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

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SECTION A. General description of the project

A.1. Title of the project:

«Reduction of Process Losses in Power Lines Vinnytsyaoblenergo PJSC»
Sectoral Scope: (2) Energy Distribution
Version of the document 3.0
Date of the document: 01/11/2011

A.2. Description of the project:

The objective of the JI project «Reduction of Process Losses in Power Lines Vinnytsyaoblenergo PJSC» is the realization of the programme of technical reconstruction of electrical network and equipment, introduction of the progressive technologies, organization structure improvement, transition to the higher organizational level of electricity grid transmission and distribution.

Taking measures foreseen by the project will let to increase the reliability and effectiveness of the distribution network of electric power in Vinnytsya and Vinnytsya Region, and enhance the quality of consumers service. It will also help to reduce the amount of electric power, that is lost in the distributive and transport electrical networks of Vinnytsyaoblenergo PJSC, and that, in its turn, will help to reduce the amount of the generated electric energy and as the result pollutant emissions in the atmosphere.

Situation at the beginning of the activity of the Project.

Public Joint Stock Company Vinnytsyaoblenergo (Vinnytsyaoblenergo PJSC) is an integral part of the unified energy system (UES) of Ukraine and provide the consumers of Vinnytsyao region with the electric energy regularly and reliably under the uniform tariff.

At the beginning of the project (2002) Vinnytsyaoblenergo PJSC was realizing only such measures that were directed to the maintaining of electrical networks in good working order. These measures mainly included repairing work to eliminate errors, that arise during the operation of power networks. That resulted in the technological consumption, in 2002, in networks of Vinnytsyaoblenergo PJSC which reached 31,58% % from the electric energy amount, that was coming into the company's network.

Most of the equipment that was being used at that moment in the networks of Vinnytsyaoblenergo PJSC was already physically and morally outdated, but because of the insufficient financing and operational reserves of this equipment, it remained still in use. Besides, it was possible to change this situation not only in the case of technical provision of the network modification, but also in the case of company's organizational structure improvement, which also required financing and manpower.

The possibility to sell greenhouse gas emission reduction units, became one of the factors for the start of the introduction program, the goal of which is the reduction of technological power consumption in the Vinnytsyaoblenergo PJSC electric network.

Project Scenario

Joint implementation project is based on the implementation of complex of measures on elimination of power losses, which is introduced and financed since 2003.

The measures are taken within the framework of this program (see Section A.4.2), for the implementation and constant monitoring of potential sources of the technological losses and prevention of their appearing enabled Vinnytsyaoblenergo PJSC to reduce technological consumption to 14,90% of the amount of electric power delivered to the network.

Baseline Scenario

Baseline scenario foresees further usage of equipment while performing of planned repairing work without substantial investments. More information about baseline scenario is provided in section B.

History of the project

26/04/2002 – investment programme approval by the NCPR decree of 26.04.2002 № 424. That programme includes the chapter "TPL reduction measures". This date is the date the acceptance of this project as a JI project.

January, 2003 – start of the works on the program of TPC (TVE) reduction in the electrical network of Vinnytsyaoblenergo PJSC

16/02/2011 – signing of a contract with ImexEnergo. Preparation of PDD.

Advantages of the project

Apart from emissions reduction the implementation of project «**Reduction of Process Losses in Power Lines Vinnytsyaoblenergo PJSC»** has the following advantages:

- Creation of additional jobs, connected with the introducing of new equipment, construction and reconstruction of enterprise facilities;
- Pollutant emissions reduction by the cut down of the electric energy generation as a result of shortening of losses in the networks;
- Cutting production costs.

The realization of joint implementation project will reduct pollutant emissions by the shortage of electric energy generation, which is delivered to the network of Vinnytsyaoblenergo PJSC. Thus, the realization of the project will reduce the greenhouses gasses emissions and will prevent from their further accumulation in the atmosphere, which in its turn, will loosen the climate changes.

