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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Reconstruction of Units1,2,3 and 4 at Zuyevska Thermal Power Plant.

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

PDD version 2.8 dated 15 December 2010.

A.2. Description of the project:

Outlook of power sector in Ukraine
The power generation industry is of key importance to the development of the Ukrainian economy, as both industrial and municipal/domestic sectors depend on electric power for their operation. The energy sector of Ukraine is the twelfth largest in the world[1] and experienced deep stagnation after the breakup of the USSR. The rise in electricity consumption and generation started in 1999-2000 and has continued ever since, however, a slight decrease is evident from the end of 2008. The total installed generation capacity currently reaches about 52 GW.

In 2007 thermal power plants (TPP) were producing about 40% of all electricity generated, whereas their share in available installed capacity reaches ca. 52%. This proportion has remained fairly stable from 2005 to 2007, this is much lower than in the late eighties (1985-1990), where the share of TPPs in the energy balance was far higher, 65-70%.

Power Plants	Power generation	
	Billion kWh	%
Nuclear	92.5	47.4
Thermal	73.5	37.7
CHP	10.7	5.5
Hydro	10.1	5.2
Wind	0.01	0.003
Others[2]	8.2	4.2
Total	**195.1**	**100.0**

Table 1: Structure of electricity production in for the year 2007.

The base load is covered mainly by nuclear power plants, while hydro and TPPs (due to lack of reserve capacities) have to play a role of balancing capacities, providing power during peak consumption and semi-peak hours of the day. This role has not changed in the last decade and is expected to remain for the foreseeable future[3]. The typical power demand profile during winter and summer time is shown in figure 2 below, which also indicates the size of gap between the night and peak hours which are covered by

[1] http://www.eia.doe.gov/emeu/cabs/Ukraine/Electricity.htm

[2] This category consists predominantly of natural gas-fired CHPs operated by large industrial enterprises.

[3] Energy strategy of Ukraine up to 2030.

fossil and hydro units. Current forecasts indicate that by 2030 TPPs will generate approximately 150 – 210 GWh, which is two to three times the 2007 generation.

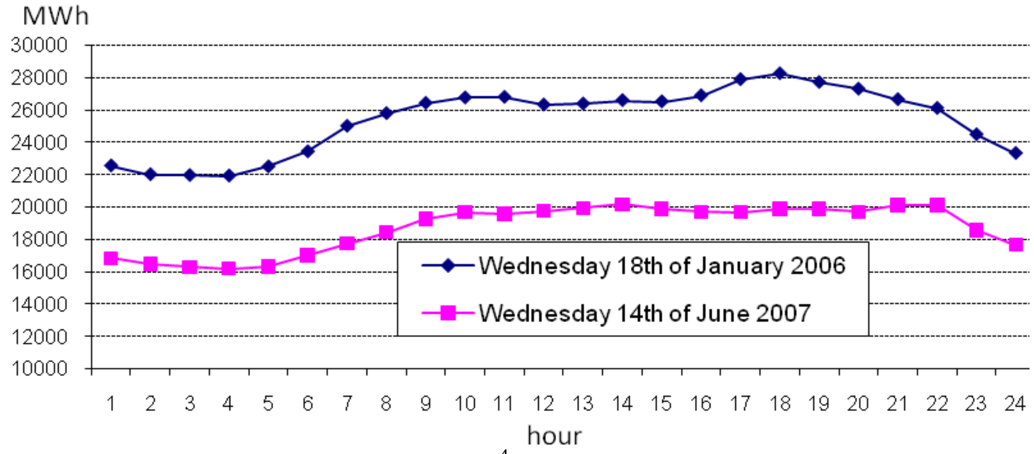

Figure 1: Load curve typical summer/winter day[4].

There are four stock Fossil generation companies, who own a total of eleven power stations. The majority of stock, over 70%, is government owned, and the main government organization, to which all the others are subordinated, is "The Energy Power Company of Ukraine." Three others PPs belong to the private company DTEK (formerly"The Donbass Fuel and Power Company"). There are also eight hydraulic power plants that are united by the State Joint-Stock Company "Ukrainian Hydroenergo" and four nuclear plants that belong to the National Nuclear Power-Generating Company "EnergoAtom."

The TPP fleet consists of 97 conventional steam turbine based plants with units varying between 150 to 800 MW installed capacity, predominantly using domestic coal as fuel, with a few using gas or heavy fuel oil. The TPPs are owned by five power generating companies. Four of them are state owned under the state holding NJSC "Energy company of Ukraine", which has a total of 71 coal-fired and eight gas fired units, listed below:

- OJSC "Zakhidenergo" with total installed capacity 4700 MW. It consists of three TPPs – Burshtynska, Dobrotvirska and Ladyzhinska, which are mainly located in western region of Ukraine. All are coal fired;
- OJSC "Centrenergo" with total installed capacity 7575 MW. It operates three TPPs: Trypilska TPP (near Kiev), Zmiivska TPP (near Kharkiv) and Vuglegirska TPP (in Donbas region);
- OJSC "Dniproenergo" with total installed capacity 8185 MW, which combines three TPPs: Prydniprovska TPP, Zaporizhska TPP and Kryvorizhska TPP, which are located in the centre and southwest of Ukraine;
- OJSC "Donbasenergo" with total installed capacity 2655 MW. This power generating company is the smallest one. It operates two TPPs: Slovianska TPP and Starobeshivska TPP - both located in Donbas region;

Three coal fired TPPs are owned by the private capital company "Skhidenergo" Ltd, which is part of DTEK holding:

- Zuyevska TPP;
- Kurahivska TPP;

[4] Data book. October 2007. One of the task reports of TACIS Project: "Support Ukraine Progressive Integration to Electricity TENs".

- Luhanska TPP.

The DTEK runs 17 coal fired units.

The existing TPP fleet was mainly built between 1960s and the start of the 80s, with a few newer plants commissioned at the end of 1980s. Over 90% of the TPPs have been operating for more than 100,000 hours and 63% of them have exceeded 170,000 running hours[5]. This has resulted in a degradation of the plants efficiency and therefore an increase in fuel consumption.

With the exception of two projects in fossil power generation mentioned below no major modernisation/rehabilitation projects to increase plant efficiency can be found over the past 10 to 15 years in the fossil TPPs fleet.

The first project was the rehabilitation of unit#8 of Zmievska TPP, co-financed by the World Bank (WB) in 1998[6]. The second project was the reconstruction of unit#4 of Starobeshevska TPP, financed by the European Bank for Reconstruction and Development (EBRD) during 2000 to 2004)[7]. Worth mentioning can be the modernisation of part of units of state owned Burshtyn TPP, but the project was mainly aimed at provision of its operation within the UCTE interconnected system.

Description of proposed project

The proposed project is aimed at increasing the fuel efficiency, reliability, and availability of all four coal fired units at Zuyevska TPP, which belong to the DTEK holding company. The TPP has four identical conventional condensing steam turbine units of 300 MW each. They were commissioned in 1982, 1986, and 1988, and as such, the TPP can be considered as one of the newest coal fired TPPs connected to the grid.

Implementation of the proposed project activity allows for producing power with higher efficiency, thus reducing the amount of combustion of fossil fuels (mainly coal) significantly below the level of what would happen in the absence of the proposed project. It directly results in reduction of GHG emission as well as emission of pollutants (dust, SO_x)

The proposed project is intended to modernise of all for units at the TPP in order to:
- Improve energy efficiency and reduce auxiliary equipment consumption
- Improve reliability and availability
- Improve part-load efficiency
- Introduce modern control systems
- Reduce the dust emission
- Reduce SO_x emission

The design solutions proposed for project implementation reflect the good engineering practices provided by major local and international equipment manufacturers.

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[5] Comparative analysis EU and Ukraine security of energy supply, by UNDP Blue Ribbon analytical and advisory centre http://www.undp.org.ua/files/en_74621comparison.pdf

[6] http://pdf.usaid.gov/pdf_docs/PNADD867.pdf

[7] http://www.ebrd.com/new/pressrel/1996/107dec17.htm

The solutions allow increasing the efficiency of existing power plant equipment to a level higher than foreseen by the original design. They represent state of the art modernisation technology which could be applied over the existing power plant equipment.

The project milestones are shown in table 2 below:

Unit#	Start up after reconstruction
1	December 2009, under reconstruction
2	December 2008, in operation
3	December 2011
4	December 2010

Table 2. Planned sequence and schedule of reconstruction of the units

The scope of reconstruction of each of the units is generally identical, and differs only in details. Flue gas desulfurization (FGD) plant is also included, and it is planned to be common for units 1, 3, and 4, with Unit #2 having an individual FDG plant.

The unit reconstruction consists of the following packages of individual measures:

1. Modernisation of steam turbine generator (STG), including:
    a. Retrofit of low pressure cylinder of STG, replacement and modernisation of STG auxiliaries
    b. Rehabilitation of high and middle pressure STG cylinders
    c. Rehabilitation of regeneration equipment and vacuum system
    d. Retrofit of alternator cooling system
2. Rehabilitation of the boiler
3. Modernisation of the unit control system
4. Rehabilitation of the unit step-up transformer
5. Modernisation of switch room equipment, partial replacement of circuit breakers
6. Improvement of ESP (electrostatic precipitators) operation

Expected result

It is expected based on equipment manufacturers data that under normal operating conditions the specific fuel consumption of the plant will be decreased from current value of approximately 10.523 to 10.04 GJ/MWh (from 359.059 to 342.5 g.c.e/kWh). This will allow operation of TPP units with high efficiency for the long period without a need to replace or substitute the equipment by more efficient one within the project period.

