

**MONITORING REPORT OF JI PROJECT**

**Monitoring period:  
01/01/2008 – 30/06/2012**

**Version 2.0  
September 28, 2012**

**Power distribution system modernization of PJSC «AES Rivneoblenergo»**

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

**Power distribution system modernization of PJSC «AES Rivneoblenergo».**

Sectoral scope: 2 – “Energy distribution”.

Date: 28 September 2012.

Version: 2.0.

**A.2. Information about registration and approval of the project:**

The project obtained written approval from Ukraine (the Host country) on 26/09/2012 (Letter of Approval 2757/23/7, issued by the State Environmental Investment Agency). The project was also approved by Switzerland – the country-buyer of GHG emission reductions (Letter of Approval № J294-0485 issued by Federal Department of the Environment, Transport, Energy and Communications of Switzerland, dated 24/08/2012).

**A.3. Brief description of the project:**

The main purpose of the Joint Implementation Project (hereinafter - JIP) implementation «Power distribution system modernization of PJSC «AES Rivneoblenergo» is the implementation of the program on the technical improvement of electrical networks and equipment, advanced technologies implementation, the transition to a higher level of organization, transmission and distribution of electric energy.

Implementation of the measures under the Project allows for improvement of the reliability and efficiency of distribution electrical grids of Public joint stock company “AES Rivneoblenergo” (hereinafter – «AES Rivneoblenergo» PJSC) and this helps reduce the amount of electricity that is lost during transportation thereof to the consumers of all forms of ownership, so the production of electricity at thermal power plants decreases and correspondingly GHG emissions are reduced.

*The baseline scenario* provides for the further use of existing equipment and routine repairs and recovery works without significant investment. Losses of electricity in the electrical grids would remain at the same level, leading to greenhouse gases emissions due to burning of fossil fuels at electricity generating companies at the pre-project level.

*The project scenario* provides for implementation of new energy efficient equipment and complex of organizational and technical measures aimed at reduction of process losses of electricity (hereinafter – PLE). The Project provides for creation of the PLE management system at the Company that is aimed at efficient implementation of a set of organizational and technical measures as well as and improvement of methodological support of PLE reduction in the course of implementation of licensed types of activity of electricity supply and transfer. The list of these measures is provided below:

- Modernization activity and introduction of new energy efficient equipment;
- Improvement of the reliability of electricity supply;
- Introduction of automated systems of electricity consumption commercial accounting (ASECCA) in the perimeter of energy supply company, ASECCA of consumers and substations;
- Introduction of a complex Program on electricity process losses reductions.

**A.4. Monitoring period:**

- Date of commencement of the monitoring period: 01/01/2008.
- Date of termination of the monitoring period: 30/06/2012.

**A.5. Methodology applied to the project:****A.5.1. Baseline methodology:**

The methodology used to identify the baseline scenario and the corresponding calculations based on a JI specific approach, according to the Guidance on criteria for baseline setting and monitoring (version 03), paragraph 9a. Also, to identify the baseline scenario and demonstrate additionality methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality"<sup>1</sup> (Version 03.0.1)<sup>2</sup> was used.

The baseline scenario provides for continuation of existing practice with the introduction of minimum repairs on the background of the overall deterioration of electricity supply systems. In case the proposed project is not implemented electrical energy will still be transported with considerable losses in the grid. Electricity losses in the baseline scenario are determined for each project year when monitoring of project activity takes place. These losses are calculated for each project measure based on the data on the grid state before the measure implementation.

Detailed information on the algorithm of baseline emissions calculation is given in determined PDD, version 2.0.

**A.5.2. Monitoring methodology:**

The proposed project uses a specific approach for Joint Implementation projects on the basis of Guidance on criteria for baseline setting and monitoring, version 2 of the Joint Implementation Supervisory Committee – JISC<sup>3</sup>. The monitoring plan is designed for accurate and clear greenhouse gas emissions measurements and calculation and conducted according to practices established at «AES Rivneoblenergo» PJSC to measure the transmitted and consumed electricity. Monitoring of the project does not require changes in existing metering and data collection system. All monitoring data are calculated, recorded and stored within two years after emission reduction units generated by the project are delivered.

The project «Power distribution system modernization of PJSC «AES Rivneoblenergo» is aimed at reducing of electricity process losses in the course of electricity transportation to consumers of all forms of ownership. However, it is impossible to assume that in the absence of the project (baseline scenario) the percentage of losses would have remained constant (at the level that is the same as the pre-project level) because it is also affected by other factors that don't depend of the project activities (eg, increase or decrease in the number of consumers, etc.). At the same time one can not provide accurate estimation or foresee the future impact of other factors than those proposed in the project. Therefore, the proposed methodology, that is based on the JI specific approach, takes into consideration reduction of electricity losses, achieved by means of the implementation of each individual project measure. At the same time the calculation of losses in the baseline scenario is actually performed with consideration of the state of the electrical grid before implementation of such measure. Thus, the application of the developed

<sup>1</sup> <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-02-v3.0.1.pdf>

<sup>2</sup> At the beginning of the determination process for the project, the latest version of "Combined tool to identify the baseline scenario and demonstrate additionality" was version 04.0.0, dated from March 2, 2012. In current project, the project participants are using a previous version of the tool, according to the "Guidance on criteria for baseline setting and monitoring" (version 03), paragraph B (10), page 3:

[http://ji.unfccc.int/Ref/Documents/Baseline\\_setting\\_and\\_monitoring.pdf](http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf)

<sup>3</sup> [http://ji.unfccc.int/Ref/Documents/Baseline\\_setting\\_and\\_monitoring.pdf](http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf)

methodology for calculating emissions in the baseline scenario actually leads to their underestimation by taking into account the effect of energy saving measures implemented earlier, which is conservative.

Input data used to calculate electricity losses are the official data of the enterprise, which are also used to calculate electricity process losses in electricity distribution grids of Oblenergo that are further agreed upon in the Ministry of Energy and Coal Mining Industry of Ukraine and approved by the National Electricity Regulatory Commission of Ukraine (hereinafter – NERC).