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)	Vinnytsyaoblenergo PJSC	No
Poland	«IMEX ENERGO», Sp. z o. o.	No

Publik joint stock company Vinnytsyaoblenergo (Vinnytsyaoblenergo PJSC), EDRPOU code 00130694,is an integral part of the unified energy system (UES) of Ukraine and provides the consumers of Vinnytsya region with regular and reliable power supply under the uniform tariff.

Braches of CEA:

- Power production and distribution
- Power distribution and supply
- Activities in the sphere of engineering

Vinnytsyaoblenergo JSC was founded by the order of the Ministry of Energy and Electrification of Ukraine No. 147 dated 09.08.1995 from the power production association Vinnytsyaenergo of the National power supply joint-stock company Vinnytsyaoblenergo, which became by the decision of the Shareholders' General Assembly (Protocol No.1 dd. 11.12.1998) the Publick Joint-Stock Company Vinnytsyaoblenergo being the successor of the National power supply joint-stock company Vinnytsyaoblenergo.

According to Shareholders general meetings decision Vinnytsyaenergo JSC (Protocol №3/2010 від 10.11.2010) Open Joint-Stock Power Supply Company "Vinnytsyaenergo" was renamed into Public Joint-Stock Company "Vinnytsyaenergo".

«IMEX ENERGO», sp. z o. o., NIP 7952307407, REGON 651542435 was created on December 9th 2003 in Przemysl. The main Company's activity is exportation, importation, and supply of specialized electric devices for the energy sector, as well as natural gas, petroleum, liquefied petroleum gas, petrol, and electric energy supply.

The company also realizes some innovative-investment and ecological projects in Poland and Ukraine. In 2010 the legal address of the Company was changed, and now it is – Zheshuv, Przemysłowa, 14. Thereafter, the main Company's activity is:

- Development problem - stripped gas provision from Ukraine to Poland (Podkarpackie region)
- Chervonograd cogeneration systems 24 MW technical documentation elaboration (PJSC Energoinwest)
- Project on power generation investments, from the use of stripped gas in Boryslav, Ukraine (CHP 12 MW) – the project received the letter of approval № 2 from the Ukrainian Ministry of ecology in 2006.
- great quantity of CHP and equipment, boilers, etc., import to the Ukraine
- project starting with the help of wind power ("Kryla vitru" project in the Truskavec power station 40 MW)
- biomass organization and obtaining, assembly equipment briquetting, as well as supplies form Ukraine to Poland.
- Collaboration with the local thermal and electric stations in the sphere of investments to the operational network of heat distribution, from cogeneration with the use of biomass as the fuel.
- Preparation together with the Ukrainian companies: ecological systems and EUEU.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located in Vinnitsa and Vinnitsa region

A.4.1.1. Host Party(ies):

Ukraine

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

Vinnytsya Region

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

Vinnytsya

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

Figure 1. Location of the Vinnytsya Region on the map of Ukraine

Figure 2. The city of Vinnytsya (•) on the map of Ukraine

The project is to be implemented at the facilities of Vinnytsyaoblenergo PJSC located in the city and region of Vinnytsya in the west of Ukraine (coordinates of main office: 28°28′25.56″ eastern longitude 49°14′0.72″ northern latitude). The region's total area is 26,500 sq. km and the population is 1,772,000 people (by Jan. 1, 2004)

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

Public joint stock company Vinnytsyaoblenergo (Vinnytsyaoblenergo PJSC) is an integral part of the unified energy system (UES) of Ukraine and provides the consumers of Vinnytsyao region with the electric energy regularly and reliably under the uniform tariff.

At the beginning of the project (at the end of 2002) Vinnytsyaoblenergo PJSC was realizing only such measures that were directed on the maintaining of electrical networks in good working order. These measures mainly included repairing work on eliminations of errors, that arise during the operation of electric networks. That resulted in the technological power consumption, in 2002, in networks of Vinnytsyaoblenergo PJSC which reached 31,58% from the electric energy amount, that was coming into the company's network.

