

THIRD PERIODIC JI MONITORING REPORT

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Annex 1: Definitions and acronyms

SECTION A. General project activity and monitoring information**A.1 Title of the project activity:**

“Reconstruction of Units 1, 2, 3 and 4 at Zuyevska Thermal Power Plant”

Date: 28 March 2012.

Version: 2.4.

A.2. JI registration number:

JI Ref #: 0198

ITL ID: UA2000028

A.3. Short description of the project activity:

The proposed project is aimed at increasing the fuel efficiency, reliability, and availability of all four coal fired units at Zuyevska TPP (thermal power plant), which belongs to the DTEK holding company, Ukraine. The TPP has four conventional condensing steam turbine units of 325 MW (Unit #1), 315 MW (Unit #2) and 300 MW (Unit #3, #4)

Implementation of the proposed project activity allows to generate electric energy 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 all four 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.

The solutions allow increasing the efficiency of the 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 scope of reconstruction of each of the units is generally identical, and differs only in details. Plant auxiliaries, common for all units are involved in the reconstruction as well. Flue gas desulfurization (FGD) plant is also included, and it is planned at this stage to be common for Units #1, 3, and 4, with Unit #2 having an individual FDG plant.

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

1. Modernisation of steam turbine generator (STG), including:
 - a. Reconstruction 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
7. Plant auxiliaries modernisation (mainly plant cooling part, which includes cooling tower, cooling water supply and return channels).

Expected results

It is expected that under normal operating conditions the specific fuel consumption of the plant will be decreased from current value of approximately 10.523 to some 10.040 GJ/MWh. This will allow operation of TPP units with high efficiency for a long period without the 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.

The reconstruction of Unit #1 is included:

- Modernization of boiler TPP-312A
- Modernization of the turbine K-300-240-2
- Modernization of alternator TGV-300-2UZ
- Modernization of electrostatic precipitators

The reconstruction of Unit #2 is included:

- Modernization of boiler TPP-312A
- Modernization of the turbine K-300-240-2
- Modernization of alternator TGV-300-2UZ
- Modernization of electrostatic precipitators

The project has received the following letters of approval:

- Letter of approval by National Environmental Investment Agency, 19 August 2010, #1231/23/7;
- Letter of approval by SenterNovem Netherlands, 7 January 2010, #2009JI22.

The map below indicates the position of the project activity in Ukraine, near Zugres village, located about 40 km west of Donetsk, the regional capital of Donetsk Oblast in Southwest Ukraine:



Figure 1: Ukraine, the project location and neighbouring countries

The plant is located in Zugres village, 60-letiya Oktyabrya street 100, Donetsk region, 86784. Coordinates: +48° 1' 4.19"N, +38° 17' 16.13"E.

A.4. Monitoring period:

- Monitoring period starting date: 01/03/2011
- Monitoring period closing date: 31/12/2011

Both days are included into the monitoring period.

A.5. Methodology applied to the project activity (incl. version number):

A.5.1. Baseline methodology:

A Joint Implementation (JI) specific approach regarding baseline setting and monitoring has been developed in accordance with Appendix B of the JI Guidelines. 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 project¹.

A.5.2. Monitoring methodology:

The JI specific approach has been used for the purpose of the monitoring. This approach foresees monitoring of:

- fuels consumption for producing electricity and heat by the TPP (including the NCV (net calorific value) of each particular fuel used);
- amount of electricity supplied to the grid.

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

¹ JI guidelines, appendix B

Assumptions:

- The technical lifetime of the existing equipment will last at least to 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 are the IPCC default data.
- 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.

General remarks:

For the greenhouse gas emissions only the CO₂ emissions are taken into account. The CH₄ and N₂O emission reductions will not be claimed similarly to ACM0061. This approach is conservative.

A.6. Status of implementation including time table for major project parts:

During the third monitoring period two reconstructed Zuyevska TPP units were being in operation #1 and #2. Changes after the reconstruction of Units #1 and #2 are reflected in the table below:

| | Unit #1 | Unit #2 |
|-------------------------------------------------|---------|---------|
| Planned start of operation after reconstruction | 12/2009 | 12/2008 |
| Actual start of operation after reconstruction | 08/2011 | 04/2009 |
| Installed capacity before the reconstruction | 300 MW | 300 MW |
| Installed capacity after the reconstruction | 325 MW | 315 MW |

Table 1: Schedule of reconstruction and installed capacity changes of modernised units

As a result of modernization, capacity of turbine K-300-240-2 changed from 300 MW to 315 MW; of alternator TGV-300-2UZ - from 300 MW to 315 MW. This had substantively risen the effectiveness of Unit #2 energy generation. After the reconstruction of Unit #2 concentration of ashes in smoke gases decreased from 0.4 to 0.18 g/m³.