Since the main process of electricity production stays the same, it is not expected that operation and maintenance of equipment will represent difficulties for plant personnel. Some new equipment, like control and instrumentation, however would require initial training of staff. This will be provided by the respective suppliers.

Date start and commissioning

The decision to start the reconstruction of the power plant was taken 21 December 2004 as described in section C.1. During years 2005-2006 the feasibility study was conducted to develop technical solutions to obtain the required scope of work and to estimate the future cost.
The first stage in project implementation was achieved on the 30st of December 2008 with first start of the reconstructed unit #2. Within the first commitment period of 2008-2012 the following schedule is planned:

Start of Unit #1 after reconstruction December 2009

Start of Unit #4 after reconstruction December 2010

Start of Unit #3 after reconstruction December 2011

Average time for reconstruction of one unit up to its commissioning is about nine months (actual time for unit #2 and expected for units 1, 3 and 4). It includes design, equipment supply, installation and commissioning. Therefore, the latest dates for commissioning are shown above.

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)	Skhidenergo Ltd	No
Netherlands	Global Carbon BV	No

* Please indicate if the Party involved is a host Party

Table 3. Project Participants.

Role of the Project Participants:

- Skhidenergo Ltd is the legal entity operating and leasing the Zuyevska thermal power plant, which is implementing the proposed JI project;
- Global Carbon BV is responsible for the preparation of the investment as a JI project including PDD preparation, obtaining Party approvals, monitoring, and transferring the resulting ERUs;

A.4. Technical description of the project:

Power generated from fossil fuels (mainly local hard coals) plays important role not only in the power balance (about 45% of total power) but also in balancing the daily load profile.

A total of 97 fossil units are installed at Ukrainian TPPs with unitary capacity ranging from 150 to 800 MW. 89 of the 97 units are operating or serving in stand-by mode[8], the rest are currently mothballed. The majority of the units are the coal fired 200 and 300 MW units (42 and 40 respectively, out of total).
The proposed project is to reconstruct of all four units at Zuyevska TPP. The TPP operates four identical condensing units rated 300 MW each supplying power to the national grid.

The designed fuel for the boilers is a local hard coal with a high volatile content. Start-up and stand-by fuel is heavy fuel oil and natural gas. See table 4 below for the design and actual average coal properties:

[8] Rehabilitation of Thermal Power Plants in Ukraine: Assessment of Needs, Costs and Benefits. August 2008, WB.

Parameter, moist, ash-free basis	Unit	Design value	Actual average value 2002-2004
LCV	kcal/kg	4730	4979.0
Ash content	%	26.7	20.9
Sulphur content	%	1.2	1.1
Moisture	%	11	10.9
Volatile matters	%	40	40.4

Table 4. Coal parameters.

Coal is supplied to the TPP by rail and stored in the open air. The capacity of the storage is 825,000 tons of coal and 30,000 m^3 of heavy fuel oil. The supplied coal is measured by rail weighbridges tolerance.

The 300 MW unit is a conventional thermal power plant[9] generating power using a condensing type steam turbo generator. The STG is driven by steam generated in water tube steam boiler. STG consists of condensing steam turbine K-300-240-2 manufactured by turbine plant "Turboatom", Ukraine. Rated capacity is 300 MW, inlet steam parameters are given in Table 5 below:

	Inlet
Pressure, MPa	24
Temperature, ^{0}C	540

Table 5. Live Steam Parameters for turbine K-300-240-2.

The steam turbine drives a hydrogen cooled alternator, type TGV-300-2, produced by Elecrotyazhmash, Ukraine. There is a water tube drum steam boiler with a capacity 1,000 tonnes of steam per hour, with a steam pressure of 25.5 MPa, temperature 545 °C, produced by Taganrog boiler plant, Russian Federation.

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

Ukraine, figure 3 below, shows Ukraine and neighbouring countries, with a white arrow indicating the approximate location of the site.

[9] http://en.wikipedia.org/wiki/Fossil_fuel_power_plant

Figure 2: Ukraine, the project location and neighbouring countries

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

Donetsk oblast (province).

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

Village Zugres, located about 40 km west of Donetsk, the regional capital of Donetsk Oblast in southwest Ukraine.

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

The village of Zugres is a district centre and a part of the so called Donetsk industrial agglomeration, which include the cities of Donetsk, Makeyevka, Khartsyzsk, Avdeevka, Yasinovataya. The closest neighbouring city is Khartsyzsk.

Zugres was founded in 1929 during construction of power plant Zuyevska TPP-1 (decommissioned in the 1970s) near a small village called Zuyevka. The population as of 2004 was 19.2 thousand inhabitants. The main industries are power generation, servicing and repairs associated with power generation, construction materials, food processing, and fishery.

The proposed JI Project site co-ordinates are: 48°01'58.55" N and 38°17'08.89" E. An aerial photograph of the Power Plant is shown in Figure 3 below:

Figure 3: *Power plant satellite view*[10].

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

Reconstruction of one unit includes the following package of measures:

- Modernisation of steam turbine generator (STG), including:
    - Retrofit of low pressure cylinder of STG, replacement and modernisation of STG auxiliaries;
    - Rehabilitation of high pressure and middle pressure STG cylinders;
    - Rehabilitation of regeneration equipment and vacuum system;
    - Retrofit of alternator cooling system. Alternator type TGV-300-2UZ produced by Elektrotyazhmash, Ukraine, rated power 300 MW;
        - Increase of capacity to some 320 MW;
        - Provision of long term loading at this capacity under summer conditions of 33^{0}C cooling water temperature;
        - Prevention of leakages of cooling water and hydrogen.
- Rehabilitation of the boiler. Boiler type TPP-312A, manufactured by Taganrog Boiler Factory, Russia, rated capacity 1000 t/h, live steam parameters 235 bar(g), 535 ^{0}C.
- Modernisation of unit control system;

[10] Google Earth

- Rehabilitation of unit step-up transformer;
- Modernisation of switch room equipment, partial replacement of circuit breakers;
- Improvement of ESP (electrostatic precipitators) operation allowing for reduction of dust emission.

Expected result
After full implementation of the proposed project and start of regular operation of the four unit it is expected that the specific fuel consumption will be decreased from current some 10.523 to 10.04 GJ/MWh (from 359.059 g.c.e./kWh to 342.5 g.c.e./kWh) thus allowing the reduction of fuel consumption and the emission of GHGs.

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:

The main objective of the proposed project is to increase the fuel efficiency of the existing Zuyevska TPP through its reconstruction. The reconstruction involves scheduled modernisation of main and auxiliary equipment of all four TPP units over 2008-2011.

The reconstruction would result in reduction of fossil fuel combustion in TPP four boilers and therefore reduce the GHG emission during power generation.

The only emission source identified is the combustion of fuel at TPP.

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

	Years
Length of the crediting period	4
Year	Estimate of annual emission reductions in tones of CO_2 equivalent
Year 2008	0
Year 2009	105,359
Year 2010	174,912
Year 2011	227,077
Year 2012	300,455
Total estimated emission reductions over the crediting period (tones of CO_2 equivalent)	807,803
Annual average of the estimated emission reductions over the crediting period (tones of CO_2 equivalent)	201,951

Table 6. Estimated amount of emission reductions over the crediting period

Period after 2012 for which emission reductions are estimated	Estimate of annual emission reductions in tones of CO_2 equivalent
Year 2013	300,455
Year 2014	300,455
Year 2015	300,455
Year 2016	300,455
Year 2017	300,455
Year 2018	300,455
Year 2019	300,455
Year 2020	300,455
Total estimated emission reductions over the period indicated (tones of CO_2 equivalent)	2,403,641
Annual average of estimated emission reductions over the period within 2013-2020 (tones of CO_2 equivalent)	300,455

Table 7: Estimated amount of emission reductions generated after the crediting period

A.5. Project approval by the Parties involved:

Separately for unit #2 on the 10th of December 2008 the Designated Focal Point of Ukraine (NAEI) issued a Letter of Endorsement #1089/23/7 supporting the reconstruction project at Zuyevska TPP Unit #2.
On the 3rd of September 2009 the NAEI issued a Letter of Endorsement # 1036/23/7 supporting the project at the TPP Units 1 to 4.

The previous Letter of Endorsement issued separately for unit#2 was recalled after the letter # 1036/23/7 had been issued.

On 7th of January 2010 The Netherlands has issued a Letter of Approval for the proposed project.

On 19th of August 2010 the NAEI has issued a Letter of Approval #1231/23/7 for the proposed project.

SECTION B. Baseline

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

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

A baseline for a JI project has to be set in accordance with Appendix B of the Annex to decision 9/CMP.1 (JI guidelines), and with the "Guidance on criteria for baseline setting and monitoring, version 0.2"[11] developed by the Joint Implementation Supervisory Committee (JISC) (hereinafter referred to as "Guidance"). A JI specific approach regarding baseline setting and monitoring has been developed in accordance with Appendix B of the JI Guidelines and with the JISC Guidance. This specific approach will use some elements of CDM methodology AM0061.