Calculation of ERU generated by the project is performed according to the methodology described in the registered (ITL UA1000316) PDD “Khmelnyskoblenergo PJSC Power Distribution System Modernization” in accordance with the Article 9c of the Guidance On Criteria For Baseline Setting And Monitoring, Version 03 and PDD “Power distribution system modernization of PJSC “AES Rivneoblenergo”, version 2.0 (hereinafter – the Methodology).

According to the Methodology calculation of process losses of electricity is based on the provisions of the following industry-specific regulatory documents:

- Law of Ukraine "On Electricity" from October 16, 1997 № 575/97-VR, amended;
- GOST 6570-96 "Electric meters of active and reactive power induction. General specifications";
- ISO 14064-1: 2006 Greenhouse gases - Part 1: Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals;
- "Power units adjustment rules ", Chapter 1.5 Electricity accounting;
- "Rules for using electricity" approved by the National Electricity Regulatory Commission of 31.07.96 № 28 (amended and supplemented from 17.10.2005 № 910);
- GND 34.09.104-2003 "Methods of compiling the balance of power structure in power networks 0.38-150 kW, analyze its components and standardization of technological power consumption";
- Change number 1 to GND 34.09.104-2003 "Methods of compiling the balance of power structure in power networks 0.38-150 kW, analyze its components and standardization of technological power consumption";
- GND 34.09.203-2004 "Rationing power consumption for own needs 35-750 kV substations and distribution points 6-10 kV. Manual ";
- "Instructions on commercial electricity metering" (Annex 10 to the Agreement between the members of the Wholesale Electricity Market), approved by the Annual General Meeting on 21.02.2003 and ORE up by the NERC number 480 of 30.05.2003, as amended;
- Instructions for compiling, reporting and analysis of departmental reporting forms 1B-TPL "The structure of the balance of power and technology of electric power to the transmission of electrical networks", approved by the Ministry of Power of Ukraine September 9, 1997;
- Form number 67-energy "Report on the organization of accounting systems active electric energy consumers and the installation of electrical systems and consumer and power transmitting organizations, automated accounting of electricity and local facilities for collecting and processing data (LUZOD)", approved by the Energy Ministry of Ukraine of 01 July 2008 number 352 in agreement with the State Statistics Committee of Ukraine.

The provisions of these documents are binding on all energy companies of Ukraine, which have the distribution grids of the specified voltage classes.

Following parameters are have to be under control with the aim to monitor TPL volumes in power systems with voltage 0.38-150 kW which used to calculate indirect emissions of carbon dioxide for the relevant crediting period:

- Compliance of the official statistical reporting data of energy distributing companies by reporting form 1-B TPL (TVE), form number 67-energy and data from company's annual report on the number of residential consumers of electricity in the same year, the data that used in the calculations;
- Compliance with the order of calculation of TPL to set out in the Methodology.

The monitoring plan includes measures (measurements, maintenance, registration and calibration) that satisfies the requirements of the chosen monitoring methodology and guarantees the possibility of checking the calculations of emission reductions.

**A.6. Status of implementation including project milestones:**

Implementation of project activities started in 2003, as provided for in the determined PDD, version 2.0. However, ERUs generated in 2003 are excluded from the calculation from a conservative standpoint. Therefore, 01/01/2004 was taken as the crediting period start date.

Project implementation status in the reporting period of 01/01/2008 – 30/06/2012, including the project milestones is provided in Table 1.

*Table 1. Project implementation status*

№	Name of activities	Units	2008	2009	2010	2011	2012 (6 months)
1	Repairs of PL-0.4-10 kV	km	606.743	445.4	427.3	1988.07	478.5
2	Power transformers 6-10 kV overhauls	pcs	140	208	322	444	261
3	Repairs of PL-35-110 kV	km	266.64	201.7	221.4	174.74	133.2
4	Replacement of wires at PL-0.4-10 kV	km	204.078	152.69	174.677	192.46	98.1
5	Installation of isolated cables at PL-0.4-10 kV	km	2.2842	9.7	24.3	112.801	50.45
6	Replacement of meters with high accuracy meters and its installation in front of buildings	pcs	25389	34155	33971	35648	29272
7	Reconstruction and modernization of wrecked PL-0.4-10 kV	km	131.244	100.6	107.28	134.98	72.13
8	Replacement of worn-out oil switches with vacuum ones	pcs	20	25	31	38.00	16
9	Power transformers 35-110 kV overhauls	pcs	134	56	142	204	113
10	Replacement of insulators at PL-35-110 kV	pcs	1510	519	1367	1263	713
11	Introduction of ASKOE	pcs	0	3	0	0	1
12	Installation of RZ PA devices	pcs	60	32	3	22	9
13	Replacement of signal lamps with LED ones	pcs	60	75	93	114	79

Implementation of project measures is carried out according to the project plan that is included in the Financial Plan.

**A.7. Deviations from or change of registered PDD:**

Deviations in the amount of carbon credits takes place in 2012. Emission reductions achieved exceed projected in the PDD on 94 667 t CO<sub>2</sub>e. This difference is a logical reflection of fact that in the PDD for predicting emission reductions in 2012 used data based on assumptions preservation rate increment of TPL level (see PDD, version 2.0), while in this report the actual values from official sources were used. Also, this difference is associated with a significant reduction of TPL and different structure components of energy losses - technical / non-technical, namely, a large proportion of non-technical losses in the aggregate balance of TPL.

**A.8. Deviations from or change of the registered monitoring plan:**

There aren't any deviations or changes from the registered monitoring plan.