The objective of the project is the realization of technical reconstruction of electrical network and equipment programme, introduction of the progressive technologies, organization structure improvement, transition to the higher organizational level of electricity grid transmission and distribution by attracting investments.

The Joint implementation project is based on the implementation complex of organizational and technical measures on electricity losses reduction, which includes:

- realization of scientific and technical support, extension of the exploitation term of the functioning equipment, realization of the equipment diagnostics system and prognostication of its residual operating time;
- introduction of organizational and technical measures for technological power consumption reduction;
- reconstructions and renovations of the electric networks, and substitution of outdated equipment;
- attraction of investments for the development and achievement of high technical and economical level of the Company;
- increase of power supply reliability level for the region consumers;
- implementation of the Automatized system of commercial accounting of power consumption of the energy-supplying company perimeter, ASCAPC of consumers and substations;
- introduction of complex technical power consumption reduction Program;
- modernization of the equipment in the framework of the electric power development investment programs.

Implementation of the program is continuous process that wills conduct over the operational period of the project.
The Project implementation provided the following measures:

1. For processes of power transmission:

1.1. Organizational measures of methodological ensuring.
1.1.1. External audit and organization of constant internal audit of power transportation (power grid system, power accounting and power streams and balances detection and control)
1.1.2. Formation of a technical database (a list and specifications of all components and charts of normal operation modes) of the Company's power grid conforming to annual and monthly operation reports.
1.1.3. Implementation of a programmed system of calculation and analysis by feeder to locate intolerable power losses in 110-35 and 10-6-0.38 kV power network.
1.1.4. Development of a planning, organization and monitoring system of measures aimed at elimination of power losses.
1.1.5. Modernization of programs and technical means.

1.1.6. Creation of separate subdivisions within the Company dealing with the task of reducing power losses (power audit and accounting department, measuring laboratory, etc.)
1.1.7. Other improvement measures
1.1.8. Other actions aimed at reduction of power losses.

1.2. Organizational and technical measures:
1.2.1. Shutdown of transformers in small load mode for PS-110/35/10 kV and TP/RP-10/6.038 kV
1.2.2. Shutdown of transformers at PS-110/35/10 kV and TP/RP-10/6/0,38 kV substations with seasonally changing load:
1.2.3. Regular monitoring and phasing load leveling in power grids 0.38 kV
1.2.4. Modernization of technical means of control automation – telemeasurement system, alarm system in 110-35 and 10-6-0,38 kV power grids
1.2.5. Normal operation mode optimization.
1.2.6. Reduction of inefficient distribution and supply system operation time by reducing the maintenance time.
1.2.7. Implementation of measures aimed at reducing the power consumtion by the company's subdivisions.
1.2.8. Reduction of own power consumption by PS-110/35 kV and TP/RP-10/6/0,38 kV
1.2.9. Other actions aimed at reduction of power losses.

1.3. Technical measures:
1.3.1. Wire replacement on overloaded power lines PL-6-10 kV and PL-0,38kV
1.3.2. Replacement of overloaded 10/0,38kV transformers
1.3.3. Replacement of underloaded 35-110 kV and 10/0,38kV transformers
1.3.4. Installation of new transformers at the existing transformer and distribution stations.
1.3.5. Replacement of high loss transformers older than 25 years.
1.3.6. Optimization of power grid loading by reconstruction
1.3.7. Reconstruction of PL-110/35 kV and PL 10-0,38kV
1.3.8. Cleaning of PL-110/35 kV and PL 10-0,38kV routes.
1.3.9. Replacement of wiring at PL-110/35 kV and PL 10-0,38kV
1.3.10. Reinforcement of insulators, replacement of bindings on PL-110/35 kV and PL 10-0,38kV
1.3.11. Replacement of twisting by clipping on PL 10-0,38kV
1.3.12. Installation of KTP lead caps
1.3.13. Instollation of RLND apparatus clips
1.3.14. Insulation cleaning on PL-110/35 kV and PL 10-0,38kV
1.3.15. Checking and improvement of grounding on PL-110/35 kV and PL 10-0,38kV
1.3.16. Checking and improvement of grounding at PS 110/35 kV and TP/RP-10/6/0,38 kV
1.3.17. Fastening the contacts at TP/RP-10/6.038 kV
1.3.18. Reduction of PL-110/35 kV and PL 10-0,38kV length.
1.3.19. Replacement of branching from PL-0.38 kV to bbuildings.
1.3.20. Current measurement and replacement of commutators and fuses.
1.3.21. Downsizing of PL-110/35 kV and PL 10-0,38kV