The baseline is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project[12]. Plausible future scenarios are identified and listed on the basis of conservative assumptions (paragraph 24 of the Guidance). The proposed project, not developed as a JI project, has been included as one of the alternatives. These alternatives are assessed as credible or plausible, and the most plausible is identified as the baseline. The consistency between the baseline scenario determination and additionality determination has been checked.

The proposed approach is being applied through the following three steps:

1. Identification of a baseline in accordance with paragraphs 21-29 of the Guidance;
2. Additionality demonstration in accordance with the most recent version (version 05.2) of the "Tool for the demonstration and assessment of additionality";
3. Calculation of emissions of the baseline scenario.

The proposed approach allows reducing the uncertainties by using of historically recorded data as well as parameters measured in the project scenario for the baseline. The usage of values measured with high accuracy (electricity and fuel) and IPCC default factors is foreseen.

The conservativeness for the baseline is safeguarded by not taking into account the degradation of efficiency of the plant over time.

Uncertainty is reduced by taking average historical plant operation records for the extended period of seven years preceding the project start.

Step 2: Application of the approach chosen.

Sub-step 2a: Identification and listing of plausible alternative baseline scenarios

Identification of a baseline will be based on the selection of the most plausible alternative scenario. To identify all realistic and plausible alternatives, all options which are consistent with current laws and regulations were considered. The following alternatives to the proposed project activity have to be considered as a minimum:

- The continuation of operation of project activity power plant, continuing to use all power generation equipment that was already used prior to the implementation of the project activity and undertaking regular maintenance;

[11] http://ji.unfccc.int/Ref/Guida.html

[12] JI guidelines, appendix B

- Investment in a new power generating capacity;
- The proposed project activity not undertaken as JI project;
- Individual measures which are part of the total package of proposed energy efficiency measures not undertaken as JI project;
- Individual packages of measures which are the part of the total package of proposed energy efficiency measures not undertaken as JI project;

There are several alternatives that could be considered at Zuyevska TPP that are technically feasible and discussed below.

The two major parts of the power plant equipment are, the steam turbo generator part (steam turbine with alternator and their auxiliary and related equipment like condenser, condensate and cooling water pumps, cooling tower, control system etc.), and the steam boiler with its auxiliaries. These two elements are sometimes called the *Turbine Island* and the *Boiler Island*. Other equipment, unrelated specifically to the two main parts, and which is related to operation of the unit or plant as a whole (ex. unit control system, cooling tower) is defined as the auxiliaries of the unit or the TPP.

The individual modernization/energy efficiency measures can be divided into two large groups depending on the island they are related to. Individual measures taken as separate alternatives which are the parts of the package of measures implemented at the respective island will not be further considered as realistic options due to the low possibility to stop the plant or the unit for implementation of a single measure.

A number of alternatives can be identified as a combination of packages of measures, related to the function of which part(s) of power plant is being reconstructed or modernization, or is having energy efficiency measures implemented.

- *Reconstruction/modernization of turbine (steam turbo generator) only without reconstructing the boiler island of the power plant, and without reconstructing the unit auxiliary systems;*
- *Reconstruction/modernization of boiler island only, without reconstruction of STG and unit auxiliaries;*
- *Reconstruction/modernization of unit auxiliary equipment only, without reconstruction of STG and boiler;*
- *Reconstruction/modernization of both, boiler and turbine equipment and modernization of unit auxiliary equipment (represents the proposed project not undertaken as JI);*

Also, the following alternatives were considered:

- *Construction of new generating capacity;*
- *Continuation of operation of existing power plant;*

These six realistic alternatives, identified above, are further described in more detail below:

Alternative 1:	*Reconstruction/modernization of turbine (STG) only, without reconstructing the boiler island of the power plant, and without reconstructing the unit auxiliary systems*

This alternative would constitute a partial reconstruction of the unit involving rehabilitation of STG which would include:

- Retrofit of low pressure cylinder of STG, replacement and modernization of STG auxiliaries;
- Rehabilitation of high and middle pressure STG cylinders;

- Rehabilitation of regeneration equipment and vacuum system;
- Retrofit of alternator cooling system

This would improve the efficiency of STG, including part-load efficiency, to extend the load range, and to reduce steam leaks. The boiler and unit auxiliaries will not be the subject of reconstruction/modernization and will remain the same or could pass the maintenance/repair if necessary.

Alternative 2:	*Reconstruction/modernization of boiler island only, without reconstruction of STG and unit auxiliaries*

This alternative would constitute of partial reconstruction of the unit and would involve the following main measures:

- Modernization of heating surfaces (piping);
- Modernization of sealing system of regenerative air pre-heater;
- Control system upgrade;
- Variable speed drives for fans;
- ESP improvement.

This would improve the boiler operation under a larger load range, increasing its fuel efficiency and decreasing the consumption of electricity for auxiliary devices.

The turbine part of the unit would not be involved in the reconstruction and would remain the same or could pass the maintenance/repair if necessary.

Alternative 3:	*Reconstruction/modernization of unit auxiliary equipment only, without reconstruction of STG and boiler*

This alternative would constitute the implementation of a number of measures related to the equipment involved in operation of the unit as a whole:

- Modernization of unit control system
- Rehabilitation of unit step-up transformer
- Modernization of switch-room equipment

This would mainly result in an improvement in the control and monitoring of unit operation. Indirectly, it would also result in unit efficiency improvement due to introduction of improved control systems.

Alternative 4:	*Reconstruction/modernization of both, boiler and turbine equipment and modernization of unit auxiliary equipment (represents a proposed project not undertaken as JI)*

This alternative represents the implementation of proposed project not being undertaken as a JI project; therefore, it does not take into consideration any JI incentives.

It would constitute of reconstruction of unit as a whole, all the above mentioned measures including turbine and boiler islands and unit auxiliary systems.

The implementation of the proposed project would increase the fuel efficiency of the unit due to reconstruction/modernization of boiler and STG with their auxiliaries and due to introduction of more efficient unit control system, reduce the consumption of power to unit auxiliary systems, and increase the load regulation range, and increase the availability of the unit.

This alternative would become fully operational after finishing the reconstruction and conducting commissioning/performance testing of the unit. The full completion of all work and beginning of regular operation is scheduled for 1 April 2009.

Alternative 5: Construction of new generating capacity

This alternative would constitute the construction of new generation capacity of a similar size to the existing Zuyevska TPP and would replace it. The existing plant would be decommissioned after the new capacity is operational.

Under this alternative the new coal fired condensing unit of capacity around 300 MW would be built either on existing site of Zuyevska TPP or at a different location. The new unit would have higher electrical efficiency and would be equipped with modern control systems allowing for variable load range as required by grid electricity demand in Ukraine.

Alternative 6: Continuation of operation of existing power plant;

This alternative would constitute of continuation of existing activity. The unit would continue running without any non-required reconstruction/modernization, carrying out only regulatory enforced scheduled overhauls. According to procedures in force thermal power units/plants are obliged to be overhauled each year and a major overhaul every 5 years[13]. The cost of a major overhaul can vary within certain narrow limits, actual cost for similar 300 MW condensing units overhaul was from 17 to 19 MUAH (about 3 MEuro) in 2004 to 2006.

The production of electricity would grow slightly each year based on historical records of the last seven years. Using The installed capacity would allow the increase in production using the existing equipment.

Sub-step 2b: Assessment of the alternative scenarios

Zuyevska TPP since the commissioning of the first unit in the 1980s has been supplying electricity to the Ukrainian interconnected grid. As mentioned in section A.2, the existing TPPs fleet is not only covering close to 50% of country electricity demand, but also serving to regulate peak demand by providing a reserve capacity. This is achieved by instantly following the demand by loading/unloading and turning on/off the units.

Operating under these conditions Zuyevska TPP should work within the following constraints:
- The ability to meet the quality requirements of the grid in terms of timely loading/off-loading of the units, availability and reliability;
- Cope with technical risks, including the risks related to usage new or reconstructed/rehabilitated equipment shall be minimized and properly mitigated;
- The plant should be able to meet the growing demand for electricity in the Ukrainian market should it occur;
- And the plant should remain profitable under all conditions, which means that the efficiency of power generation should be as high as possible within the technical and financial circumstances;

[13] GKD 34.20.507-2003. Order of Ministry of Fuel and Power of Ukraine #286 from 13.06.2003

Assessment of Alternative 1: Reconstruction/modernization of turbine (STG) only without reconstructing the boiler island of the power plant and without reconstructing the unit auxiliary systems

This alternative would constitute:

- A partial reconstruction of the unit involving rehabilitation only of the steam turbo generator.
- Implementation of the proposed measures would improve the efficiency of STG, including part-load efficiency, extend the load range, and reduced steam leakage.
- Boiler and unit auxiliaries would not be the subject of reconstruction/modernization and would remain the same, or if necessary meet minimum maintenance/repair criteria.

Due to only a partial fulfillment of the full scope of reconstruction, only part of efficiency increases would be achieved.

The main incentive to conduct the reconstruction is to achieve the maximum possible increase of the unit efficiency, which is provided mainly by the STG and boiler improvements. As any reconstruction would require from three to seven months during which the unit is not operational; it is not feasible or sensible to conduct a partial reconstruction once the decision has been taken to take the unit out of service for reconstruction.