The reconstruction of Unit #1 increased capacity of generator and turbine from 300 MW to 325 MW. The regular operation of Unit#1 began in the third quarter of 2011. The marking of the reconstructed equipment has been changed according to installed capacity after the reconstruction.

Reconstruction of Unit #4 started in March 2012. Schedule of units start after modernisation is planned below:

| | |
|---------------------------------------|------------|
| Start of Unit #4 after reconstruction | April 2012 |
| Start of Unit #3 after reconstruction | April 2013 |

Table 2: Planned units reconstruction schedule

After completion of the last unit the project will operate at full scale.

During the monitoring period several planned repairs took place. Delivery of repair parts for Unit#1 was delayed and runner of Unit #3 turbine needed maintenance. The dates of repairs were changed according to the table below.

| Unit # | Repairs type | Actual repair start | Actual repair end |
|--------|--------------|---------------------|-------------------|
| 1 | running | 12/04/2011 | 11/05/2011 |
| 2 | periodic | 26/07/2011 | 09/10/2011 |
| 3 | periodic | 18/05/2011 | 25/07/2011 |
| 4 | periodic | 10/10/2011 | 02/11/2011 |

Table 3: Repair plan

A.7. Intended deviations or revisions to the registered PDD:

The value of emission reductions in the Project Design Documents (PDD) expected for 2011 is higher than Emission Reductions (ER) stated in the Monitoring Report (MR). The discrepancy in baseline emissions can be explained by the repairs of Unit #2 held in August-September 2011 and repairs of Unit #3 held in May, so less electricity was produced during the monitoring period. ER in the PDD were evaluated based on forecasts, so slight difference between expected and achieved ER values is acceptable. In the following table ER are compared for the 10 months' period.

| | PDD | MR | Data unit |
|----|-------------------------|---------|--------------------|
| ER | 227 077/12×10 = 189 231 | 126 649 | tCO ₂ e |

Table 4: Expected and actual monitoring values

A.8. Intended deviations or revisions to the registered monitoring plan

Actual conversion factor from kcal/kg (or kcal/m³) into GJ/t (or GJ/1000 m³) differs from the one in the previous monitoring report for the respective period stated in A.4. as shown in a table 2 below:

| Source | Conversion factor value |
|-----------|-------------------------|
| MR #1, #2 | 0.004187 |
| MR #3 | 0.0041868 |

Table 5: Conversion factor values in monitoring reports

Conversion factor differs, because it is rounded in the text of second MR, but not in the calculating model. Calculations were made using conversion factor, stated in current MR. The amendment does not influence the amount of emission reduction. The corrected conversion factor is used in the formulas of the MR

A.9. Changes since last verification:

No changes.

A.10. Person(s) responsible for the preparation and submission of the monitoring report:

Zuyevska TPP

- Yevgen Zheleznyak, head of process department (PTO), DTEK;
- Aleksey Mikhailov, leading specialist, department of environmental safety.

Global Carbon B.V.

- Denis Prusakov, Team Leader JI Consultants;
- Natallia Belskaya, JI Consultant.

SECTION B. Key monitoring activities

The project activity only affects the emissions due to combustion of fuels in the boilers of plant 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 (measuring the amounts of fuels consumed, their NCV and calculating the heat content of fuels used);
- amount of electricity supplied to the grid.

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

Data are measured, processed and stored by respective departments of the TPP as described in section B.3. Standard plant reporting from 3-TEH (approved standard form according to the methodological guidelines GKD 34.09.103-96) is prepared on monthly and yearly basis. The form contains amounts of electricity generated by each unit, electricity consumed by plant/unit auxiliaries, electricity exported to grid, total fuel consumption and its breakdown by fuel types, number of run and idle hours of equipment, number of starts, heat rate of steam turbogenerators, efficiency of boilers, boilers heat losses, steam, air temperatures and other detailed operational data.

The plant process department (PTO) is responsible for collecting, processing the data and producing the 3-TEH form on a regular basis.

B.1. Monitoring equipment:

Annual amount of electricity supplied by TPP to the grid in period y

The electricity produced by each of four plants alternators is measured by four individual meters located at each of the unit step-up transformers.

Part of electricity produced is used to feed the unit and plant auxiliary systems at 6 kV voltage.

The amount of electricity consumed by auxiliaries is measured by 8 individual meters located after four auxiliary transformers, two meters per each transformer.

Each of the meters is a modern electronic type device of high accuracy.. Each meter has a back up meter installed of same accuracy.