**A.9. Persons responsible for preparation and submitting of the monitoring report:**

**Project owner:**

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**SECTION B. Key monitoring activities**

Methodology described in the registered (ITL UA1000316) PDD “Khmelnyskobleno PJSC Power Distribution System Modernization” in accordance with the Article 9c of the Guidance On Criteria For Baseline Setting And Monitoring, Version 03 and PDD “Power distribution system modernization of PJSC “AES Rivneoblenergo”, version 2.0 (hereinafter – DAEI Methodology) determines the procedure and is used for carbon dioxide in the process of the power production by the thermal electric power station and its consumption by the final consumer specific emissions estimation, is lost while transmitting and supplying during GHG emission reduction estimation in the course of JI projects realization according the article 6 of the Kyoto protocol to UN framework convention on climate changes and other projects, directed on the GHG emissions reduction.

DAEI methodology contains directions as to the indicated indices values calculation arrangement and output data sources that are used in these calculations. Calculation of the indicated indices is carried out according thermal power stations activity actual results, transnational power grids operator, and power supply companies. Carbon dioxide emissions in the process of power consumption calculation or while its transfer and supply is based on the data concerning technological power consumption in the power grids.

According to DAEI methodology the data concerning technological power consumption in the power grids are accepted on the bases of annual report according the form 1B- TPL "Power balance structure and technological power consumption for the power transfer through the grids" (1B-TPL form).

Specific indirect carbon dioxide emissions for the electric power unit calculation that is used by the consumer and is lost for its transfer and supply should be carried out separately.

Specific indirect carbon dioxide for the electric power unit, that are lost for the its transfer and supply by the power supply company, are determined according the formula (6) of DAEI Methodology, in which the data as to the TPL in the 800-220 kV transnational grids are used, in the percent to the issue (consolidated income) of power into the network and data concerning TPL in the 0.38-150kV power grids of power supply companies in the percent to the issue (consolidated income) of power into the grid according the form data 1-B TPL form for the respective year. So the use of the data of line 19 is expected “RV TPL percent from the power issue into the grid” form 1-B TPL.

GHG emission reduction estimation in the course of JI projects realization for the current calculated period (year) according to DAEI methodology is made through the means of difference calculation between the basic emissions (for the basic year) and project emissions (for the current calculated year).

The peculiarity of the process of transmission and distribution is that the balance of power structure indicators (income and output power (total value and significance of voltage levels), transformation of energy between degrees of, RV TPL (total value and significance of voltage levels), NV TPL (total value and significance levels of voltage), calculated on the bypass power LEP and transformers for voltage levels and releasing (balanced revenues) in the electricity network in different accounting periods (baseline and current) differ significantly among themselves, because changing the supply of electricity to consumers and the mutual flow of electricity between neighboring distribution companies. During the insignificant changes of technical characteristics of grids in the calculated periods, the scopes of transfer and power supply structure can change essentially, that is energetic characteristics of the object, concerning which the estimation of GHG emissions reduction in the course of JI projects realization should be made. Such estimation may be done correctly only under condition of object energetic characteristics providing, for the calculated periods to equal conditions. Object energetic characteristic, that is to be provided is the power balance structure according the form 1-B TPL “Power balance structure and TPL for the power transfer through the grids” for the respective year.

That important to note that chapter 8 data “Technical calculated power losses”, chapter 9 “Normative power losses for substations personal needs”, and chapter 10 “Normative TPL value” of forms 1-B TPL in different calculating periods were figured out according to requirements, that were in effect on that time, normative documents and should be adjusted to the normative base that is on effect nowadays.



Chapter 8 data “Technical calculated power losses” to March, 31 2004 were calculated according the requirements GKD 34.09.104-96 “TPL normalization for transference through 0.38-150kV power grids. Methodical directions”. In the period since April, 1 2004 till March, 31 2009 – according the requirements GND 34.09.104-2003, since April, 1 2009 and till present day - according the requirements GND 34.09.104-2003 with the consideration Change № 1 to GND 34.09.104-2003.

Chapter 9 data “Normative power losses for substations personal needs” to March, 31 2004, calculated according the requirements RD 34.09.208-81 «Instruction on the power consumption for 35-500 kV substations personal needs normalization», since April, 1 2004 and till present day - according the requirements GND 34.09.203-2004.

So, power balance structure on the form 1-B TPL for the respective years should be made according the data of form 1-B TPL 2010.

Power balance structure bringing to equal conditions on the form 1-B TPL should be made with the use of scoping coefficient that is equal to 1 for the year 2010, being the reference year.

Applying the conservative approach, while it is evident, that grids technical characteristics in 2010, from the TPL point of view are more perfect, than in any previous calculated year, and to proceed from the fact that to calculate indices of chapters 8 and 9 of 1-B TPL forms for the previous calculated years with the use of data provided in chapters 1,2 and 3 and provided normative TPL (NCTPL) characteristics that is practically impossible because of necessity to develop for each previous year NCTPL according to normative bases that is in effect at present day, data providing in chapters 8 and 9 should be made in the following way:

Variable technical calculated power losses in LEP (line 8.1) are equal to the value for 2010 on the respective power level multiplied by the calculated overplus transfused square through LEP for the respective previous year on the respective voltage level and divided by the square of calculated overplus transfused through LEP for 2010 on the respective voltage level;

Variable technical calculated power losses in transformers (line 8.3.1) are equal to the value for 2010 on the respective voltage level multiplied on the calculated overplus transfused square on transformers for the respective previous year on the respective level and divided on the square of calculated overplus transfused on transformers for 2010 on the respective voltage levels;

Conditionally-stable technical calculated power losses in transformers (line 8.3.2) for the respective previous year is considered equal to the value of 2010 on the respective voltage level; (for a leap year the Conditionally-stable technical calculated power losses in transformers shall be multiplied by 8784 hours and divided by 8760 hours).

Other conditionally-stable technical calculated power losses in other elements (line 8.4.3) for the respective previous year is considered equal to the value of 2010 on the respective voltage level; (for a leap year the Conditionally-stable technical calculated power losses in transformers shall be multiplied by 8784 hours and divided by 8760 hours).

Normative power losses for substations personal needs (chapter 9) for the respective previous year is considered equal to the value of 2010 on the respective voltage level (for a leap year the Conditionally-stable technical calculated power losses in transformers shall be multiplied by 8784 hours and divided by 8760 hours).