Therefore, the implementation of Alternative 1 is possible, but not credible.

Assessment of Alternative 2: Reconstruction/modernization of boiler island only, without reconstruction of STG and unit auxiliaries

This alternative would constitute the partial reconstruction of the unit and would involve reconstruction/modernization of the boiler island only.

The implementation of the abovementioned measures would provide improvements to the boiler operation under a larger load range, increasing its fuel efficiency and decreasing the consumption of the electricity requirements for the auxiliary devices.

The turbine part of the unit would not be included in the scope and would remain the same, or if necessary meet minimum maintenance/repair criteria.

For similar reasons to Alternative 1, this alternative is possible, but not credible.

Assessment of Alternative 3: Reconstruction/modernization of unit auxiliary equipment only, without reconstruction of STG and boiler

This alternative would involve implementing of a number of measures related to the equipment involved in the operation of the unit as a whole, including the:

- Modernization of unit control system;
- Rehabilitation of unit step-up transformer;
- Modernization of switch-room equipment.

The implementation of these measures would predominately result in improvements in the control and monitoring operation. Indirectly, it would also result in improvement of unit efficiency due to introduction of better control system.

However, this represents only a partial reconstruction of the unit and would not allow the unit to reach maximum energy efficiency as neither boiler nor the STG would be modernized.

As stated in alternatives 1 and 2 this third alternative is neither realistic nor credible for commercial reasons.

Assessment of Alternative 4: Reconstruction/modernization of both, boiler and turbine equipment and the modernization of the unit auxiliary equipment

This alternative would involve the implementation of the proposed project without taking into consideration any JI incentives associated with the ability to transfer ERUs.

It would constitute of reconstruction of unit as a whole, including all the improvements detailed in the alternatives 1 to 3, including turbine and boiler islands and unit auxiliary systems.

Implementation of the proposed project would allow to increase the fuel efficiency of the unit due to reconstruction/modernization of the boiler and the STG with their auxiliaries and due to introduction of more efficient unit control system, reduce the consumption of power to unit auxiliary systems, increase the load regulation range and increase the availability of the unit.

As described further in section B.2 this alternative is not attractive to the company from financial perspective, despite being technically possible.

Alternative 5: Construction of new generating capacity

This alternative would involve the construction of new generation capacity of a similar size to the existing Zuyevska TPP. The existing plant would continue operation till the end of its technical lifetime or it could be put into reserve or even mothballed.

Under this alternative a new coal fired plant with condensing units with total capacity of around 4x300 MW would be built either on existing site of Zuyevska TPP or at different location. The TPP would have a higher electrical efficiency and would be equipped with a modern control systems allowing for a variable load range as required by electricity demand from the Ukrainian grid.

Construction of a new fossil power capacity represents a large investment that can range from 1,000 to 1,500 USD/kW_e (study dated 2005)[14]. Taking into account the increase in equipment and labor costs that have occurred since the study in 2005, this would represent lowest minimum cost. Therefore, to construct similar coal fired plant, an estimated 4x300 to 4x450 MUSD (1200 to 1800 MUSD) would have to be spent.

As the Ukrainian energy sector, has an excessive thermal generation capacity, it would seem very unlikely that the addition of a new coal fired PP would be required.

Taking into account the existing capacity and construction costs, Alternative 5 is technically possible but not realistic or feasible.

Alternative 6: Continuation of operation of existing power plant;

[14]Projected cost of generating electricity by NEA/IEA: http://www.iea.org/textbase/nppdf/free/2005/ElecCost.pdf

This alternative would involve continuing the existing activity. The unit would continue running without any reconstruction/modernization. Production of electricity would grow slightly over years as supported by performance records over the last five years, and excess installed capacity with the existing equipment.

Over last 15 years, in Ukraine, only two coal fired units have been reconstructed/modernized, the rest continue operation with scheduled or forced overhauls only. There is no legislation in force that requires the plant owners to conduct modernization. Therefore, the continued normal operation of Zuyevska TPP can be considered a possible and feasible baseline scenario.

Conclusion
Alternative 6 is the only feasible and credible alternative and is identified as the baseline scenario to the proposed project. The baseline emissions of the baseline scenario are detailed in section D.

Demonstration of additionality

Please, see section B.2.where additionality has been assessed.

Emissions in the baseline scenario

To establish the emissions with the baseline scenario a project specific approach has been selected by the project participants as described further in the text below.

Theoretical description of the approach chosen for calculation of emissions in the baseline scenario.
The emissions in the baseline scenario occur due to combustion of fossil fuels in the boilers of the TPP units to run the steam turbines and produce power to the grid. Part of the power generated is used to drive the auxiliary systems of the units and of the TPP. The net power supplied to the grid EL_y and the net fuels consumption FC_y are the two major indicators of the plant efficiency.
The following assumptions are made:

- The TPP is supplying to the grid the same amount of electricity in both, baseline and project scenarios.
- Same fuel types (coal, natural gas and heavy fuel oil (mazut)) will be used in baseline and project scenario. Possible variations of proportion of actual fuels (composition of fuels) used in the project scenario will have equal influence to the baseline scenario;
- Actual NCV of fuels will be used in baseline and project scenario

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

Where:

BE_y is the baseline emissions for the year y (tCO_2)

$BE_{Fuel,y}$ is the baseline CO_2 emissions due to combustion of fossil fuels in the boilers of TPP (tCO_2)

$$BE_{Fuel,y} = SFC_{Bsl} \times \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO_2 i,y}\right)}{\sum_i \left(FC_{i,y} \times NCV_{i,y}\right)} \times EL_y$$

Where:

SFC_{BSL} is the baseline specific fuel consumption for supply of power to the grid (or station heat rate) (GJ/MWh)

$FC_{i,y}$ is the fuel of type i (coal, natural gas and heavy fuel oil (mazut)) consumption during the year y (tons or thousands Nm^3)

$EF_{CO2,I,y}$ is the carbon emission factor of fuel of type i during the year y (tCO_2/GJ)

$NCV_{i,y}$ is the net (lower) calorific value of fuel of type i during the year y (GJ/ton or per thousand Nm^3)

EL_y is the annual amount of electricity supplied by TPP to the grid in year y (MWh)

In order to calculate the emissions in the baseline the ex-ante setting of SFC_{BSL} is used. To exclude the influence of possible fluctuation of TPP efficiency due to different factors (loading factor, ambient conditions) the SFC is taken as an average value of SFCy during seven years preceding the start of project activity as shown in a formula below:

$$SFC_{BSL} = \sum_{y} SFC_y \times \frac{1}{7},$$

Where:
SFC_y is the specific fuel consumption of the TPP in year y (GJ/MWh)
SFC_{BSL} is the baseline fuel consumption of the TPP (GJ/MWh)
y is a year within the period from 2002 to 2008

The key data and information used to establish the baseline are presented in tabular form below:

Data/Parameter	SFC_{BSL}
Data unit	GJ per MWh of power supplied to grid
Description	Specific fuel consumption in the baseline
Time of determination/monitoring	Fixed ex-ante
Source of data (to be) used	TPP data
Value of data applied (for ex ante calculations/determinations)	10.5232
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$FC_{i,y}$
Data unit	Tonnes or volumetric units
Description	Fuel consumption of fossil fuel of type *i* in year y
Time of determination/monitoring	Annually
Source of data (to be) use	Plant data
Value of data applied (for ex ante calculations/determinations)	Please, see Annex 2

Justification f the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	Three main types of fuels are considered: coal, heavy fuel oil and natural gas.

Data/Parameter	**$NCV_{i,y}$**
Data unit	GJ per ton or volumetric unit
Description	Net calorific value of fossil fuel type *i* in year *y*
Time of determination/monitoring	Annually
Source of data (to be) use	Plant data
Value of data applied (for ex ante calculations/determinations)	-
Justification f the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	**$EF_{CO2,i}$**
Data unit	tCO_2/GJ
Description	CO_2 emission factor of fossil fuel type *i* in year *y*
Time of determination/monitoring	Ex-ante
Source of data (to be) use	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion, IPCC, 2006
Value of data applied (for ex ante calculations/determinations)	Please see Annex 2, Table 22
Justification f the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	Three main types of fuels are considered: coal, heavy fuel oil and natural gas.

Data/Parameter	**EL_y**
Data unit	MWh
Description	Electricity supplied to the grid by the project activity PP in year y
Time of determination/monitoring	Annually
Source of data (to be) use	Plant data
Value of data applied (for ex ante calculations/determinations)	-
Justification f the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

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 proposed project activity would constitute in reconstruction/modernization of main and auxiliary equipment of all four units of the TPP as described in details in section A.4. In order to demonstrate that the project provides reductions in emissions by sources that are additional to any that would otherwise occur the following step-wise approach was used:

STEP 1. Indication and description of the approach applied

The latest version of the CDM Executive Board approved "Tool for the demonstration and assessment of additionality" Version 05.2[15] has been applied to show that the reductions of anthropogenic emissions of the greenhouse gases are reduced below those that would have otherwise occurred. This tool has been used in accordance with the JISC Guidance on Criteria for Baseline Setting and Monitoring.

STEP 2. Application of the approach chosen

Step 1. Identification of alternatives to the project activity

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

See section B.1 which contains 6 identified alternatives. Alternative 6: Normal continued operation and Alternative 4: Proposed project not undertaken as JI was deemed the feasible and credible alternative scenarios.