2. For power supply

2.1. Organizational measures
2.1.1. External audit and organization of constant internal audit of power supply (power grid system, power accounting and power streams and balances detection and control)
2.1.2. Development of a planning, organization and monitoring system of measures aimed at elimination of power losses.

2.2. Organizational and technical measures:

2.2.1. Checking, improvement and accounting of power accounting facilities and power overflows with ORE participants.

2.2.2. Stimulating the transfer of the company consumers on tariff basis differentiated by time zones, in order to level the power consumption schedules during peak loads.

2.3. Technical measures:

2.3.1. Installation of insulated lead-ins in dwelling houses.

2.3.2. Improvement of inner networks in blocks of flats (fastening the contacts, earthing, replacement of wire with wrong cross-section).

2.3.3.. Introduction of ARSKOE for legal entities.

2.3.4. Implementation of SMART system of power supply accounting to individuals.

2.3.5. Introduction of ARSKOE on the battery limits.

All these measures, implementation and continuous monitoring of possible sources of energy losses and prevent possible occurrence of Vinnytsyaoblenergo PJSC reduce technical electricity losses in their electrical systems.

Reduction of technological power consumption in the Company networks allowed reducing CO2 emissions, caused by generation of electricity that was lost.

Duration of the project is unlimited, since the measures taken to detect and remove TPC (TVE) in separate power network units and feeders, power network areas, as well as to reduce general technological power consumption in the Vinnytsyaoblenergo PJSC, are a constant and continual process. CO2 eq emissions reduction are affirmed on one crediting period (22years) according to the modality and JI Mechanism procedures(3).

General characteristics of new equipment (transformers, substations and distributive stations, appliances and power account systems , electricity transmission lines, automatic equipment, etc), installed in the networks 110-35-10-6-0,38kV of Vinnytsyaoblenergo PJSC from 2002 till 2010 as well in the Annex 4, including the characteristics of equipment which was bought for improvement of networks exploitation and power supply processes (thermal imagers, measuring equipment, vehicles, etc).

Purchase of equipment and supplies as well as carrying out of project assembly and commissioning operations are accomplished by contract organizations by tender in the order, established in Ukraine. Besides the equipment and work cost, the main criteria of equipment selection is its quality and reliability, as well as professionatism and responsiveness to ISO–9000 of executors. The equipment suppliers are national and foreign producers which have proved themselves in the power.

All measures are taken according to investment programs (investment programs (IP) Vinnytsyaoblenergo PJSC are approved by the appropriate NCPR decrees for each year, IP – 2003 is approved by the NCPR decree №424 of 26.04.2002), that are approved at the beginning of each year. Besides in Vinnytsyaoblenergo PJSC organizing – technical measures (OTM) are elaborated according to the sectoral command paper “Methodical instructions on the TPL analyses and measures choice for their reduction”(HND 34.09.204-2004). Report information on the OTM realization is delivered to HIOTS NEK “Ukrenergo” as a model 41931.

The list of new equipment, that was established in the Vinnytsyaoblenergo PJSC electric networks since 2002 is given in the annex №4 to PDD

In order to introduce the TPL 20.01.2004 program according to the Vinnytsyaoblenergo PJSC decree №209 of 30.12.2003, power balances service was created, in the group of balances and losses calculation. Since 01.08.2007 the group of transit was removed to the power balances service, and in January 2011 in this service the group of hourly calculation providing was created, with the Wholesale power market of Ukraine.