Separately, the amount of electricity consumed by back-up excitation system is measured by individual meter.

Amount of electricity supplied by TPP to the grid EL_y is obtained by subtraction of electricity used to feed auxiliaries (including the back-up excitation) from the amount of electricity produced.

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. The coal is being transported by two parallel belt conveyors LK-2A and LK-2B and the daily consumption is recorded by fuel department in paper form and transferred to process department where it is stored and used for daily control.

Consumption of natural gas

Consumption of natural gas is metered by flow meter Flowtek-2 installed at gas pressure reducing station owned by gas suppliers. This meter is certified as commercial metering device used for billing the power plant for gas consumed. Data is recorded and stored and constantly reported to the TPP. For the purposes of collecting monitoring data reports of the gas supplying company are used.

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). The daily volumetric consumption is recalculated to mass units. The data is recorded and transferred from fuel department to process department where has been stored and also used for daily control.

Net calorific value (NCV) of fuel type *i* during period *y*

The NCV of coal and heavy fuel oil is measured by TPP laboratory. The samples of coal are taken four times an hour, mixed together and kept for testing which is carried out every 5 days. This provides measurement of the average coal NCV for 5 days. Testing of heavy fuel oil is carried out every five days. The gas suppliers data is used for billing (monthly NCV certificates).

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B.1.2. Table providing information on the equipment used:

| ID* | Measuring instrument | Manufacturer/type | Serial number | Unit | Accuracy class or error | Last calibration | Next calibration | Comments |
|----------------------------------------------------------------------|-----------------------------------------------------------|--------------------|---------------|------|-------------------------|------------------|------------------|---------------------|
| Electricity generation | | | | | | | | |
| Wh1 _{new} | Electricity meter, Unit #1 alternator | Actaris SL7000 | 53101785 | kWh | 0.2s | 2Q2011 | 2Q2017 | |
| Wh1 _{old} | Replaced electricity meter, Unit #1 alternator | EA02RAL-C-4 | 01147041 | kWh | 0.2s | 4Q2006 | N/A | Replaced 17/08/2011 |
| Wh2 _{new} | Electricity meter, Unit #2 alternator | Actaris SL7000 | 53101788 | kWh | 0.2s | 2Q2011 | 2Q2017 | |
| Wh2 _{old} | Replaced electricity meter, Unit #2 alternator | EA02RAL-C-4 | 01147080 | kWh | 0.2s | 4Q2006 | N/A | Replaced 16/08/2011 |
| Wh3 _{new} | Electricity meter, Unit #3 alternator | Actaris SL7000 | 53101793 | kWh | 0.2s | 2Q2011 | 2Q2017 | |
| Wh3 _{old} | Replaced electricity meter, Unit #3 alternator | EA02RAL-C-4 | 01147064 | kWh | 0.2s | 4Q2006 | N/A | Replaced 17/08/2011 |
| Wh4 _{new} | Electricity meter, Unit #4 alternator | Actaris SL7000 | 53101791 | kWh | 0.2s | 2Q2011 | 2Q2017 | |
| Wh4 _{old} | Replaced electricity meter, Unit #4 alternator | EA02RAL-C-4 | 01147039 | kWh | 0.2s | 4Q2006 | N/A | Replaced 19/08/2011 |
| Wh14 _{new} | Electricity meter on consumption of PE "Adamant-Ya" | NIK2303 | 0119034 | kWh | 1.0 | 4Q2011 | 4Q2028 | |
| Wh14 _{old} | Replaced electricity meter consumption of PE "Adamant-Ya" | Energia-9 STK-3-10 | 36102 | kWh | 1.0 | 4Q2006 | N/A | Replaced 29/12/2011 |
| Wh15 _{new} | Electricity meter on consumption of ZEMZ | NIK2104-02 | 3723772 | kWh | 1.0 | 4Q2011 | 4Q2028 | |
| Wh15 _{old} | Replaced electricity meter on consumption of ZEMZ | Energia-9 STK-1-10 | 83226 | kWh | 1.0 | 4Q2006 | N/A | Replaced 13/12/2011 |
| Electricity consumption for reserve excitation of alternators | | | | | | | | |
| Wh5 _{new} | Electricity meter, 6 kV Section 1-A | Actaris SL7000 | 53112339 | kWh | 0.5s | 2Q2011 | 2Q2017 | |
| Wh5 _{old} | Replaced electricity meter, 6 kV Section 1-A | EA05RL-C-3 | 01147108 | kWh | 0.5s | 4Q2006 | N/A | Replaced 19/08/2011 |
| Electricity consumption for power plant auxiliaries | | | | | | | | |
| Wh6 _{new} | Electricity meter, TR 21 Sect A | Actaris SL7000 | 53112337 | kWh | 0.5s | 2Q2011 | 2Q2017 | |
| Wh6 _{old} | Replaced electricity meter, TR 21 Sect A | EA05RL-C-3 | 01147105 | kWh | 0.5s | 4Q2006 | N/A | Replaced 17/08/2011 |
| Wh7 _{new} | Electricity meter, TR 21 Sect B | Actaris SL7000 | 53112326 | kWh | 0.5s | 1Q2011 | 1Q2017 | |
| Wh7 _{old} | Replaced electricity meter, TR 21 Sect B | EA05RL-C-3 | 01147103 | kWh | 0.5s | 4Q2006 | N/A | Replaced 17/08/2011 |
| Wh8 _{new} | Electricity meter, TR 22 Sect A | Actaris SL7000 | 53112346 | kWh | 0.5s | 2Q2011 | 2Q2017 | |
| Wh8 _{old} | Replaced electricity meter, TR 22 Sect A | EA05RL-C-3 | 01147094 | kWh | 0.5s | 4Q2006 | N/A | Replaced 16/08/2011 |
| Wh9 _{new} | Electricity meter, TR 22 Sect B | Actaris SL7000 | 53112327 | kWh | 0.5s | 2Q2011 | 2Q2017 | |

