applied[38] (for ex ante calculations/determinations)	Year	2009	2010	2011	2012
	TJ/ mln.m^3	33.08	33.08	33.08	33.08

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurement every 5 days
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier
Any comment	SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»

Data / Parameter	$NCV_{s,y}$
Data unit	TJ/tt
Description	Low-grade coal efficiency used by TPP during year *y* of credit period
Time of determination/monitoring	Monitored during crediting period
Source of data (to be) used	Report of TPP chemical laboratory
Value of data applied[38] (for ex ante calculations/determinations)	

Year	2009	2010	2011	2012
TJ/tt	-	18.81	18.81	18.81

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurement every 5 days
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier
Any comment	SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»

Data / Parameter	$NCV_{bo,y}$
Data unit	TJ/tt
Description	Black oil efficiency used by TPP during year *y* of credit period
Time of determination/monitoring	Monitored during crediting period
Source of data (to be) used	Report of TPP chemical laboratory
Value of data applied[38] (for ex ante calculations/determinations)	

Year	2009	2010	2011	2012
TJ/tt	39.36	39.36	39.36	39.36

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measurement every 5 days
QA/QC procedures (to be) applied	The relevant metering devices will be calibrated according to the host Party's legislation and requirements of the supplier
Any comment	SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»

Data collection for all monitoring period

The data necessary for project monitoring will be collected under schedule during normal operation of power-plant; accordingly, project monitoring will make organic part of the scheduled monitoring.

All collected data will be archived in electronic base to be submitted together with monitoring report.

To monitor of GHG emissions and draw up annual reports of ERU monitoring, the responsible managers of operation service will be appointed.

The developers of the project will regularly supervise realization of project's monitoring Plan implementation.

The operation troubleshooting procedure at the Starobeshivska TPP is provided in accordance with the internal TPP's procedures by the Service of exploitation and controlled by Deputy Chief Engineer on Operation Bekerov Valeriy Ametovich.

Types of control equipment

To weigh consumable solid fuel, the power-plant is equipped with conveyer scales which provide weighing precision not less than ± 1,0%.

Determining fuel consumption for production, capacity of raw coal bunkers and boiler is assessed as on the first of each month stating it in the certificate under form № ТР-22.

To select and process solid fuel samples, the power-plant is equipped with sampling units (samplers, machines for preparation of laboratory and analytical samples etc.) for coal[39].

Complex test of sample unit for representatives of sampling and processing of tests is conducted every 5 years, and also before putting into operation of the mounted sampling unit, transfer of power-plant on combustion of other fuel grade, after each case of structural modifications in sampling unit and after major overhaul of the unit. It is tested by third party competent organization with participation of Production and Technical Department, Fuel Transportation Shop, adjustment workshop and chemical workshop of the power-plant. Except for it, pursuant to leading document РД 34.23.504, in-process tests for verification of technical parameters of the unit must be conducted annually. Technical report should be drawn up by the result of sampling unit tests.

To assess liquid fuel consumption by each reservoir, graduated table according to the requirements of normative documents currently in force must be drawn up (GOST 8.346. GOST 8.570, RD 50-156).

Reservoirs must be equipped by level meters which provide error of measuring no more than ± 4.0 mm pursuant to RD 34.11.321.

Determining daily (variable) consumption of liquid fuel by flow meters, the measuring must be carried out on pressure pipelines and recirculation pipelines. At the end of each month, liquid fuel consumption is corrected by inventory results.

Method of measuring and condition of flow meters installation conform to GOST 8.563.2, RD 34.11.326 and RD 50-411.

[39] РД 34.23.504

Sampling of liquid fuel consumed for production is carried out under GOST 2517 from samplers installed on pipelines of fuel supply in boiler room, or from reservoir in case no fuel is consumed for production.

Gaseous fuel consumption for production is measured under GOST 2939, GOST 8.563.1, GOST 8.563.2, GOST 8.563.3.

With the purpose to specify remains, and also for keeping records of fuel the following actions are undertaken at the power-plant:

- monthly inventory of liquid fuel[40] as on the first of next month drawing up the certificate under form №ТР-23 (Section P) and the requirements 5.11

- monthly documentary verification of current registration data of fuel remains reporting the results in the form TP-22, (items 1-6).