Reduction to equal conditions of the data in chapters 1, 2, 3 of the balance structure shall be made by using the reduction factor equal to 1 for 2010 and for other years the quotient from the division of the power sale in 2010 by the sale in the respective year. Such reduction, made by dividing the values in Chapters 1, 2, 3 for each year by the reduction factor, will be correct only if the following two conditions are simultaneously satisfied:

- relative values of power sale structure on voltage levels, calculated by Chapter 3 data as percentage of the power sale in 2010 and each other year are similar and do not have significant differences;
- reduction factor trend in 2010 and the previous years is stable, without sharp fluctuations and tends to decrease starting with 2010;

The decision to reduce the data in Chapters 1, 2, 3 of power balance structure to equal conditions is taken when the above conditions are satisfied. If not, only the data in Chapters 8 and 9 of 1-B TPL shall be reduced.

If the decision is made to reduce the data in Chapters 1, 2, 3 of the power structure balance to equal conditions the data are divided by the reduction factor. All other data of 1-B TPL form, besides those of Chapters 8 and 9 are calculated by the formulae given in the Instructions to reporting and analysis of the 1-B TPL form data.

The criteria of the 1-B TPL form data providing correction verification are as follows:

- equality of power sale into the grid values (chapter 18) for 2010 and respective previous years;
- equality of reporting TPL percentage from the power issue into the grid (line 19) in forms 1-B TPL for the respective year before and after 1-B TPL form data providing.

In case of a change the territory of the energy supply company licensed to supply electricity at regulated tariffs, which took place as a result of its division and the formation of her new utility company in accordance with NERC's decisions and changes as a result, the structure of the balance of power in form 1B-TPL for the year in which was a division, and subsequent years after separation, may be required during the calculation of indirect carbon dioxide emissions, accounting reporting forms 1B-TPL utility company for part of the settlement period (the year in which the division took place, and prior to the year in which the division occurred).

For the years after 2010 the reduction of the data in Chapters 1, 2, 3 of 1-B TPL form to equal conditions is made using the reduction factor if such reduction was made for the years prior to 2010.

If the data in Chapters 1, 2, 3 of 1-B TPL form are reduced to equal conditions after 2010, the data in Chapters 8 and 9 are reduced as follows:

Variable technical calculated power losses in LEP (line 8.1) are equal to the value for the subsequent period on the respective power level multiplied by the calculated overplus transfused square through LEP for the respective previous year on the respective voltage level and divided by the square of calculated overplus transfused through LEP for the subsequent period on the respective voltage level;

Variable technical calculated power losses in transformers (line 8.3.1) are equal to the value for the subsequent period on the respective voltage level multiplied on the calculated overplus transfused square on transformers for the respective previous year on the respective level and divided on the square of calculated overplus transfused on transformers for the subsequent period on the respective voltage levels;

Conditionally-stable technical calculated power losses in transformers (line 8.3.2). Other conditionally-stable power losses in other elements (line 8.4.3) and normative losses for substation own usage (Chapter 9) are taken as equal to reported values.

If the data in Chapters 1, 2, 3 of 1-B TPL form for the years after 2010 are equal to reported values than the data in Chapters 8 and 9 are also equal to reported values.

Total value in section 8, "Technical estimated energy losses" for all billing periods should be multiplied by coefficient of deterioration in electrical indexes over time, the value of which according to statements presented in Annex 3 of the determined PDD, version 2.0 is taken no more than 1.15.

Structure of RVTPL in the main power grids 800-220 kV, relative value of which is used in the interest of power transmission to the grid (consolidated income) according to the formula (6) "Methodology of the specific emissions of carbon dioxide in the process of the power production by the thermal electric power stations and its consumption" to calculate specific indirect emissions of carbon dioxide for the power unit, contains the technical calculated power losses in the grids, power consumption by the substations as well as the nontechnical losses. Nontechnical power losses in the main grids are conditioned by the metrological losses, which under the quantitative estimation of the structure of the nontechnical losses are to be calculated on the basis of the actual metrological characteristics of the accounting devices. Thus RVTPL in the main power grids are such that are calculated by the power registration system with the actual metrological error and are considered as the indirect emissions of carbon dioxide.

The structure of the RVTPL in the local power grid 150-0.38 kV of the power supply company contains the technical calculation power losses in the grids, power consumption by the substations as well as the nontechnical losses. Nontechnical losses in the local power grid of the power supply company are conditioned by the metrological losses as well as by others factors conditioned by the understatement (overstatement) of the power transmission to the consumers.

Metrological power losses in the process of the quantitative estimation of the structure of the nontechnical losses are to be calculated on the basis of the actual metrological characteristics of the accounting devices. Peculiar feature of the system of power registration in the local grid 0.38-150kV of the power supply company is the existence of hundreds of thousands of the accounting devices, actual metrological characteristics of which are unknown. That is why in the process of the quantitative estimation of the metrological losses only fixed metrological characteristics of the accounting devices must be used. The calculated metrological losses should be corrected taking into consideration actual metrological characteristics of the accounting devices of the same type which are defined with the certain assumptions. As the result we obtain the component of the fixed metrological power losses.

The components of the nontechnical losses, conditioned by the understatement (overstatement) of the power transmission to the consumers, arise:

- due to the power theft and to the errors in the process of calculation of the amount of the supplied power and compiling pay-lists;
- due to the technological reasons, connected with the procedure of the estimation of the amount of power supplied to the consumers, i.e. due to the calculation of the amount of power supplied to the consumers at the actual payment using the power retail prices without the pay-lists; usage of the average amounts while compiling the pay-lists; non simultaneous taking of indexes from the accounting devices as well as the existence of the seasonal component;
- due to the technical reasons, i.e: due to the errors of the accounting devices, which exceed their fixed indexes.

The first two components of the non-technical losses are conditioned by the power theft and by the drawbacks in the organization of the control over the power consumption and the payment. These losses form the part of RVTPL, conditioned by the faults of power supply organization. They are very difficult to formalize as this component of the nontechnical power losses is predetermined by the social and organizational factors.