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| | | | | | | | | |
|---------------------|------------------------------------------|----------------|----------|-----|------|--------|--------|------------------------|
| Wh9 _{old} | Replaced electricity meter, TR 22 Sect B | EA05RLC3 | 01147104 | kWh | 0.5s | 4Q2006 | N/A | Replaced 16/08/2011 |
| Wh10 _{new} | Electricity meter, TR 23 Sect A | Actaris SL7000 | 53112348 | kWh | 0.5s | 2Q2011 | 2Q2017 | |
| Wh10 _{old} | Removed electricity meter, TR 23 Sect A | EA05RL-C-3 | 01147096 | kWh | 0.5s | 4Q2011 | N/A | Replaced 18/08/2011 |
| Wh11 _{new} | Electricity meter, TR 23 Sect B | Actaris SL7000 | 53112350 | kWh | 0.5s | 2Q2011 | 2Q2017 | |
| Wh11 _{old} | Replaced electricity meter, TR 23 Sect B | EA05RL-C-3 | 01147095 | kWh | 0.5s | 4Q2006 | N/A | Replaced 18/08/2011 |
| Wh12 _{new} | Electricity meter, TR 24 Sect A | Actaris SL7000 | 53112336 | kWh | 0.5s | 2Q2011 | 2Q2017 | |
| Wh12 _{old} | Replaced electricity meter, TR 24 Sect A | EA05RL-C-3 | 01147097 | kWh | 0.5s | 4Q2006 | N/A | Replaced 18/08/2011 |
| Wh13 _{new} | Electricity meter, TR 24 Sect B | Actaris SL7000 | 53112340 | kWh | 0.5s | 2Q2011 | 2Q2017 | |
| Wh13 _{old} | Replaced electricity meter, TR 24 Sect B | EA05RL-C-3 | 01147106 | kWh | 0.5s | 4Q2006 | N/A | Replaced 18/08/2011 |

*Electricity meters with index WhXX_{old} were replaced with electricity meters with index WhXX_{new} respectively.

Table 6: Electricity meters

| Measuring instrument | ID | Manufacturer/type | Serial number | Unit | Accuracy class or error | Last calibration | Next calibration |
|-----------------------------------------------|------|----------------------|---------------|------|-------------------------|------------------|------------------|
| Coal conveyor strain scales at conveyor LK-2A | MC#1 | MICA, "ErMak VL 2-2" | 1757 | t | ± 0.5 % | 26/10/2011 | 26/04/2012 |
| Coal conveyor strain scales at conveyor LK-2B | MC#2 | MICA, "ErMak VL 2-2" | 1803 | t | ± 0.5 % | 26/10/2011 | 26/04/2012 |

Table 7: Conveyor belt coal weight meters

Calibration dates are provided in following formats:

- DD/MM/YYYY – exact date;
- MM/YYYY – month of the year in which calibration should be performed;
- QQYYYY – quarter of the year in which calibration should be performed.

Calibration of the metering devices and equipment has been conducted on a periodic basis according to the procedures of the Host Party and internal company policies.