Duplicates meters are foreseen.

Monitoring equipment

All measuring devices conform to national standards and are verified. All equipment is calibrated in according to State Standards of Ukraine №2708:2006 "The Metrology. Check of facilities of measuring instruments". The class of devices precision is mandatory taken into account for calculation of emissions reduction.

Monitoring of power loading given out to power network and consumed by the equipment of Starobeshivska TPP , that is used for own needs, will be carried out by the electric power meters. Their readings are consolidated monthly, are registered in electronic format and documented. The data of electric power given out to the network and consumed from power supply system by auxiliary equipment, is monthly checked with the bills got from network operator.

Pursuant to the current legislation, all measuring equipment in Ukraine must conform to the established norms of respective standards and should be periodically verified (once a year). Specifications of all measuring devices must comply with technical standards of Ukraine; the same standards are used for calibration of meters to provide their precision.

[40] GDK 34.09.102

Parameter measured	Equipment	Place of location	Producer	#	Accuracy	Calibration	Calibration interval
Useful electric supply of power unit № 4	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319158	0,2 S	Donetsk center of standardization, metrology and certification	6 years
Useful electric supply of power unit № 5	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319162	0,2 S	Donetsk center of standardization, metrology and certification	6 years
Useful electric supply of power unit № 6	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319161	0,2 S	Donetsk center of standardization, metrology and certification	6 years
Useful electric supply of power unit № 8	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319159	0,2 S	Donetsk center of standardization, metrology and certification	6 years
Useful electric supply of power unit № 9	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319165	0,2 S	Donetsk center of standardization, metrology and certification	6 years
Useful electric supply of power unit № 10	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319155	0,2 S	Donetsk center of standardization, metrology and certification	6 years
Useful electric supply of power unit № 11	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319156	0,2 S	Donetsk center of standardization, metrology and certification	6 years
Useful electric supply of power unit № 12	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319166	0,2 S	Donetsk center of standardization, metrology and certification	6 years

Useful electric supply of power unit № 13	electric power meter SL 761 A 071 SL7000 Smart	KRU-6 kV	„AKTARIS"	30319171	0,2 S	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needs power unit № 4	electric power meter SAZU-I681	KRU-6 kV	„LEMZ"	353032	1,0	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needs power unit № 5	electric power meter SAZU-I 670	KRU-6 kV	„LEMZ"	053573	2,0	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needs power unit № 6	electric power meter SAZU-I 681	KRU-6 kV	„LEMZ"	353210	1,0	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needs power unit № 8	electric power meter SAZU-I 670	KRU-6 kV	„LEMZ"	656706	2,0	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needs power unit № 9	electric power meter SAZU-I И687	KRU-6 kV	„LEMZ"	620967	1,0	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needspower unit № 10	electric power meter SAZU-I 670	KRU-6 kV	„LEMZ"	200848	2,0	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needs, unit № 11	electric power meter SAZU-I 681	KRU-6 kV	„LEMZ"	353188	1,0	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needs power unit № 12	electric power meter SAZU-I 681	KRU-6 kV	„LEMZ"	225262	1,0	Donetsk center of standardization, metrology and certification	6 years
Electric power for own needs power unit № 13	electric power meter SAZU-I 681	KRU-6 kV	„LEMZ"	223170	1,0	Donetsk center of standardization, metrology and certification	6 years

Coal consumption at the power-plant, thousand t	1) Band scales VAK-1202	Conveyer 9AII	Firm «TAU» Donetsk	-	1%	Donetsk center of standardization, metrology and certification	1 year
	2) Band scales VKP	Conveyer 9BII	«Scientific production center of energy saving problems», Donetsk	-	1%		1 year
Natural gas consumption at the TPP, mln m^3	The device of commercial registration of natural gas consumption at Starobeshivska TPP belongs to Starobeshivska TPP Direction of gas-supply and gasification of «Donetskoblgaz» JSC of «Naftogaz of Ukraine» NJSC						
Black oil consumption at the TPP, tt	Measuring of level meters + calculation						
Net calorific volume:							
NCV_c, Kcal/kg	Laboratory		Registration by five-days[41]				
NCV_{ng}, Kcal/m^3							
NCV_{bo}, Kcal/kg							

[41] SOU-N MPE 40.1.44.201:2006 «Solid, liquid and gaseous fuel at power facilities. Assessment of fuel quality for calculations of cost per unit. Methodological instructions»

Control procedures

Pursuant to the legislation currently in force, all measuring equipment in Ukraine must comply with specified requirements of standards and is subject to periodic verification.