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

See section B.1.where it has been shown that all the identified alternatives do not contradict to Ukrainian legislation and regulations in force.

Outcome of Step 1: We have identified at least one realistic and credible alternative scenario to the project activity that is in compliance with mandatory legislation and regulations taking into account the enforcement in Ukraine.

Step 2. Investment analysis

The purpose of the investment analysis is to determine whether the proposed project activity is not:

a) The most economically or financially attractive; or
b) Economically or financially feasible, without the revenue from the sale of emission reductions.

The investment analysis has been carried out by the project participants in accordance with the Additionality Tool's Annex: Guidance on the Assessment of Investment Analysis: (Version 02).

15 http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf Hereinafter referred to as Additionality Tool

Sub-step 2a. Determination of the analysis method

The proposed project generates cost savings, so cost analysis (sub-step 2b Option I) of the Additionality Tool cannot be used.

In line with the CDM Additionality Tool version 05.2 Option III – benchmark analysis – has been chosen. The project participants have chosen to use Project IRR as the assessment indicator. In order to select a proper benchmark for the indicator chosen project participants have assessed options contained in the Additionality Tool.

The 4b approach of the Option III was selected. Project participants have taken the average commercial lending rates from the statistics of the National Bank of Ukraine[16] relevant for the decision taking context of this project as a benchmark for the Project IRR.

Sub-step 2b. Application of the benchmark analysis

The benchmark for this project's IRR is the average commercial lending rate in Ukraine. This means that the project owner would not consider the investment if the project is generating cash flow with an IRR less than the benchmark.

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

The project's cash flow was calculated using the following assumptions:

- The benchmark is the average commercial lending rate in Ukraine due in 2005 according to the statistics of the National Bank of Ukraine in UAH. It is equal to 15.5%.
- Cash flow calculation was made for the period 2007-2019 (13 years)

The decision to start the reconstruction was made in August 2004 and following it the preparatory work which included technical assessment, feasibility was completed during 2004-2005.

Due to a higher expected electrical efficiency of the unit after the reconstruction, less fuel would be spent to generate the same amount of electricity, thus the project generates cost saving resulting from fuel saving.

Units of this type have to pass through major overhaul every 4 to 5 years. The next scheduled overhauls were due during 2007/2008 for unit #2 and 2009-2013 for units #1, 3, and 4. To be conservative, the costs of such mandatory scheduled overhauls were subtracted from the project cost. The cost of scheduled overhaul was taken as an average cost of similar overhauls carried out in identical 300 MW units of Skhidenergo during the period 2004 to 2006.

The resulting **Project IRR is equal to 12.21%.** Taking into consideration the benchmark of 15.5% the project would not have been financially attractive without the JI element.

Sub-step 2d. Sensitivity analysis

[16] http://www.bank.gov.ua/Statist/Electronic%20bulletin/data/4-Financial%20markets(4.1).xls Spreadsheet 1.3 Loan interest rates for non-financial corporations for the period indicated by currencies and terms. Data for 2005, rate for the loans in national currency for the period greater than 1 year (includes both from 1 to 5 years and more than 5 years) is 15.5%.

The Sensitivity analysis summary is presented below to show the impact of fluctuation of the most important factors.

The following scenarios were considered*:*

- *Scenario 1 – Investment cost down 10%;*
- *Scenario 2 – Fuel price up 10%.*

The results for the sensitivity analysis are shown in table below:

Scenario 1

IRR	14.11%

Scenario 2

IRR	13.92%

Table 8: Scenarios in sensitivity analysis

Scenario 1 represents the most favourable course for this energy efficiency project attractiveness as lowering the investment cost would increase the project financial indicators. Even in this case the project IRR stays below the benchmark. This confirms that the calculation of the project financial indicators is robust to the changes in the key input parameters.

Outcome of Step 2: After the sensitivity analysis it is concluded that the proposed JI project activity is unlikely to be financially/economically attractive. Proceeding to Step 4 (Common practice analysis).

Step 3. Barrier analysis (optional)

Not applicable

Step 4. Common practice analysis

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

Two similar projects undertaken in fossil power generation in Ukraine can be observed. The first one is the rehabilitation of 300 MW unit #8 of Zmievska TPP, co-financed by the WB in 1998[17]and the second was the reconstruction of 200 MW unit#4 of Starobeshevska TPP, financed by the EBRD during 2000 to 2004 (the project was mainly aimed at replacement of pulverized coal unit boiler to CFB one)[18] These two projects are similar by scale, type of activity to the proposed project. No other major modernization/rehabilitation projects aimed at increasing plant efficiency can be found over the past 10 to 15 years in the fossil TPPs fleet.

The difference between the proposed project and the two mentioned ones is the access to financing. Both projects were financed from major international banks and had special guarantees from state. The

[17] http://pdf.usaid.gov/pdf_docs/PNADD867.pdf

[18] http://www.ebrd.com/new/pressrel/1996/107dec17.htm

proposed project is financed directly by the owner at its own risk. Taking into account the total number of fossil fired units at TPPs in Ukraine, which is close to one hundred, it can be admitted that the proposed project activity is not the common practice in Ukrainian energy sector.

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

As shown in the previous sub-step similar activities are not widely observed and are not commonly carried out. There is a serious distinction between the proposed project and the two similar projects identified which is the absence of international funding secured by state for the proposed project.

Due to abovementioned the conclusion can be made that the proposed JI project is not common practice in Ukrainian power sector.

Conclusion: This JI project provides a reduction in emissions that is additional to any that would otherwise occur.

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

The source of emission of GHG in power production process is the combustion of fossil fuels in the boilers of four TPP units.

Presented in table 7, below, is an overview of emission sources in project. The following approach has been used in determining whether they have been included within the project boundary:

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

No	Source	Gas[19]			Justification/Explanation
Baseline	Combustion of fossil fuels on-site of TPP for generation of power	CO_2	Direct	Included	CO_2 is the main emission source
		CH_4	Indirect	Excluded	Excluded for simplification as minor source[20].
		N_2O	Direct	Excluded	Excluded for simplification as minor source[21].
Project	Combustion of fossil fuels on-site of TPP for generation of power	CO_2	Indirect	Included	CO_2 is the main emission source
		CH_4	Indirect	Excluded	Excluded for simplification as minor source.
		CO_2	Direct	Excluded	Excluded for simplification as minor source.

Table 9: Sources of emissions

[19] Only CO_2 emissions are taken into account. CH_4 and N_2O emission reduction are omitted. This is conservative and is in line with CDM methodologies, for example AM0061.

[20] Similar to ACM0061

[21] Similar to ACM0061

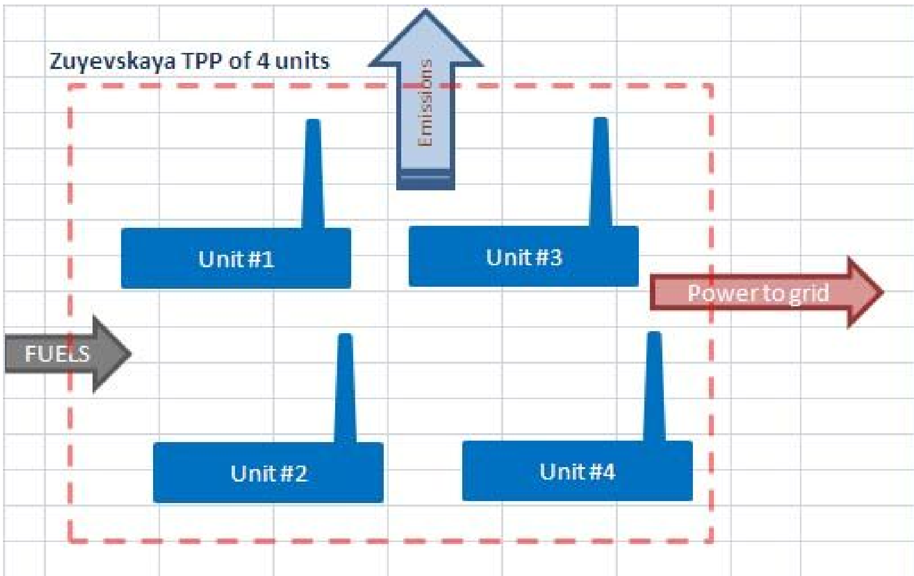

Figure 4: Project boundary

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

Date of completion of the baseline study: 15/12/2010

Name of person/entity setting the baseline:

- Global Carbon BV

Global carbon BV is the project participant listed in Annex 1.
See Annex 1 for detailed contact information

SECTION C. Duration of the project / crediting period

C.1. Start date of the project:

Starting date of the project is considered 21 December 2004 when Skhidenergo, the owner of the TPP, decided to perform feasibility study for future plant reconstruction project and issued an order to start preparatory work. The feasibility was completed by design bureau Energoproject by the end of 2005.

C.2. Expected operational lifetime of the project:

Until 2020, at the least (12 years or 144 months).

Zuyevska TPP is one of the newest TPP additions to the grid (from 1982 to 1988). The first two units were commissioned in 1982, and by January 2007 had been operating for about 140,000 hours with 462 cold start ups. The standard operating lifetime for turbo alternators of this type is 200,000 hours and 600 cold starts, assuming that the operation of the first two units would continue for at least 8 to 10 years. The last two units, commissioned later, could continue operation for more than 10 years. The oldest units of this type have been in operation for almost 40 years and under proper maintenance units of Zuyevska TPP could be operational for the similar time.