The component of the nontechnical power losses, conditioned by the faults of power supply organization cannot be considered as the indirect carbon dioxide emissions, because it is of nontechnical nature.

The third component of the nontechnical power losses, connected with the work of the accounting devices with the measuring errors that exceed their fixed indexes, are to be estimated separately, according to the actual metrological characteristics of the accounting devices of the same type, which are defined with the certain assumptions.

Thus, RVTPL in the local power grid of the power supply company (data of the line 19 “The percentage of reporting TPL (RVTPL) from the power supply to the grid” form 1-B TPL) in the process of calculation should be transferred to the indirect carbon dioxide emissions taking into consideration the fixed metrological power losses and the component of the nontechnical power losses, conditioned by the faults of power supply organization.

According to the above mentioned the scheme of the putting of the power balance structure of the form 1B-TPL for the accounting periods to the equal condition and the scheme of RVTPL correction in the local power grid 0.38-150kV of the power supply company to ensure the possibility of usage of the provided corrected RVTPL for the transmission of them to the indirect losses of carbon dioxide are to be worked out.

In the process of the development of the RVTPL correcting scheme the fact that NPL cannot be measured should be taken into consideration. They may be only calculated but with some error. The error depends not only of the power supply and transmission measurement errors in the process of RVTPL calculation, of the component of the nontechnical power losses, conditioned by the faults of power supply organization, etc., but also of the NVTPL calculation errors, and of the technical calculation power losses in the grids. The technical calculation power losses in the grids as well as the losses, conditioned by the measurement errors are the components of the power balance, and in the process of their analysis the interval estimations, which are based on the precision grade of registration devices are used. The literature review affirms that the defining of the errors of this or that measuring device of power losses accounting is usually used for the qualitative estimation of its acceptability. In the practical calculations, including the process of the NVTPL structure calculation, the results are provided as the determined indexes.

**B.1. Information about types of metering equipment:**

Information on the metering equipment used in the project monitoring, classes of accuracy and calibration procedures is given in Table 2.

*Table 2. Metering equipment involved in the project monitoring*

#	Metering equipment (substation)	Type	Accuracy class	Calibration frequency
1	PL-110 Krayiv	Elvin ET2A SE	0.5S	6 years
2	PL-35 M'yakoty	EA02RAL	0.2S	6 years
3	PL-35 Golovli	EA02RAL	0.2S	6 years
4	PL-35 Pererosle	EA02RAL	0.2S	6 years
5	PL-35 Mukhariv	EA02RAL	0.2S	6 years
6	PL-35 Shepetyn	ZMO405	0.5S	6 years
7	PL-110 Snovydyvychi	EA02RAL	0.2S	6 years
8	PL-35 Zhadkivka	EA05RAL	0.5S	6 years
9	PL-110 Radyvyliv	EA02RAL	0.2S	6 years
10	PL-35 Teslugiv	EA02RAL	0.2S	6 years
11	PL-35 Rogizno	EA02RAL	0.2S	6 years
12	PS-110 L'ubeshiv	EA02RAL	0.2S	6 years
13	PS-220 Luts'k-Pivdenna	EA02RAL	0.2S	6 years
14	PS-110 Tsuman'	EA02RAL	0.2S	6 years
15	PL-10 Prolisok	EA05RAL	0.5S	6 years
16	PL-0,4 Mochulki (TP-797)	EA02RAL	0.2S	6 years
17	PL-0,4 Mochulki (TP-262)	EA05RAL	0.5S	6 years
18	PL-35 Bilyavtsi (TP-110)	EA05RAL	0.5S	6 years
19	PL-35 Sukhovolya	EA05RAL	0.5S	6 years
20	PL-35 Bilyavtsi (TP-35)	EA02RAL	0.2S	6 years

Detailed information about metering equipment is given in Annex 3.



*Fig. 1. Typical electricity meter*



*Fig. 2. Typical voltmeter*



*Fig. 3. Typical ammeter*



*Fig. 4. Typical phase meter*



*Fig. 5. Typical ohmmeter*



Fig. 6. Typical wattmeter

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

**B.2.1. List of fixed parameters and constant values:**

Not applicable.

**B.2.2. List of parameters that are subject to periodic monitoring.**

Table 3 Parameters that are controlled during the monitoring period and used to calculate emissions in the baseline scenario.

Parameter	Description	Source of data	Data unit	Recording frequency
$V_y$	Total reduction of technical power losses in the power grid during the period $y$ of the project scenario compared with the baseline scenario.	Calculated used “The methodology of technical power losses amount determination, in 0.38-150 kV power grids power supply company for the indirect carbon dioxide emissions estimation”.	<i>MWh</i>	Yearly
$GEF_y$	Carbon dioxide emission factor for projects of power loss reduction in power transport networks of Ukraine. This value objectively reflects specific carbon dioxide emissions due to power losses during transportation. Using such factors is a common practice when estimating JI projects. Only officially approved factors have been used for estimation.	Default value (approved calculated values and Orders of the National Environmental Investment Agency of Ukraine).	<i>tCO<sub>2</sub>e/MWh</i> <i>(kg CO<sub>2</sub>e/kWh)</i>	Yearly

Parameter values used for calculation of GHG emissions in the project scenario for each year are included in Excel file *20120726\_ROE\_MR001.xls*.

**Since the baseline emissions are calculated based on difference between of power loss before and after the project implementation, consequently the project emission will equal zero.**

**B.2.3. Data related to leakage:**

The leakage of sulfur hexafluoride SF<sub>6</sub> (Electronegative gas) that is used as a heat rejection and insulating medium in sulfur hexafluoride circuit breakers and current transformers and indirect extraneous leakage of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O from fuel extraction and transportation activities, are excluded according to the monitoring methodology provided in the determined PDD, version 2.0.