Works on technological power losses reduction are held in the framework of investment Programs of the Company, Plans of current and capital repairs, Plans of power networks maintenance that are annually approved by “Minpalyvenergo”of Ukraine and NPRC of Ukraine.

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:

Introduction of the project will secure the reduction of greenhouse gasses emissions, due to the power production cut down in the national power network.

The list of measures aimed at reducing electricity losses in networks of Vinnytsyaoblenergo PJSC given in Section A.4.2 above.

At the start of the Project (2002) there existed a number of normative acts (Power conservation Act), the aim of which was to stimulate manufacturers and suppliers to the power conservation activity. Yet, these acts had formal character, and were ineffective.

Realization of suggested reconstruction project demand considerable funding. At present, project funding on the foreign market is available for short period of time (up to three years), and interest rate is high. Obtaining of project funding on the foreign loan market for Ukrainian companies is complicated by low international ratings of Ukraine and, accordingly, high risks of investments. Additional income from the JIE sale was one of the leading criterias for the enterprise owners in the decision to make investments into the suggested project. The possibility to get the JIE, before the decision about the investment had been taken, was considered to be on the master-plan preparing stage.

Additional income from the JI mechanism usage will influence positively the economical indices of the project. JI project realization will raise inner profitability rate and reduce project payback period.

Most of the equipment, used at that moment, in the networks of Vinnytsyaoblenergo PJSC was already physically and morally outdated, but because of the insufficient financing and operational reserves of this equipment, it remained still in use. Besides, changing of this situation was possible not only in the case of modification of technical provision of the network, but also in the case of company's organizational structure improvement, which also required financing and manpower.

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

Emission reduction calculations provided in the Excel file «VIN-1БТВЕ-2002-2010-01-11-2011-km=1-ok-КП».

Table 1. Emission reductions for the period 2004-2007.

Year	Estimate of annual emission reductions in tonnes of CO2 equivalent
2004	81191
2005	108675
2006	163588
2007	196448
Total estimated emission reductions over the crediting period 2004-2007 (tones of CO_2 equivalent)	**549902**
Annual average of estimated emission reductions over the crediting period 2004-2007 (tones of CO_2 equivalent)	**137475**

Table 2. Emission reductions for the crediting period 2008-2012.

Year	Estimate of annual emission reductions in tonnes of CO2 equivalent
2008	267313
2009	269346
2010	201561
2011	246057
2012	246057
Total estimated emission reductions over the crediting period 2008-2012 (tones of CO_2 equivalent)	**1230334**
Annual average of estimated emission reductions over the crediting period 2008-2012 (tones of CO_2 equivalent)	**246067**

Table 3. Reduction of post-Kyoto period 2013-2025.

Year	Estimate of annual emission reductions in tonnes of CO2 equivalent
2013	246057
2014	246057
2015	246057
2016	246057
2017	246057
2018	246057
2019	246057
2020	246057
2021	246057
2022	246057
2023	246057
2024	246057
2025	246057
Total estimated emission reductions over the crediting period 2013-2025 (tones of CO_2 equivalent)	**3198735**
Annual average of estimated emission reductions over the crediting period 2013-2025 (tones of CO_2 equivalent)	**246057**

A.5. Project approval by the Parties involved:

Approval by the investor country (Ministry of the Environment of Poland) and approval by the Ukrainian authorities (State Environmental Investment Agency of Ukraine) will be received after the successful passage of determination.

SECTION B. Baseline

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

For determination baseline scenario and demonstration additionality was used JI specific approach based on Methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 03.0.0). Using this tool is a common practice in determining the baseline and demonstrateion additionality.

Baseline scenario is determined according to the following four Steps:

STEP 1. Identification of alternative scenarios;

STEP 2. Barrier analysis;

STEP 3. Investment analysis (if applicable);

STEP 4. Common practice analysis.