C.3. Length of the crediting period:

Within the first commitment period:
- Four years and two days (48 months and two days). From 30/12/2008 to 31/12/2012)

Within any relevant agreement under the UNFCCC from 2013 onwards:
- For the duration of the agreement but not more than the remaining operational lifetime of the project

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

As detailed in section B.3, the project activity only affects the emissions due to combustion of fuels in the boilers of plants units 1, 2, 3 and 4. Therefore, for the purpose of establishing the baseline emissions and in order to monitor the project emissions a JI specific approach was proposed which foresees monitoring of: fuels consumption by the TPP (including the NCV of each particular fuel used) and the amount of electricity supplied to the grid.

These values are metered and stored allowing for reliable and transparent monitoring.

The baseline emissions are established in the following way (details see in Annex 2):
1. The Specific Fuel Consumption (SFC_{BSl}) in the baseline for the whole TPP was constantly monitored with monthly and annual reporting; the reporting forms are created and stored. The SFC is expressed in grams of coal equivalent/MWh supplied to the grid and will be converted to GJ/MWh.
2. SFC in the baseline was fixed ex-ante based on seven years (2002-2008) average data of: power supplied to the grid, fuels consumption taking into account the amount of each fuel and its NCV.

The project emissions will be obtained by monitoring of actual fuels consumption (and their NCV).

Assumptions:
- The technical lifetime of the existing equipment extends to at least the end of the crediting period;
- Electricity supply to the grid is the same in baseline and project scenario;
- Same fuel types (coal, natural gas and heavy fuel oil (mazut)) will be used in baseline and project scenario;
- Actual NCV of fuels will be used in baseline and project scenario;
- The carbon emissions factors of each of fuels type the IPCC default data will be used.
- The thermal energy produced by the project activity power plant is used only for heating the premises of the TPP and dwellings of plant personnel in an adjacent village. The amount of thermal energy is not influenced by the project and the share of fuel to produce it will be neglected.

General remarks:
For the greenhouse gas emissions only the CO_2 emissions are taken into account. The CH_4 and N_2O emission reductions will not be claimed similarly to ACM0061. This is conservative.

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

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1.	PE_y	Monitoring of GHG emissions in year y	tCO_2	c	Yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.1
2.	$PE_{Fuel,y}$	Monitoring of GHG emissions in year y	tCO_2	c	Yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.1
3.	$FC_{i,\ y}$	*Plant records*	*Tonnes or thousands* Nm^3	*m/c*	*Regularly, for natural gas continuously*	*100%*	Electronic and paper	
4.	$EF_{CO2,i}$	*IPCC data*	tCO_2/GJ	*c*	*Default factor*	*100%*	Electronic and paper	*http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htmlx*
5.	$NCV_{i,\ y}$	*Plant records*	GJ/ton or per thousand Nm^3	*m/c*	*Regularly: for NG monthly; for coal and mazut*	*100%*	Electronic and paper	*Plant laboratory accredited to conduct NCV tests of coal and*

	every 5 days.	*liquid fuel. Gas NCV is provided by Supplier of gas*

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

$$PE_y = PE_{Fuel,y} \qquad (1)$$

Where:

PE_y Project emission in year y (tCO_2)

$PE_{Fuel,y}$ Project emission due to combustion of fossil fuels in the boilers of TPP in year y (tCO_2)

$$PE_{Fuel,y} = \sum_i \left(FC_{i,y} \times EF_{CO2,i} \times NCV_{i,y} \right) \qquad (2)$$

Where:

$FC_{i,y}$ is the fuel of type *i* consumed during year y (tonnes or thousand Nm^3)

$EF_{CO2,i}$ fuel of type *i* Emission Factor (tCO_2/GJ)

$NCV_{i,y}$ is the net calorific value of fuel of type i in year y (GJ/ton or per thousand Nm^3)

Consumption of coal

The coal is supplied to the TPP by rail and stored at the coal storage. The amount of coal received is measured by railway wagon scales. A measurement of coal consumed by all four units of the TPP is done by conveyor belt scales when the coal is being transported from coal storage to the coal milling department after which powdered coal is supplied to each of the units.

Consumption of gas
Consumption of natural gas is metered by flow meter installed at gas pressure reducing station owned by gas suppliers. Data are constantly reported to the TPP. TPP has right to access the metering unit and participate in scheduled calibrations of it.

Consumption of heavy fuel oil (mazut)
Heavy fuel oil is supplied to the TPP by rail cisterns and it is stored in reservoirs from which it is pumped into fuel pipeline connected to the units. Consumption of heavy fuel oil is metered by measurement of level in the reservoirs 3 times a day (each shift).

Measurement of NCV of fuels
The NCV of coal, natural gas and heavy fuel oil is measured by TPP laboratory. The samples of coal are taken four times an hour and are kept for testing which is carried out every 5 days. Testing of natural gas and heavy fuel oil is carried out every five days.

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

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
6.	BE_y	Monitoring of GHG emissions in year y	tCO_2	c	Yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.2
7.	$BE_{Fuel, y}$	Monitoring of GHG emissions in year y	tCO_2	c	Yearly	100%	Electronic and paper	Calculated using the formulae in Section D.1.1.2

8.	SFC_{BSL}	See Annex 2	GJ/MWh	c	Fixed ex-ante	100%	Electronic	Fixed baseline parameter
9.	EL_y	Plant data	MWh	m	Continuously	100%	Electronic and paper	

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

$$BE_y = BE_{Fuel,y} \qquad (3)$$

Where:

BE_y is the baseline emissions for the year y (tCO_2)

$BE_{Fuel,y}$ is the baseline CO_2 emissions due to combustion of fossil fuels in the boilers of TPP (tCO_2)

$$BE_{Fuel,y} = SFC_{Bsl} \times \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO_2 i,y}\right)}{\sum_i \left(FC_{i,y} \times NCV_{i,y}\right)} \times EL_y \qquad (4)$$

Where:

SFC_{BSL} is the baseline specific fuel consumption for supply of power to the grid (station heat rate) (GJ/MWh)

$FC_{i,y}$ is the fuel of type i (coal, natural gas and heavy fuel oil (mazut)) consumption during the year y (tons or thous. Nm^3)

$EF_{CO2,i,y}$ is the carbon emission factor of fuel of type i during the year y (tCO_2/GJ)

$NCV_{i,y}$ is the net (lower) calorific value of fuel of type i during the year y (GJ/ton or per thous. Nm^3)

EL_y is the annual amount of electricity supplied by TPP to the grid in year y (MWh)

See annex 2 for SFC_{BSL} setting

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

Not applicable

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

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

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

Not applicable

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

Not applicable. There are fugitive CH4 emissions associated with fuel extraction, processing, transportation. These emissions have not been taken into account for simplicity and conservativeness

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

Not applicable.

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

Not applicable

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

$$ER_y = BE_y - PE_y \quad (5)$$

Where:

ER_y is emission reduction of the JI project in year y (tCO_2e)

BE_y is the baseline emissions in year y (tCO_2e)

PE_y is the project emissions in year y (tCO_2e)

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

The environmental assessment impact has been performed according the Ukrainian legislation in force as described in section F. It describes in details the collection and archiving of the information of the project environmental impacts. According to the Ukrainian legislation in force the data on environmental impacts will be collected along the operation of the TPP.

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.

Fuel consumption	Low	Measurement methods approved (certified) by the bodies of the State Standard of Ukraine. The measurement inaccuracy of the devices the readings of which are controlled in monitoring, meet the requirements laid down in the local norms. Actual sectoral standards on inaccuracy of measurements of: – coal weighing by conveyor belt scales is ±1% or better; – heavy oil is ±2.5% or better; – gas consumption measurements is ± 0.5% or better. The meters involved will be calibrated according to the host Party's legislation.
Electricity output to grid	Low	The electricity meters will be calibrated according to the host Party's legislation obligatory requirements.
NCV_y	Low	Periodic accreditation of TPP laboratory by authorised state certification/metrological body

QA/QC procedures include:
- Monitoring of coal consumption by conveyor scales, daily reports;
- Monitoring of natural gas consumption by the gas meter, daily reports;
- Monitoring of heavy fuel oil consumption by level meter in the reservoir, daily reports;
- Monitoring of electricity supplied to grid by the electricity meter, constantly;

The metering devices are subject to calibration according to manufacturer's manuals and host Party's legislation in force.
Monitoring of coal, heavy fuel oil and natural gas NCV is performed by TPP laboratory.

TPP will designate a system manager to be in charge of and accountable for the generation of ERUs including monitoring, record keeping, computation and recording of ERUs, validation and verification. The system manager will officially sign off on all worksheets used for the recording and calculation of ERUs. Defined protocols and routine procedures, with good, professional data entry, extraction and reporting procedures will make it considerably easier for the determinator and verifier to do their work.

The monitoring manual will be compiled and the working staff in the monitoring department will undertake their responsibilities in accordance with the manual.

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

Collection of information required for calculations of reductions of GHG emissions as a result of the project is performed in accordance with the procedure common for the enterprise, as monitoring requires no additional information to be obtained, apart from the data already being collected and processed.