**B.2.4. Data relating to ecological and social impact:**

Project implementation doesn't cause adverse effects on the environment. Environmental effect will be caused only by dismantled equipment. It will further be used as secondary raw material.

Replacement of power grids, transformers, meters and other electrical equipment used to transport electricity takes place in the framework of the project. Equipment that is decommissioned as part of the project activity, is written off and dismantled. In such cases the Commission executes a "Certificate of fair wear and tear OZ-3" and prepares the conclusion of the impossibility of further use of this equipment. Equipment is described and placed in property of the warehouse (according to the decree of the CMU № 408 dated 16.03.1999 "On a system for collecting, sorting, transporting, processing and recycling of used packaging (packing) and municipal solid waste"<sup>4</sup>) with further sale to the companies involved in recycling scrap metal.

Implementation of this project will allow for improvement of servicing the consumers of electricity services. Experienced staff of «AES Rivneoblenergo» PJSC and compliance with the regulations "On electric energy sector" will allow for minimization of the potential emergency situations in the process of the project implementation.

Transboundary impacts from the project activity according to their definition in the text of "Convention on transboundary long-range pollution", ratified by Ukraine, will not take place.

**B.3. Emergency situations and procedures for detection and liquidation of malfunctions at «AES Rivneoblenergo» PJSC:**

«AES Rivneoblenergo» PJSC provides for the following procedures to identify and eliminate malfunctions according to the determined PDD. The operator informs the engineer of a transformer substation about emergency or malfunction. If the problem cannot be eliminated right away, a commission of 6-7 people, consisting of representatives of the technical department, a chief engineer, a shift engineer and leading engineers. Depending on the type of failure deficiency or emergency certificate is executed. It is further transferred to the administration of «AES Rivneoblenergo» PJSC, after which repair of equipment takes place. All records on equipment failures and elimination of such failures are stored in the respective district units of «AES Rivneoblenergo» PJSC.

There were no emergency situations and considerable technological errors that could affect the monitoring of the project figures at «AES Rivneoblenergo» PJSC in the monitoring period of January 1, 2008- June 30, 2012.

<sup>4</sup> <http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=408-99-%EF>

**SECTION C. Quality assurance and quality control measures**

**C.1. Roles and responsibilities**

Operational structure includes «AES Rivneoblenergo» PJSC operational departments and personnel for operation of the distribution electrical grids. Monitoring management structure of the project also includes specialists of Carbon Management Company, the company – developer of the project.

Scheme of data collection relevant for the monitoring plan is shown in Figure 7.

Scheme of data collection using automated system of electricity consumption commercial accounting (ASECCA) in the perimeter of the energy supply company is provided in Figure 8.

Scheme of data collection prior to implementation of the automated system of electricity consumption commercial accounting (ASECCA) is shown in Figure 9.