Measuring facilities (scales, flow meters, calorimeters, etc.) subject to verification by territorial agencies of Derzhspozhyvstandart (State Consumption Standard) have stamp of state supervisor and are submitted to state supervisor in accordance with established procedure. Power-plant has verification schedule made and agreed with organizations of Derzhspozhyvstandart, approved by chief engineer (technical manager). Organization and verification procedure should meet the requirements of the state standards.

Adjustment, technological and complex tests of units for mechanized selection and treatment of hard fuel samples are carried out by competent setting up organization pursuant to RD 34.23.504.

Monitoring of environment impact

As the project provides measures of power efficiency at existing thermal power-plant, and improvement of environmental impact, and it is not building project, that's why no negative environmental impact is foreseen. Therefore, pursuant to the Ukrainian legislation, no estimation of environmental impact is required and monitoring of estimation of environmental impact during implementation and activity of the project is not necessary.

Project management

All responsibility for management and implementation of the project is vested on general director Donbasenergo OJSC, Mr. Ivanov Sergiy Olexandrovich

Starobeshivka TPP staff is also responsible for project's activity:

Monitoring of data concerning fuel consumption and useful delivery of electric power to the network

Fedorenko Olena Vasylivna – deputy head of production and technical department

Useful delivery of electric power to the network

Davidyan Sergiy Ivanovych – power shop manager

Mikhalev Igor Mikhaylovych – deputy manager of operation shop

Responsible for reporting is Sedlyar Volodymyr Mikhaylovych – head of production and technical department

Fuel consumption

Solid fuel – Kulik Anatoliy Mykolayovych – Manager of fuel transportation shop

Natural gas – Gulov Sergiy Illich – chief shiftnman of power plant: responsible for data transmission from Gas supply and gasification direction to TPP

Black oil – Aleynikov Yuriy Ivanovych – operation block

Responsible for reporting is Sedlyar Volodymyr Mikhaylovych – head of production and technical department

Analysis of net calorific value

Kolenska Olga Ivanivna – manager of chemical department

Bakhmatska Ella Gennadiyvna – head of production chemical laboratory at chemical department: primary analysis

Verification of inspection equipment

Donetsk centre of standardization and metrology performs verification of equipment

Responsible for verification of inspection equipment: Kalashnik Mykola Pylypovych – chief metrologist, deputy chief engineer

Reconstruction of blocks

Nechvalodov Olexandr Petrovich – deputy director of capital construction of Starobeshivska TPP

The environmental impacts

Bilyy Georgy Volodymyrovych – head of the special department on environmental protection

The operation troubleshooting procedure at the Starobeshivska TPP is provided in accordance with the internal TPP's procedures by the Service of exploitation and controlled by Deputy Chief Engineer on Operation Bekerov Valeriy Ametovich.

Fedorenko Olena Vasylivna is responsible for monitoring of data concerning fuel consumption and useful delivery of electric power to the network, deputy head of production and technical department of Starobeshivska TPP

Scheme of data collection for Monitoring Report is shown at the Fig. An.3.1.

Trainings

As far as the main activity of Starobeshivska TPP will not change in course of the JI project implementation, the special technical trainings for personnel are not necessary. The technical personnel of the enterprise has sufficient knowledge and experience for implementation of the project activity and maintenance of the usual equipment. Standard periodical training procedures are established at the plant, and staff is qualified enough

Since the boiler's air circulating boiling layer is quite different from the commonly used technologies in Ukraine, the corresponding initial training of operating staff is envisaged in addition to the usual professional training.

In cases of the installation air circulating boiling layer, recently performed training of operating staff:

a) Training course by The Coal Energy Technology Institute of National Academy of Sciences of Ukraine, Ministry of Fuel and Energy of Ukraine. Verification of knowledges on "Modern air circulating boiling layer – technology" (Protocol №1 from 10-13.04.2007);

b) Training course by Ministry of Fuel and Energy of Ukraine, Donbas state company for commissioning, setting-up, upgrading and servicing of power stations and electrical networks. Verification of knowledges on "Construction and exploitation of equipment of block 210 MW with a boiler's air circulating boiling layer and turbine K-200-130" (Protocol №1 from 20.11.2007).