Authority and responsibility of project management, registration, monitoring, measurement and reporting

Global Carbon BV

- Control of monitoring and submission of GHG emissions reporting.

Zuyevska TPP:

- Organizes monitoring (the appropriate orders and instructions may be issued, specifying the responsible executors, monitoring and reporting are carried out),
- Organizes and conducts personnel training and education,
- Recording the required data, monitoring and reporting on the project GHG emissions at the TPP
- Operation of power plant equipment.

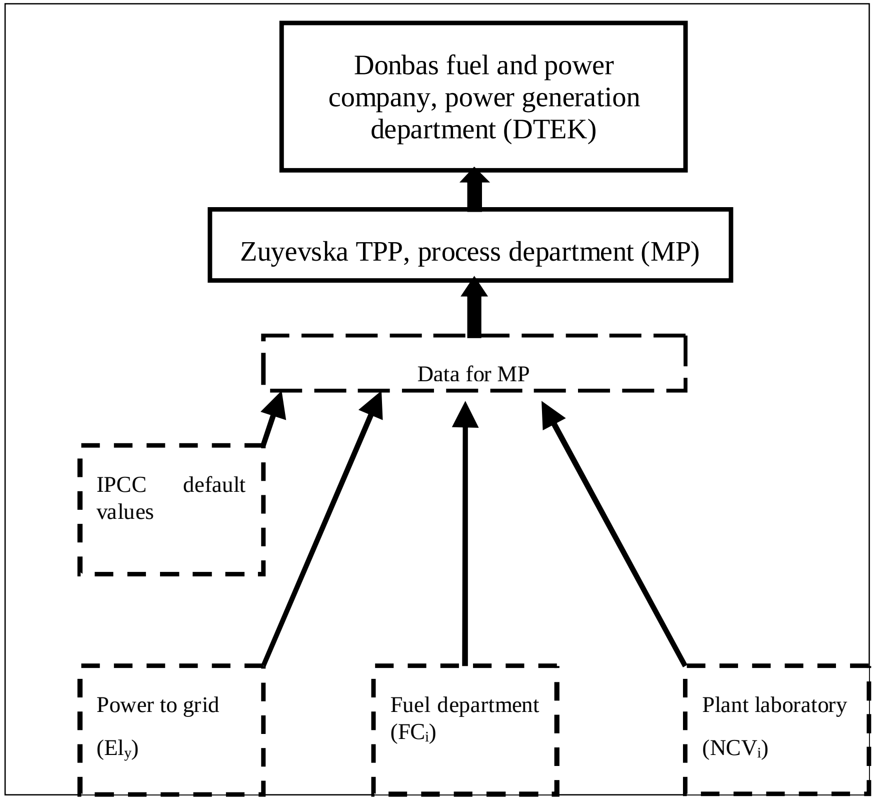

Figure 5: Data collection and processing for monitoring at Zuyevska TPP

Procedures identified for training of monitoring personnel

The management of the personnel training and retraining at TPP is carried out by the Technical Director, and the control of implementation thereof − by the Head of the enterprise.
Depending on the category of the personnel, the following methods are applied:

- Checking the knowledge of the regulations, norms and instructions related to process, labor protection, industrial and fire safety;
- On-going training and retraining.

The activity with the personnel is organized and carried out in accordance with the plans approved by the Chief Engineer of the plant that include the following:

- Entry training;
- Personnel training in second and allied professions;
- Re-training;
- Organizing the activity of the technical libraries, technical materials rooms and simulator training facilities.

Personnel involved in monitoring process will be trained and instructed according to the MP.

Procedures identified for maintenance and calibration of monitoring equipment
Company's authorized department (metrology department) provides the operation and maintenance of measuring equipment and is responsible for ensuring the control of the accuracy of the readings. The control equipment and devices are maintained and checked up periodically in accordance with calibration schedule. Calibration is carried out at stands with using of standard devices. There is also reserve base of control equipment at the plant which can be used in case of failure of any measuring equipment.

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

Name of person/entity determining the monitoring plan:
Global Carbon B.V.
Lennard de Klerk
Global Carbon BV is the Project Participant
For the contact details please refer to Annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

This section contains the estimate of GHG emission reductions. The calculations are made using formulae described in details in section D of the document.

E.1. Estimated project emissions:

The calculations are made using formulae 1 and 2 as described in section D.1.1.2

Project emissions		2008	2009	2010	2011	2012
From fossil fuels combustion	[tCO2/yr]	5,044,978	6,138,069	6,068,516	6,016,351	6,214,427
Total	[tCO2/yr]	5,044,978	6,138,069	6,068,516	6,016,351	6,214,427
Total 2008 - 2012	[tCO2]	29,482,342				

Table 10: Estimated project emissions during the crediting period

		2013-2020	Total
Estimated project emission after the crediting period	[tCO2/yr]	6,214,427	49,715,416

Table 11: Estimated project emissions after the crediting period

E.2. Estimated leakage:

No leakage occurs in the project scenario.

Project leakage		2008	2009	2010	2011	2012
Leakage	[tCO2/yr]	0	0	0	0	0
Total	[tCO2/yr]	0	0	0	0	0
Total 2008 – 2012	[tCO2]	0				

Table 12: Estimated leakage during the crediting period

		2013-2020	Total
Estimated leakage after the crediting period	[tCO2/yr]	0	0

Table 13: Estimated leakage after the crediting period

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

Project emissions and leakage		2008	2009	2010	2011	2012
From fossil fuels combustion	[tCO2/yr]	5,044,978	6,138,069	6,068,516	6,016,351	6,214,427
Leakage	[tCO2/yr]	0	0	0	0	0
Total	[tCO2/yr]	5,044,978	6,138,069	6,068,516	6,016,351	6,214,427
Total 2008 - 2012	[tCO2]	29,482,342				

Table 14: Estimated total project emissions during the crediting period

		2013-2020	Total
Estimated total project emission after the crediting period	[tCO2/yr]	6,214,427	49,715,416

Table 15: Estimated total project emissions after the crediting period

E.4. Estimated baseline emissions:

The calculation is made using formulae 3 and 4 as described in D.1.1.4. Conservative assumptions: not taking into account the natural deterioration of plant efficiency, fixing the baseline efficiency using extended period of seven years have been used as described in section B.1.

Baseline emissions		2008	2009	2010	2011	2012
From fossil fuels combustion	[tCO2/yr]	5,044,978	6,243,428	6,243,428	6,243,428	6,514,882
Total	[tCO2/yr]	5,044,978	6,243,428	6,243,428	6,243,428	6,514,882
Total 2008 - 2012	[tCO2]	30,290,145				

Table 16: Estimated baseline emissions during the crediting period

		2013-2020	Total
Baseline emission after the crediting period	[tCO2/yr]	6,514,882	52,119,055

Table 17: Estimated baseline emissions after the crediting period

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

The calculation has been made using formula 5 as described in section D.1.4.

Reductions		**2008**	**2009**	**2010**	**2011**	**2012**
Total	[tCO2/yr]	0	105,359	174,912	227,077	300,455
Total 2008 – 2012	[tCO2]	807,803				

Table 18: Estimated emission reduction during the crediting period

		2013-2020	**Total**
Emission reduction after the crediting period	[tCO2/yr]	300,455	2,403,641

Table 19: Estimated emission reduction after the crediting period

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

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2008	5,044,978	0	5,044,978	0
Year 2009	6,138,069	0	6,243,428	105,359
Year 2010	6,068,516	0	6,243,428	174,912
Year 2011	6,016,351	0	6,243,428	227,077
Year 2012	6,214,427	0	6,514,882	300,455
Total (tonnes of CO_2 equivalent.)	29,482,342	**0**	30,290,145	807,803

Table 20: Estimated balance of emissions under the proposed project over the crediting period

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)

2013-2020	49,715,414	0	52,119,055	2,403,641
Total (tonnes of CO_2 equivalent.)	49,715,414	0	52,119,055	2,403,641

Table 21: Estimated balance of emissions under the proposed project after the crediting period

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:

Power production has an impact on the local environment. In Ukraine emission levels in power sector are regulated by operating licenses issued by the regional offices of the Ministry for Environmental Protection on an individual basis for each enterprise that has a deemed significant impact on the environment. The current levels of emissions of the main pollutants (dust, sulphur oxides and nitrogen oxides), are in compliance with the requirements of the plant's operational license.
The assessment of environmental impact (AEI) was performed for two units: #2 and #1 which are the first units under the project schedule. The conclusions drawn from the assessment are positive and confirm that the project is in line with Ukrainian environmental legislation in force. Approximately a year in advance of start of reconstruction of units 3 and 4 the assessment of environmental impacts will be performed for these units as well. See section F.2 for data on AEI performed.
According to the information from the design documentation, including environmental impact assessment, there is no transboundary impact to be expected, as all pollution will occur within the sanitary zone of the Zuyevska TPP.

Climate and microclimate
The planned project activity will have no negative impact on the climate and microclimate.

Air pollution
There are 52 identified sources of the air pollution available on-site.