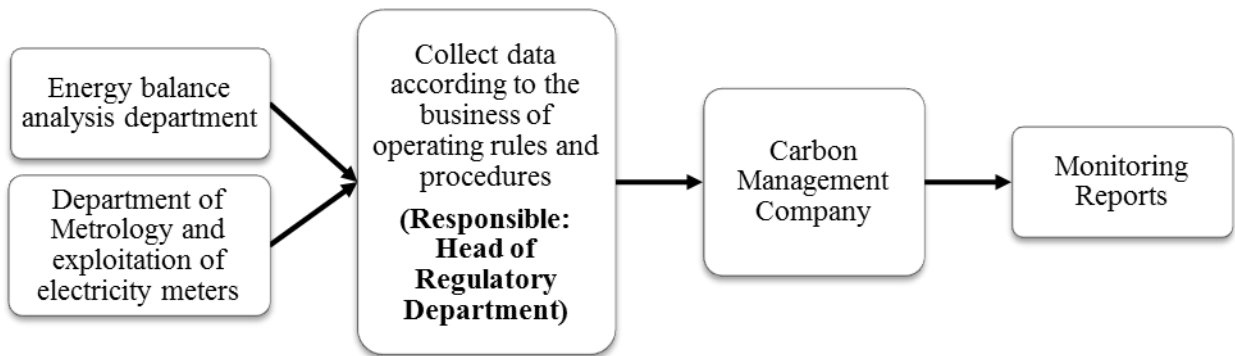


Figure 7. Scheme of data collection for the monitoring of the project parameters



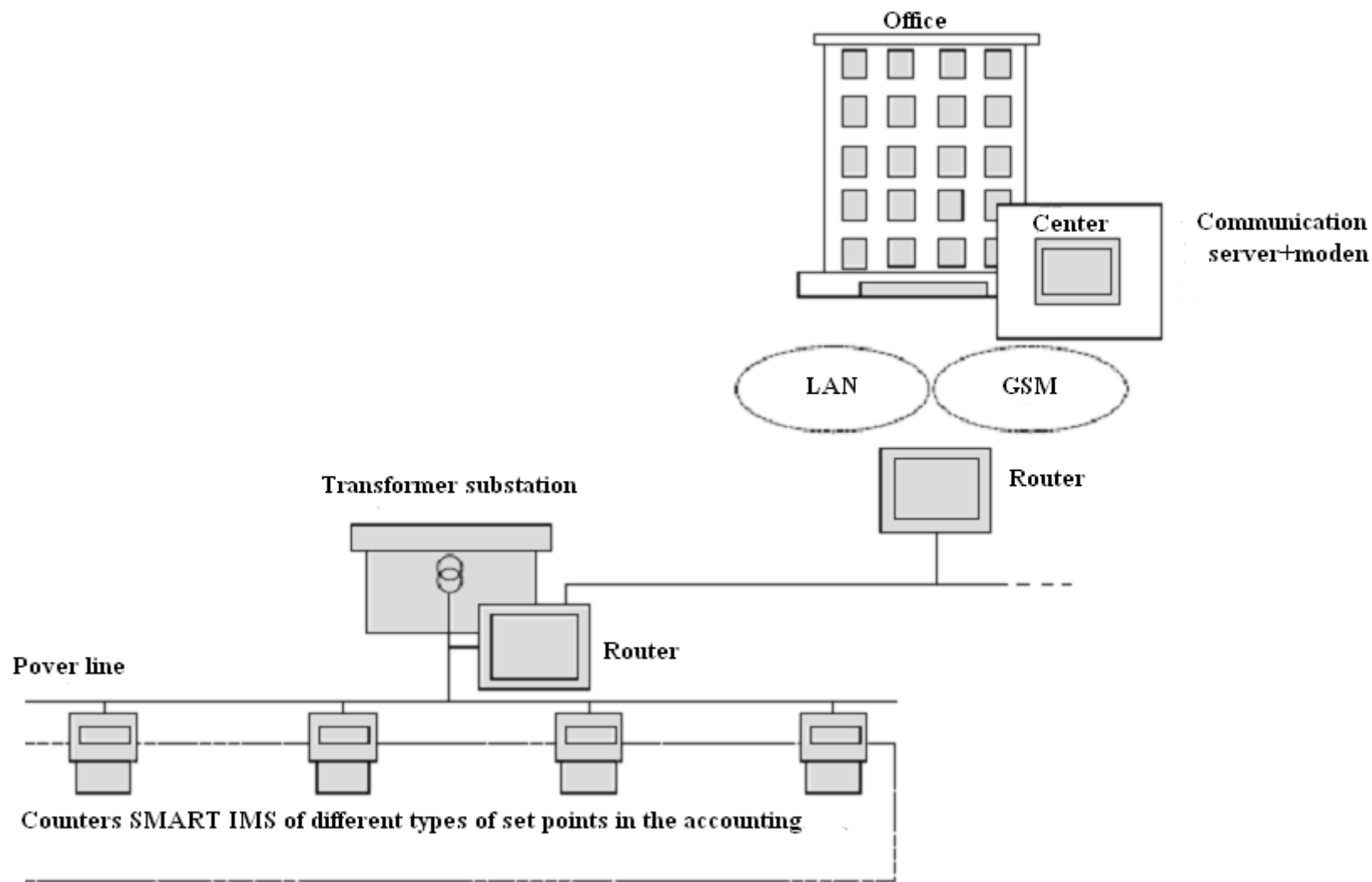
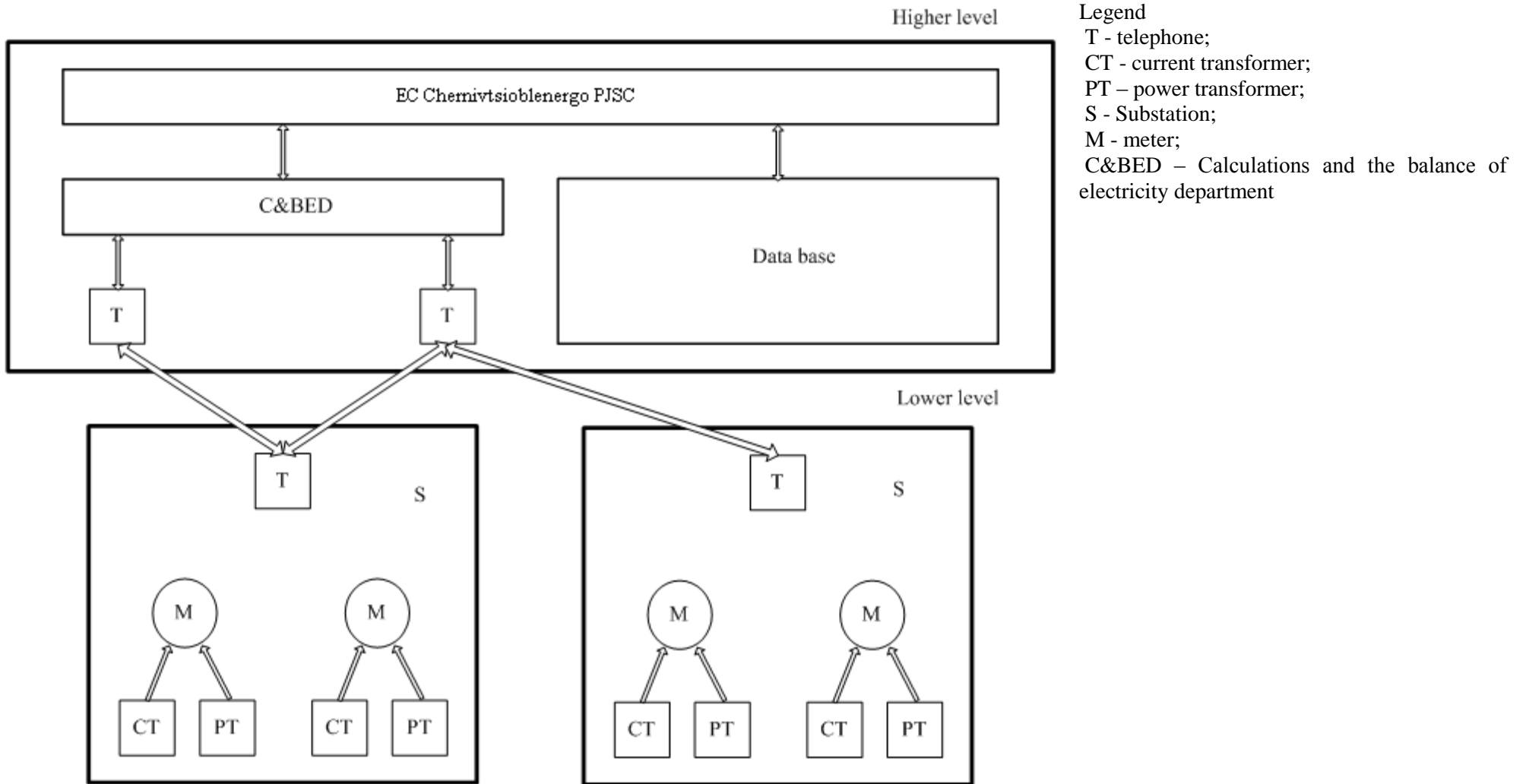


Figure 8. Scheme of data collection using automated system of electricity consumption commercial accounting (ASECCA) in the perimeter of the energy supply company



Data of electricity meters at the substation are taken by on-duty personnel.