Step 1: Identification of alternative scenarios

Step 1a: Define alternative scenarios to the proposed JI project activity

Only two alternatives are the most veritable for the suggested project activity.

Alternative A: Continuation of the current situation.

Alternative B: Implementation of proposed project activity without JI registration.

Partial implementation of the TPC (TVE) reduction program in the Vinnytsyaoblenergo PJSC electric power networks will reduce the effect of its implementation. That's why this scenario is not considered as an alternative to the proposed project activity.

Outcome of Step 1a: Two most plausible alternatives were identified. List of identified alternatives is presented above.

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

At the start of the project (2002) there existed a number of regulation acts (Law on energy saving) aiming at directing the producers and supplyers to the sphere of energy saving. However, these acts mostly had formal character and were ineffective. It is confirmed by the permenant increase of TPC (TVE) in the electrical network of Vinnytsyaoblenergo PJSC before the start of the project.

Outcome of Step 1b: Alternative A, Alternative B, is in compliance with applicable laws and regulations.

Step 2: Barrier analysis

Sub-step 2a: Identify barriers that would prevent the implementation of alternative scenarios

Alternative A: Continuation of the current situation.

There are no barriers for this Alternative.

Alternative B: Implementation of proposed project activity without JI registration

Investment barriers: The project activity within the framework of the suggested project is a perpetual process which requires considerable annual investments and manpower attraction.

- This is connected with:
- Annual electrotechnical equipment renewal, which is represented in the Ukrainian market;
- Necessity of the perpetual monitoring of places where the electricity is lost, their removal and prevention of their appearing;
- Necessity of the perpetual stuff training to work with he new equipment.

Constant funding in Ukraine is possible only in case of financial attraction of the project. The current system of electric power tariff formation shifts the financial burden of technological power consumption on the final consumers and does not allow to receive the income from their reduction.

The access to the financial resources on the international level is highly limited for the suggested project. The investment environment in Ukraine is rather poor in comparison with the neighbor countries.

The confirmation of this is the sovereign rating of Ukraine according to the Fitch records in comparison with some neighbor countries of the Eastern Europe.

Ukraine B-
Poland A-
Hungary BBB
Slovakia A+

Due to the considerable volume of capital investments, needed for the accomplishment of the project, the funding obtaining from the international institutions may be rather difficult. Funding chances on the national level are also restricted. Nowadays commercial banks of Ukraine grant project financing at about 30% annually in the national currency on a three-year term. Examples of the largest bank institutions of Ukraine are: Raiffaizen Bank Aval (www.aval.ua), Pryvatbank (www.privatbank.com.ua), Pravex Bank (www.pravex.com.ua).

Taking into consideration all the hereinbefore mentioned, the funding of the project is possible only under the condition of funds attraction from the selling of greenhouse gases emission reduction units.

Outcome of Step 2a: List of barriers is provided above.

Sub-step 2b: Eliminate alternative scenarios which are prevented by the identified barriers

Only *Alternative A* is not prevented by the identified barriers..

Outcome of Step 2b: Only *Alternative A* is not prevented by the identified barriers.

Step 3: Investment analysis

For the justification of the baseline scenario and additionality demonstration barrier analyse was used.

Outcome of Step 3: N/A

Step 4: Common practice analysis

Most similar projects (like utilization of coal mine methane) were implemented with grants or other non-commercial finance terms (for example JI investment). The common practice for Ukraine at the beginning of the project introduction was the operation work implementation in the volume necessary to keep the network in a good working order and the technological power consumption reduction activity.

Outcome: In consideration of mentioned above Alternative A is most plausible baseline scenario that is not prevented by any barriers and is in line with host Party common practice.