B.1.3. Calibration procedures:

For Electricity Meters:

| QA/QC procedures | Body responsible for calibration and certification |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Calibration interval for Actaris SL7000 meters is 6 years. Calibration interval for EA05-RL-C3 meters is 8 years Calibration interval for Energia-9 STK-1-10 meters is 6 years Calibration interval for NIK2303 and NIK2104-02 is 16 years | Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine |

For Natural Gas Flow Meters:

| QA/QC procedures | Body responsible for calibration and certification |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Calibration interval of such meters is 2 years. | Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine |

The Natural Gas Flow Meters are installed at the supplier side. Gas supply company is responsible for calibration and verification of the meters. For the purposes of the monitoring data of the gas supply company are used.

For scales:

| QA/QC procedures | Body responsible for calibration and certification |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Calibration interval of such meters is 1 year. But enterprise can make calibration more frequently. | Calibration will be performed by the authorized representatives of the State Metrological System of Ukraine |

B.2. Data collection (accumulated data for the whole monitoring period):

B.2.1. List of fixed default and baseline values:

| Data variable | Source of data | Data unit | Value |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------|
| $EF_{CO_2,1}$, Sub-bituminous coal emission factor | Default CO ₂ emission factor for combustion of sub-bituminous coal (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1, Introduction, Table 1.4) | tCO ₂ /GJ* | 0.0961 |
| $EF_{CO_2,2}$, Natural gas emission factor | Default CO ₂ emission factor for combustion of natural gas (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1, Introduction, Table 1.4) | tCO ₂ /GJ* | 0.0561 |
| $EF_{CO_2,3}$ Heavy fuel oil (mazut) emission factor | Default CO ₂ emission factor for combustion of residual fuel oil (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1, Introduction, Table 1.4) | tCO ₂ /GJ* | 0.0774 |
| SFC_{Bsl} , Baseline specific overall (for producing electricity and heat) fuel consumption per unit of power supply to the grid (station heat rate) | Fixed ex-ante in the Annex 2 of PDD (version 2.8 dated 15/12/2010) | GJ/MWh | 10.5232 or 359.059 g.c.e./kWh** |

* 10000 kgCO₂/TJ = 0.0001 tCO₂/GJ

** 1 g.c.e./kWh = 0.0293076 GJ/MWh

Table 8: Project fixed default values

B.2.2. List of variables:

| Data variable | Data unit | Method of calculation |
|-----------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------|
| EL_y , Annual amount of electricity supplied by TPP to the grid in period y | MWh | Measurement by electricity meters, calculation |
| $FC_{i,y}$, Fuel of type i consumed during period y for producing electricity and heat | t or 1000 m ³ | - |
| $NCV_{i,y}$, Net calorific value of fuel type i during period y | GJ/t or GJ/1000 m ³ | TPP laboratory measurements |

Table 9: List of variables

B.2.3. Data concerning GHG emissions by sources of the project activity:

| Period | | | 03/2011 | 04/2011 | 05/2011 | 06/2011 | 07/2011 | 08/2011 | 09/2011 | 10/2011 | 11/2011 | 12/2011 |
|---------|-----------------------------------------------|-----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| FC_1 | Coal consumption | t | 336 880 | 286 747 | 220 840 | 242 481 | 264 635 | 274 783 | 203 545 | 229 719 | 297 569 | 317 314 |
| FC_2 | Natural gas consumption | 1000 m ³ * | 1 791 | 1 072 | 3 205 | 1 829 | 1 674 | 2 010 | 1 201 | 2 010 | 1 710 | 2 398 |
| FC_3 | Heavy fuel oil (mazut consumption) | t | 0 | 0 | 0 | 0 | 0 | 13.74 | 0 | 0 | 0 | 0 |
| NCV_1 | Net calorific value of coal | kcal/kg | 4 711 | 4 678 | 4 607 | 4 624 | 4 582 | 4 524 | 4 787 | 4 667 | 4 609 | 4 640 |
| NCV_2 | Net calorific value of natural gas | kcal/m ³ | 8 048 | 8 819 | 8 139 | 8 686 | 8 073 | 8 154 | 8 192 | 8 122 | 8 102 | 8 088 |
| NCV_3 | Net calorific value of heavy fuel oil (mazut) | kcal/kg | 0 | 0 | 0 | 0 | 0 | 9 178 | 0 | 0 | 0 | 0 |