Figure 9. Scheme of data collection with the help of operative informational complex (OIC)

**C.2. Trainings:**

Since the principal activities of «AES Rivneoblenergo» PJSC didn't change when implementing the Joint Implementation (JI) project and the project monitoring is carried out as a part of practice established at the company, special technical trainings for personnel are not necessary. Technical personnel of the enterprise possesses necessary knowledge and experience for execution of the project implementation and monitoring.

In case of new equipment implementation (the equipment which has not been used by this enterprise before), the company-manufacturer of this equipment shall conduct trainings for the personnel. During the monitoring period the equipment which would require special training for the personnel was not installed.

«AES Rivneoblenergo» PJSC retrains the personnel according to the requirements of Norms of labour protection. The enterprise has the Labour Protection Department responsible for professional development and trainings of the personnel.

**C.3. Involvement of third parties:**

No third parties were involved .

**C.4. Internal audits and control methods:**

Means of metering equipment used for monitoring of the project activity are subject to periodic state verification. Personnel of «AES Rivneoblenergo» PJSC are liable to periodic examination of their knowledge of requirements to:

- collecting data according to the monitoring plan (the collection of data under the monitoring coincides with the usual practice of data collection at the company);
- labour protection;

Each quarter, representatives of Carbon Management Company, developers of the project, conduct internal audits of the project monitoring system at «AES Rivneoblenergo» PJSC. Internal audit includes measures on verification of monitoring parameters accounting and record keeping, timely calibration of metering equipment, cross-check of data of the automated system of electricity consumption commercial accounting (ASECCA) and departmental reporting forms 1B-TPL DAEK "Structure of balance of electricity and process losses of electricity for transmission via electrical grids".

**SECTION D. Calculation of GHG emission reductions**

This section contains formulae used for calculation of the baseline emissions and GHG emission reductions.

**D.1. Description of formulas used for project emissions calculations**

The mission reduction will be achieved by reducing power losses in the company's power grids which in its turn will be achieved as a result of the project implementation.

Since the baseline emissions are calculated based on difference between of power loss before and after the project implementation, consequently the project emission will equal zero.

$$PE_y = 0$$

**D.2. Description of formulas used for baseline emissions calculations**

Therefore, the baseline emissions are:

$$BE_y = V_y \cdot GEF_y, \tag{1}$$

where

$BE_y$  = baseline emissions (tCO<sub>2</sub>e);

$V_y$  = total technical loss reduction in the power distribution system during the period y of the project scenario compared with the baseline, MWh;

$GEF_y$  = CO<sub>2</sub> emission factor in UPS of Ukraine for the power replacement projects in the period y, tCO<sub>2</sub>e/MWh;

y = the period for which estimates are made.

**D.2. Description of formulas used for emission reductions calculations**

Emissions reductions are defined by the following equation:

$$ER_y = BE_y - (PE_y + LE_y), \tag{2}$$

Where:

$ER_y$  = emission reduction during the period y, t CO<sub>2</sub>e;

$BE_y$  = baseline emission of the greenhouse gases in the period y, t CO<sub>2</sub>e;

$PE_y$  = greenhouse gases emission caused by the project activity in the period y, t CO<sub>2</sub>e;

$LE_y$  = escape emission in the period y, t CO<sub>2</sub>e;

y = the period for which estimates are made.

**SECTION E. Results of the GHG emission reductions monitoring****E.1. GHG emissions in the project scenario**

Since the baseline emissions are calculated based on difference between of power loss before and after the project implementation, consequently the project emission will equal zero.

Table 4. Project emissions for the period of January 1, 2008 – June 30, 2012:

Years	Project emissions, (tCO <sub>2e</sub> )
2008	0
2009	0
2010	0
2011	0
2012 (6 months)	0
<b>Total project emissions in the crediting period (tonnes of CO<sub>2e</sub> equivalent)</b>	<b>0</b>

**E.2. Leakages**

According to the Methodology provided in the determined PDD, version 2.0, there are no leakages related to this project.

**E.3. GHG emissions in the baseline scenario**

Calculations of baseline emissions are made in Excel file *20120726\_ROE\_MR001.xls* according to the formulae given in section D.1. of the Monitoring report. The results of calculation of GHG emissions in the baseline scenario during the reporting period are shown in table 5:

Table 5. Emissions in the baseline scenario for the period of January 1, 2008 – June 30, 2012:

Years	Baseline emissions, (tCO <sub>2e</sub> )
2008	177 077
2009	158 345
2010	156 240
2011	216 290
2012 (6 months)	246 069
<b>Total baseline emissions in the crediting period (tonnes of CO<sub>2e</sub> equivalent)</b>	<b>954 021</b>

**E.4. Emissions reduction due to the project implementation in the monitoring period:**

Calculation of emission reductions are made in Excel file *20120726\_ROE\_MR001.xls* according to the formulae given in section D.1. of the Monitoring report. As a result of activities implemented under the project during the reporting period the following emission reductions were achieved:

*Table 6. Results of emission reductions calculation for the period of January 1, 2008 – June 30, 2012*

<b>Year</b>	<b><u>Project</u> emissions (t CO<sub>2</sub>e)</b>	<b><u>Leakages</u> (t CO<sub>2</sub>e)</b>	<b><u>Baseline</u> emissions (t CO<sub>2</sub>e)</b>	<b><u>Emission</u> reductions (t CO<sub>2</sub>e)</b>
2008	0	0	177 077	177 077
2009	0	0	158 345	158 345
2010	0	0	156 240	156 240
2011	0	0	216 290	216 290
2012 (6 months)	0	0	246 069	246 069
<b>Total emissions (t CO<sub>2</sub>e)</b>	<b>0</b>	<b>0</b>	<b>954 021</b>	<b>954 021</b>