Key information and data used for baseline setting are provided below in tabular form:

Data/Parameter:	V_y
Data unit	MWh
Description	Total reduction of technical power losses in the power grid during the period y of the project scenario compared with the baseline scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Estimated by EES Ltd based on the statistical data of Vinnytsyaoblenergo PJSC using the approved methodology as in Appendix 3 to PDD. Estimates under the methodology are shown as an Excel file «VIN-1БТВЕ-2002-2010-01-11-2011-km=1-ok-КП».
Value of data applied (for ex ante calculations/determinations)	225 740 MWh (for emission reduction estimation after 2010 the average value for 2008-2010 has been taken. See Excel file «VIN-1БТВЕ-2002-2010-01-11-2011-km=1-ok-КП»)
Justification of the choice of data or description of measurement methods and	This parameter is an objective quantitative representation of the project implementation results.

procedures (to be) applied	
QA/QC procedures (to be) applied	This parameter is defined according to the valid norms, rules and approved methodology based on the company's statistical data.
Any comment	

Data/Parameter:	CEF_y
Data unit	t CO_2e/MWh (kg CO_2e/kWh)
Description	Carbon dioxide emission factor for projects of power loss reduction in power transport networks of Ukraine
Time of determination/monitoring	Annually
Source of data (to be) used	Reference data (approved calculations and Orders of the National Agency for Environmental Investments as indicated below)
Value of data applied (for ex ante calculations/determinations)	For 2003 – 0.770[1] t CO_2e/MWh (kg CO_2e/kWh) For 2004 – 0.755[2] t CO_2e/MWh (kg CO_2e/kWh) For 2005 – 0.740[3] t CO_2e/MWh (kg CO_2e/kWh) For 2006-2007 p– 0.807[4] t CO_2e/MWh (kg CO_2e/kWh) For 2008 - 1.082[5] t CO_2e/MWh (kg CO_2e/kWh) For 2009 - 1.096 t CO_2e/MWh (kg CO_2e/kWh) For 2010 - 1.093 [7] t CO_2e/MWh (kg CO_2e/kWh) (See Appendix 2) For 2011-2025 - 1.090 [8] t CO_2e/MWh (kg CO_2e/kWh)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Using such factors is a common practice when estimating IJ projects.
QA/QC procedures (to be) applied	Only officially approved factors have been used for estimation.
Any comment	

Parameters, subjected to the monitoring are given in the tables D.1.1.1. and D.1.1.3 Section D

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:

For baseline setting, demonstration of additionality and feasibility of the JI project implementation the 'Combined tool to identify the baseline scenario and demonstrate additionality' (Version 03.0.0) has been used. Usage of the tool is a common practice when developing JI Projects.

According to this tool the barrier analysis and the common practice analysis have been used to demonstrate the additionality oif the project. The analyses show that the most probable baseline scenario is the continuation of the resent situation at the moment of the project commencement (2002). Therefore, the suggested project is not a baseline scenario and corresponds to the additionality principles.

A more detailed description of the implementation of the 'Combined tool to identify the baseline scenario and demonstrate additionality' (Version 03.0.0) is provided in B.1 above.

1 http://ji.unfccc.int/CallForInputs/BaselineSettingMonitoring/ERUPT/index.html
2 http://ji.unfccc.int/CallForInputs/BaselineSettingMonitoring/ERUPT/index.html
3 http://ji.unfccc.int/CallForInputs/BaselineSettingMonitoring/ERUPT/index.html
4 http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514
5 http://www.neia.gov.ua/nature/doccatalog/document?id=127171
6 http://www.neia.gov.ua/nature/doccatalog/document?id=127172
7 http://www.neia.gov.ua/nature/doccatalog/document?id=126006
8 http://www.neia.gov.ua/nature/doccatalog/document?id=127498

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

Project boundaries

The approach to the emission calculation takes into consideration the CO2 emission only, which is formed as a result of the electric power production, necessary for the compensation of the technological consumption in the network and in the distributing transformer stations, and in the substations of Vinnytsyaoblenergo PJSC. The limits of the project scenario are shown on the Figures 3a and 3b (they are encircled with an dotted line).