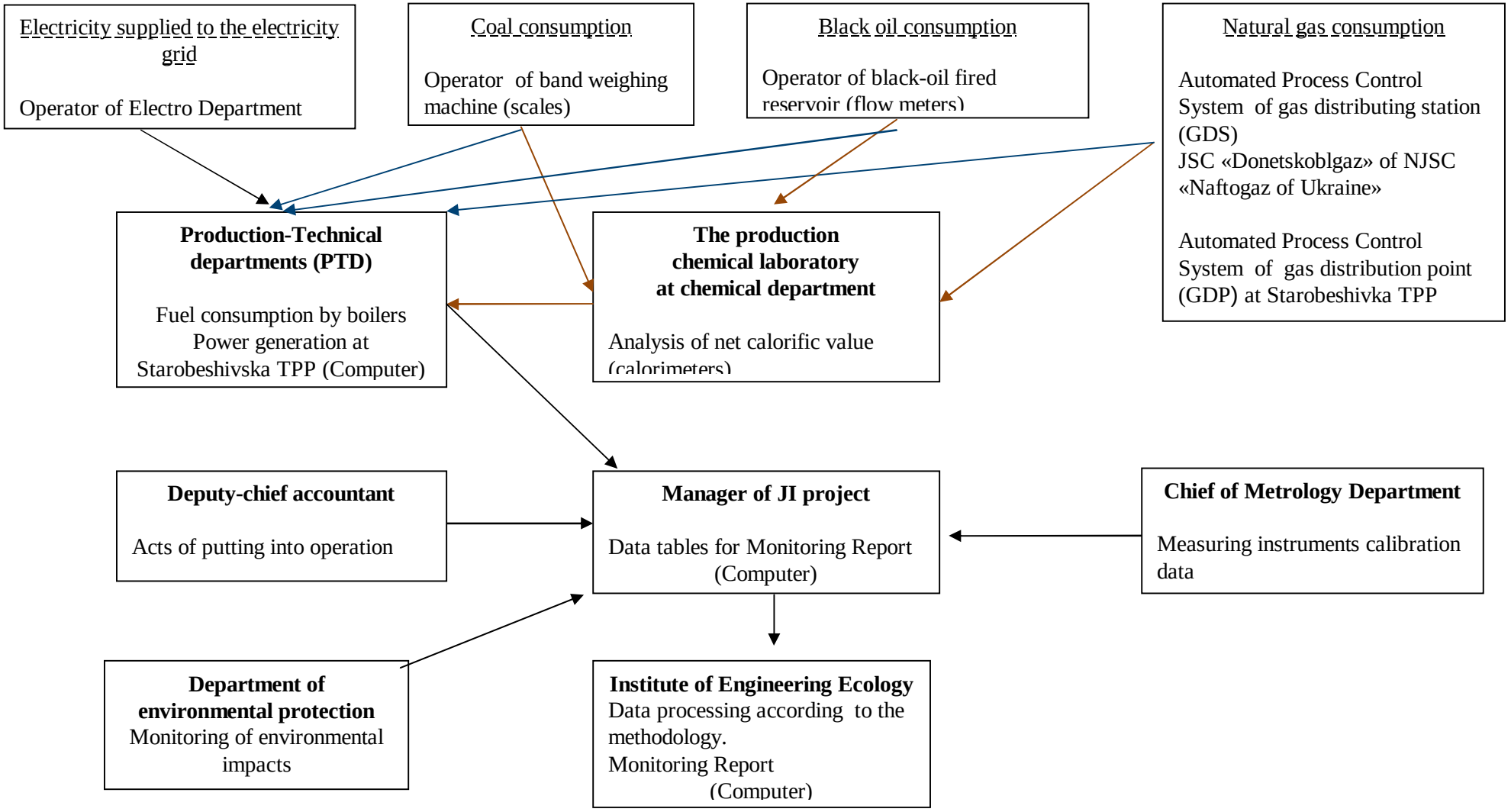

Fig.An.3.1. Scheme of data collection for Monitoring Report