Dust
Dust, emitted from electricity production processes, is non-toxic, however, is considered a nuisance. The main sources of dust from the electricity production at the coal fired TPP are the coal mill, including fuel transportation system, and coal-fired boilers. Dust emissions from Zuyevska TPP are monitored on a regular basis in compliance with the norms and regulations in force.
ESPs are used to treat flue gasses from fly ash. The ESPs have an efficiency ratio of 99.2%. Coal transportation system exhausts through the ventilation system are treated with cyclones with efficiency 94.8%.

Nitrogen and sulphur oxides
NOx is formed due to the oxidation reaction of the atmospheric nitrogen at high temperatures in the boiler during coal dust combustion process and reaching about 1200 mg/m^3 (at 6% of O_2 content). It is expected that after project commissioning the emissions will not exceed the limits allowed by the requirements of the Ukrainian legislation.

SOx emissions in power production originate mainly from sulphur content in the combusted coal, and are about 3000 mg/m^3 (at 6% of O_2 content). The sulphur content in the fuel used at Zuyevska TPP is significant (1.1-1.9%) in compliance with local limits and should not be increase after the implementation of the project. The Units will be equipped with FGD plants over the next 5 years.

Water contamination
Zuyevska TPP has a return water supply system. The source for industrial water is the river Krynka, and Zuyevska TPP has a permit for water intake. A special filter dam is used to prevent fish from becoming trapped in the intake channels.

Waste water treatment is undertaken using mechanical, chemical, and biological treatment.

Bottom ash is transported to the slurry pond by water (wet ash removal system). Therefore the slurry pond is the main source for ground water contamination at Zuyevska TPP. However, despite this, the main ground water contamination level is determined by other pollution sources in the region, and the project implementation will result in a decrease of the harmful emissions, resulting in a positive impact on the environment.

Waste handling
Waste handling is in compliance with legislative norms. All waste is collected in a proper manner, including the accounting of the waste produced. There are agreements with licensed companies for waste utilization in place, if required. Future construction waste, if any, will be dumped at the local landfill site.

Noise, vibration, heat radiation and others harmful emissions
In accordance to the technical requirements, all main and auxiliary equipment have heat and noise isolation that provides compliance with the norm, DST 12.1-003.83 (state standard). All equipment and pipelines which exceed 45°C have the necessary isolation. Monitoring of the noise level is done by specially an authorized laboratory of Zuyevska TPP. According to the measured data provided by the laboratory, Zuyevska TPP has no substantial noise impact on the environment, including the village Zugres.

Unit step up transformers: Transformers of auxiliary require open switch gear and are electromagnetic emissions source. The project implementation will not worsen the existing levels of noise, vibration, heat radiation and electromagnetic emissions.

Social impact
Donbas region is characterized by a high population density. Since 1989, there is a trend of density reduction, caused by natural population aging and typical of Ukraine in general. The location of the TPP has positive social impact as it provides around 2,500 jobs.

Due to the high volume of industrial enterprises in the region, such as metallurgical, coke, chemical, mines, etc., all of which contribute to a significant negative impact on environment pollution, the specific negative impact of the TPP is not possible to determine.

Project implementation will lead to decrease of unemployment in the region and a reduction of the total negative environmental impact specifically originating from the plant.

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

The environmental impact of the project is positive as the project expects to reduce the impact of the existing facility. The impact on the environment of the project is assessed by the Ukrainian authorities in the following way:

The environmental impacts is assessed before obtaining a (re)construction permit. The general principles of evaluating the environmental impact or AEI (OVNS, which is the Ukrainian abbreviation) procedure in Ukraine are described by the national laws “On the environmental protection” and “On the environmental expertise". According to the national legislation in force, each project or new activity that can be potentially harmful for the environment, must evaluate the environmental impact[22] [23].

The environmental impacts are analysed after the development of the detailed project design in order to obtain a (re)construction permit. The OVNS document must provide a list of viable project alternatives, a description of the current state of local environment, description of the main pollutants, risk evaluation and an action plan for pollution minimisation. The final OVNS document has to be presented as a separate volume of the project documentation for the evaluation by a state expert company and, optionally may be the subject of public hearing.

The OVNS has been developed in compliance with the Ukrainian legislative base: Law of Ukraine "On environmental protection", Law of Ukraine "On air protection", Law of Ukraine "On waste" etc and was approved by the Ministry of Fuel and Energy on 15.08.07.

[22] The Law of Ukraine "On the environmental expertise", Articles 8, 15, 36

[23] The Law of Ukraine "On the environmental protection", Article 51

SECTION G. Stakeholders' comments

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

Information on the reconstruction of the first scheduled Unit, #2, of the TPP appeared in local mass media sources. Information on the project was published in the newspaper "Rodina", Kharzysk city on 14.07.07. Further units which are to be reconstructed will have similar publicity. No comments were obtained.

The project complies with the current norms and requirements stipulated in Ukraine. Therefore, all related local authorities are involved (e.g. EIA is approved by the Ministry of Fuel and Energy).

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex2

BASELINE INFORMATION

Determination of baseline factors

The source of CO_2 emissions at the power plant is the combustion of fuel in the Units boilers.

All the efficiency measures, such as the increase of efficiency of the boilers, steam turbines and alternators undertaken in the course of the reconstruction of the units of Zuyevska TPP, result in a decrease of the specific fuel consumption for the generation of electricity. A further decrease of the specific fuel consumption is achieved due to decreasing the power and fuel loses in the plant auxiliaries, such as the cooling system, water treatment system (pumps and fans).

These measures contribution to the decrease of specific fuel consumption for power supplied to the grid. Therefore, the specific fuel consumption for power supplied to the grid (also called as station heat rate) was selected as the indicator of unit, or plant, efficiency, which also directly reflects the result of energy efficiency achieved through reconstruction.

The specific fuel consumption for the power supplied to the grid is based on metered values of total amount of fuels consumed by TPP, and power exported from PP to the grid. These values are collected and stored at the PP, they are traceable and transparent, and expressed in g.c.e. (grams of coal equivalent) per kWh of power supplied to grid. Further conversion is made into GJ/MWh.

Baseline specific fuel consumption

The baseline specific fuel consumption SFC_{Bsl} is fixed as an annual average of the most recent seven years preceding the project start (2002 to 2008).

$$SFC_{Bsl} = \sum_{y} SFC_{y} \times \frac{1}{7},$$

Where:

SFC_y is the specific fuel consumption of the TPP in year y (GJ/MWh)

SFC_{Bsl} is the baseline fuel consumption of the TPP (GJ/MWh)

EL_y is the power supplied by TPP to the grid in year y (MWh)

y is the year from 2002 to 2008

SFC_y is defined as ratio of fuels consumed to the power supplied to the grid in year y:

$$SFC_{y} = \sum_{i} (FC_{i,y} \times NCV_{i,y}) \div EL_{y}$$

Where:

$FC_{i,\,y}$ is the fuel of type i consumption during the year y (tons or volumetric units)

$NCV_{i,\,y}$ is the net (lower) calorific value of fuel of type i during the year y (GJ/ton)

Therefore, the baseline specific fuel consumption is taken as 10.5232 GJ/MWh or 359.059 g.c.e./kWh

Emission factors of fuel used

The IPCC default values are used for calculation of carbon emission factors of fuels combusted at the TPP.

Fuel type	Default emission factor[24]
	tCO_2/GJ
Natural gas	0.0561
Heavy fuel oil	0.077
Coal	0.096

Table 22: Emission factors for fuel used at the TPP

The key data and information used to establish the baseline are presented in tabular form below:

Data/Parameter	SFC_{BSL}
Data unit	GJ per MWh of power supplied to grid
Description	Specific fuel consumption in the baseline
Time of determination/monitoring	Fixed ex-ante
Source of data (to be) used	TPP data
Value of data applied (for ex ante calculations/determinations)	10.5232
Justification of the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	$FC_{i, y}$
Data unit	Tonnes or volumetric units
Description	Fuel consumption of fossil fuel of type *i* in year y
Time of determination/monitoring	Annually
Source of data (to be) use	Plant data
Value of data applied (for ex ante calculations/determinations)	Please, see Annex 2
Justification f the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	Three main types of fuels are considered: coal, heavy fuel oil and

[24] Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion (corrected chapter as of April 2007), IPCC, 2006

	natural gas.

Data/Parameter	**$NCV_{i,y}$**
Data unit	GJ per ton or volumetric unit
Description	Net calorific value of fossil fuel type *i* in year *y*
Time of determination/monitoring	Annually
Source of data (to be) use	Plant data
Value of data applied (for ex ante calculations/determinations)	-
Justification f the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Data/Parameter	**$EF_{CO2,i}$**
Data unit	tCO_2/GJ
Description	CO_2 emission factor of fossil fuel type *i* in year *y*
Time of determination/monitoring	Ex-ante
Source of data (to be) use	Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 2: Stationary Combustion, IPCC, 2006
Value of data applied (for ex ante calculations/determinations)	Please see Annex 2, Table 22
Justification f the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	Three main types of fuels are considered: coal, heavy fuel oil and natural gas.

Data/Parameter	**EL_y**
Data unit	MWh
Description	Electricity supplied to the grid by the project activity PP in year y
Time of determination/monitoring	Annually
Source of data (to be) use	Plant data
Value of data applied (for ex ante calculations/determinations)	-
Justification f the choice of data or description of measurement methods and procedures (to be) applied	-
OA/QC procedures (to be) applied	-
Any comment	-

Annex3

MONITORING PLAN

See section D for monitoring plan