* provided at following conditions: t = 20°C, P = 101325 Pa

Table 10: Data collected in project scenario

B.2.4. Data concerning GHG emissions by sources of the baseline:

| Period | | | 03/2011 | 04/2011 | 05/2011 | 06/2011 | 07/2011 | 08/2011 | 09/2011 | 10/2011 | 11/2011 | 12/2011 |
|---------|-----------------------------------------------|---------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| NCV_1 | Net calorific value of coal | kcal/kg | 4 711 | 4 678 | 4 607 | 4 624 | 4 582 | 4 524 | 4 787 | 4 667 | 4 609 | 4 640 |
| NCV_2 | Net calorific value of natural gas | kcal/m ³ | 8 048 | 8 819 | 8 139 | 8 686 | 8 073 | 8 154 | 8 192 | 8 122 | 8 102 | 8 088 |
| NCV_3 | Net calorific value of heavy fuel oil (mazut) | kcal/kg | 0 | 0 | 0 | 0 | 0 | 9 178 | 0 | 0 | 0 | 0 |
| EL_y | Amount of power supplied to grid | MWh | 668 610 | 556 217 | 423 988 | 460 216 | 485 616 | 501 037 | 398 187 | 437 806 | 575 191 | 620 942 |

Table 11: Data collected for the baseline

B.2.5. Data concerning leakage:

Not applicable.

B.2.6. Data concerning environmental impacts:

Environmental impacts due to operation of Zuyevska TPP are monitored on a regular basis according to the environmental regulations in force. Applicable norm is the Law of Ukraine “On protection of ambient air”.

Standart reporting form 2-TP (air) is produced on regular basis and includes monitoring of TPP emissions of pollutants (dust, sulphur oxides and nitrogen oxides). The level of TPP emissions is within its operation license (allowance). The environmental reporting and conformance to applicable norms in force is regularly checked by State environmental inspection in Donetsk Region.

B.3. Data processing and archiving (incl. software used):

In regard of data processing and archiving the Management of Zuyevska TPP:

- Organizes monitoring (the appropriate orders and instructions may be issued, specifying the responsible executors, who carry out monitoring and reporting);
- Recording the required data, monitoring and reporting on the project GHG emissions at the TPP;
- Operation of power plant equipment;
- Recording the required data, monitoring and reporting on the project GHG emissions at the TPP;
- All data archived will be kept for at least two years after the last transfer of ERUs to the client, what is stated in the Order #202 of “Skhidenergo” LLC - “On information archiving” from 09/09/2010.

Person responsible for data collection and archiving is Mr. Yevgeniy Zhelesnyak – head of process department of Zuyevskaya TPP.

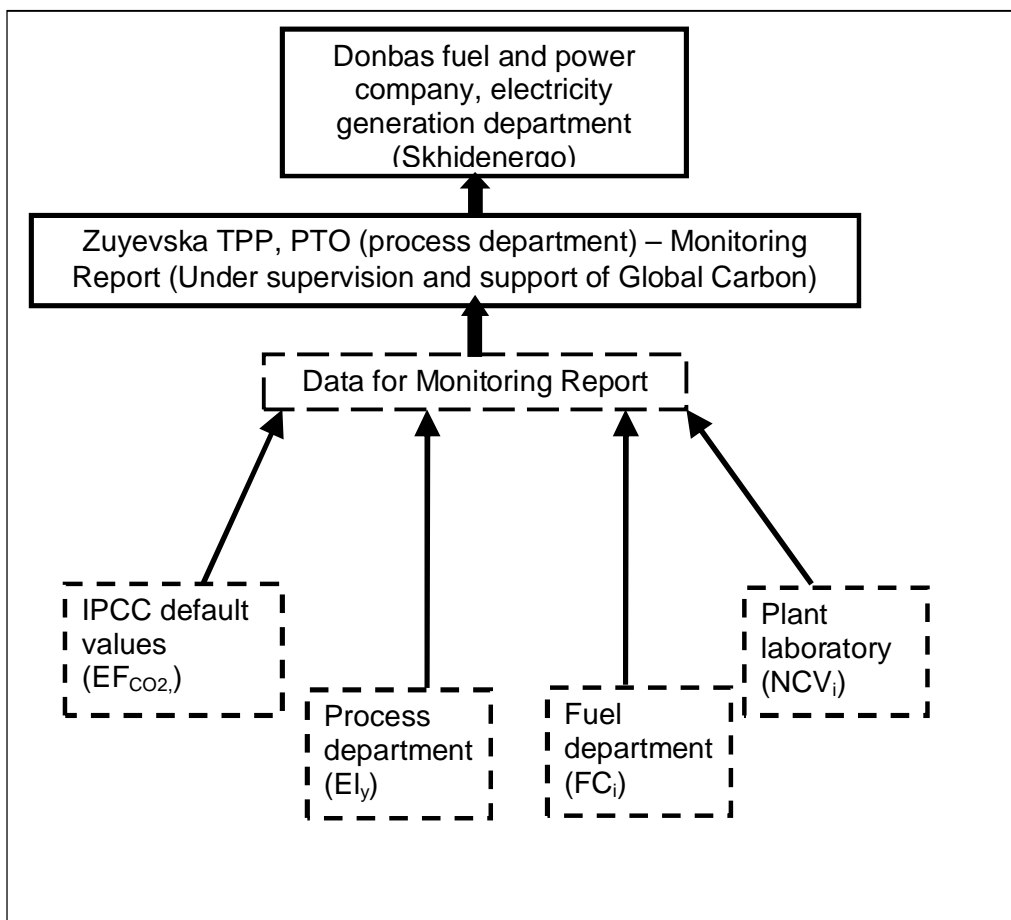


Figure 2: Data collection and processing for monitoring at Zuyevska TPP

B.4. Special event log:

All special events will be recorded in the shift-charge engineers’s log book. There were no special events during the monitored period.

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management plan:

C.1.1. Roles and responsibilities:

The general project management will be implemented by Mr. Yevgen Zhelezniak, head of process department of Zuyevska TPP through supervising and coordinating activities of his subordinates and other power plant divisions, head of accounting department, head of plant laboratory, fuel department. The process department is responsible for routine preparation and keeping the power plant performance forms, which record amount of electricity produced and exported to the grid, fuel consumed, runhours of all major equipment, specific fuel consumption, NCV of fuels, actual and planned performance and ambient conditions. Within this responsibility the process departments interacts with plant divisions in getting necessary performance data.

The plant laboratory is responsible for measurement of NCV of coal and heavy oil used. The fuel department is responsible for monitoring and recording the fuel consumption data, transferring it to the process department.

C.1.2. Trainings:

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.

C.2. Involvement of Third Parties:

The calibration of all metering equipment and accreditation of the TPP laboratory is done by Ukrainian Centre for Standardization and Metrology and State Donetsk regional centre for standardisation, metrology and certification (SE “DonetskDerzhstandartmetrologiya”).

C.3. Internal audits and control measures:

All metering equipment is controlled by the Instrument department. It makes periodical checking and calibration of metering equipment as per approved schedule and equipment manual.

C.4. Troubleshooting procedures:

The troubleshooting is made by maintenance mechanics or on-duty electrician/operator. The internal system requires a broken meter to be replaced in few hours by the Instrument department.

The Chief of Instrument Department, Mr. Alexander Zakharov, is in charge with the abovementioned activities.

The troubleshooting procedures concerning the commercial electric meters which are property of the electricity distributing company are according to the national standards for that kind of equipment, i.e. in max. 5 days the distributing company has to replace the meter. During that period the data is taken on a historical basis for a similar period of time.

SECTION D. Calculation of GHG emission reductions.

D.1. Table providing the formulas used:

D.1.1. Formulas used to calculate project emissions:

$$PE_y = PE_{Fuel,y} \tag{1}$$

Where:

- PE_y - Project emission in period y (tCO₂e)
- $PE_{Fuel,y}$ - Project emission due to combustion of fossil fuels in the boilers of TPP in period y (tCO₂).

Results of the emissions calculations are presented in metric tons of carbon dioxide equivalent (tCO₂e). The metric ton of carbon dioxide equivalent is equal to the metric ton of carbon dioxide (tCO₂). Therefore 1 tCO₂e = 1 tCO₂.

$$PE_{Fuel,y} = \sum_i (FC_{i,y} \times EF_{CO_2,i} \times NCV_{i,y}) \times 0.0041868 \tag{2}$$

Where:

- $FC_{i,y}$ - fuel of type i consumed during period y (t or 1000 m³)
- $EF_{CO_2,i}$ - fuel of type i emission factor (tCO₂/GJ)
- $NCV_{i,y}$ - net calorific value of fuel of type i in period y (kcal/kg or kcal/m³)
- i - type of fuel 1 – coal, 2 – natural gas; 3 – heavy fuel oil (mazut)
- 0.0041868 - conversion factor from kcal/kg (or kcal/m³) into GJ/t (or GJ/1000 m³)

D.1.2. Formulas used to calculate baseline emissions:

$$BE_y = BE_{Fuel,y} \tag{3}$$

Where:

- BE_y - baseline emissions for the period y (tCO₂e)
- $BE_{Fuel,y}$ - baseline CO₂ emissions due to combustion of fossil fuels in the boilers of TPP (tCO₂e)

$$BE_{Fuel,y} = \sum_i \frac{0.0293076 \times SFC_{Bsl} \times El_y \times FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_i (FC_{i,y} \times NCV_{i,y})} \tag{4}$$

Where:

- SFC_{Bsl} - baseline specific overall (for producing electricity and heat) fuel consumption per unit of power supply to the grid (g.c.e/kWh)

- $FC_{i,y}$ - fuel of type i (coal, natural gas and heavy fuel oil (mazut)) consumption during the period y (t or 1000 m³)
 $EF_{CO_2,i,y}$ - emission factor of fuel of type i during the period y (tCO₂/GJ)
 $NCV_{i,y}$ - net (lower) calorific value of fuel of type i during the period y (kcal/kg or kcal/m³)
 EL_y - annual amount of power supplied by TPP to the grid in period y (MWh)
 i - type of fuel 1 – coal, 2 – natural gas; 3 – heavy fuel oil (mazut)
 0.0293076 - conversion factor from g.c.e./kWh into GJ/MWh

The baseline specific overall (for producing electricity and heat) fuel consumption per unit of power supply to the grid SFC_{Bsl} is fixed in PDD as annual average of the most recent seven years preceding the project start (2002 to 2008).

$$SFC_{Bsl} = \sum_y SFC_y \times \frac{1}{7} \tag{5}$$

Where:

- SFC_{BSL} - baseline specific overall (for producing electricity and heat) fuel consumption per unit of power supply to the grid (GJ/MWh)
 SFC_y - specific overall (for producing electricity and heat) fuel consumption per unit of power supply to the grid (GJ/MWh)
 EL_y - power supplied by TPP to the grid in period y (MWh)
 y - year from 2002 to 2008

D.1.3. Formulas used to calculate emission reductions:

$$ER_y = BE_y - PE_y \tag{6}$$

Where:

- ER_y - emission reduction of the JI project in period y (tCO₂e)
 BE_y - baseline emissions in period y (tCO₂e)
 PE_y - project emissions in period y (tCO₂e)

D.2. Description and consideration of measurement uncertainties and error propagation:

All measurement uncertainties and error propagation are according to the passports of measuring equipment and the calibration certificates.

D.3. GHG emission reductions (referring to B.2. of this document):

D.3.1. Project emissions:

| Parameter | Monitoring Period | Unit | Value |
|-------------------|-------------------|--------------------|-----------|
| Project Emissions | 03/2011-12/2011 | tCO ₂ e | 5 030 653 |

D.3.2. Baseline emissions:

| Parameter | Monitoring Period | Unit | Value |
|--------------------|-------------------|--------------------|-----------|
| Baseline Emissions | 03/2011-12/2011 | tCO ₂ e | 5 157 302 |

D.3.3. Leakage:

N.A.

D.3.4. Summary of the emissions reductions during the monitoring period:

| Parameter | Monitoring Period | Unit | Value |
|--------------------|-------------------|--------------------|----------------|
| Emission Reduction | 03/2011-12/2011 | tCO ₂ e | 126 649 |

Annex 1

Definitions and acronyms.

| | |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ERU | EMISSION REDUCTION UNITS |
| ER | EMISSION REDUCTIONS |
| ESP | ELECTROSTATIC PRECIPITATOR |
| GHG | GREENHOUSE GASES |
| GJ | GIGAJOULE |
| IPCC | INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE |
| JI | JOINT IMPLEMENTATION |
| MR | MONITORING REPORT |
| MWh | MEGAWATT HOUR |
| NCV | NET CALORIFIC VALUE |
| PDD | PROJECT DESIGN DOCUMENT |
| PTO | PROCESS DEPARTMENT |
| STG | STEAM TURBINE GENERATOR |
| TPP | THERMAL POWER PLANT |
| Baseline | The scenario that reasonably represents what would have happened to greenhouse gases in the absence of the proposed project, and covers emissions from all gases, sectors and source categories listed in Annex A of the Protocol and anthropogenic Removals by sinks, within the project boundary. |
| Emissions reductions | Emissions reductions generated by a JI project that have not undergone a verification or determination process as specified under the JI guidelines, but are contracted for purchase. |
| Greenhouse gas (GHG) | A gas that contributes to climate change. The greenhouse gases included in the Kyoto Protocol are: carbon dioxide (CO ₂), Methane (CH ₄), Nitrous Oxide (N ₂ O), Hydrofluorcarbons (HFCs), Perfluorcarbons (PFCs) and Sulphurhexafluoride (SF ₆). |
| Joint Implementation (JI) | Mechanism established under Article 6 of the Kyoto Protocol. JI provides Annex I countries or their companies the ability to jointly implement greenhouse gas emissions reduction or sequestration projects that generate Emissions Reduction Units. |
| Monitoring plan | Plan describing how monitoring of emission reductions will be undertaken. The monitoring plan forms a part of the PDD |