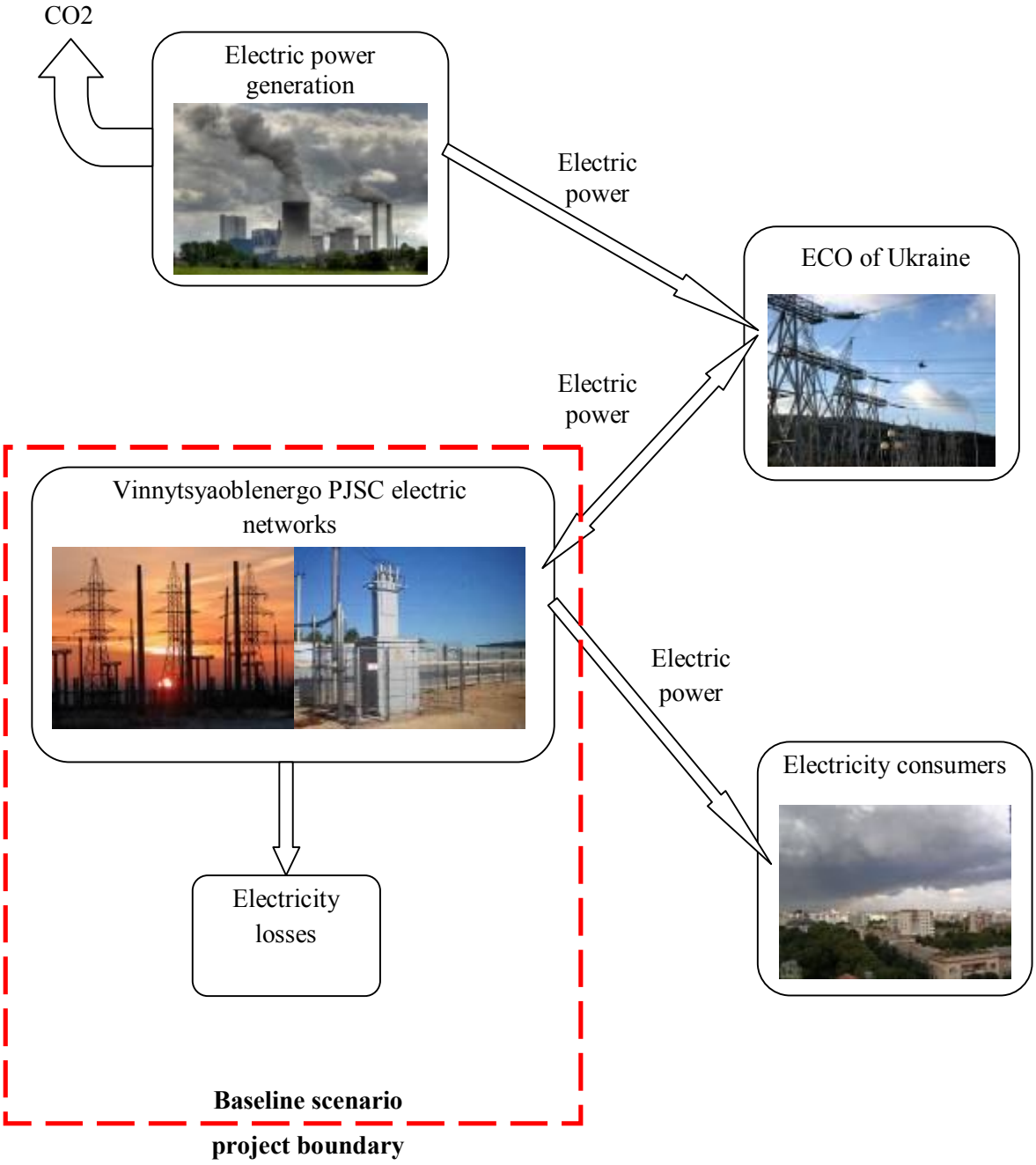

Figure 3a Project boundary of baseline scenario

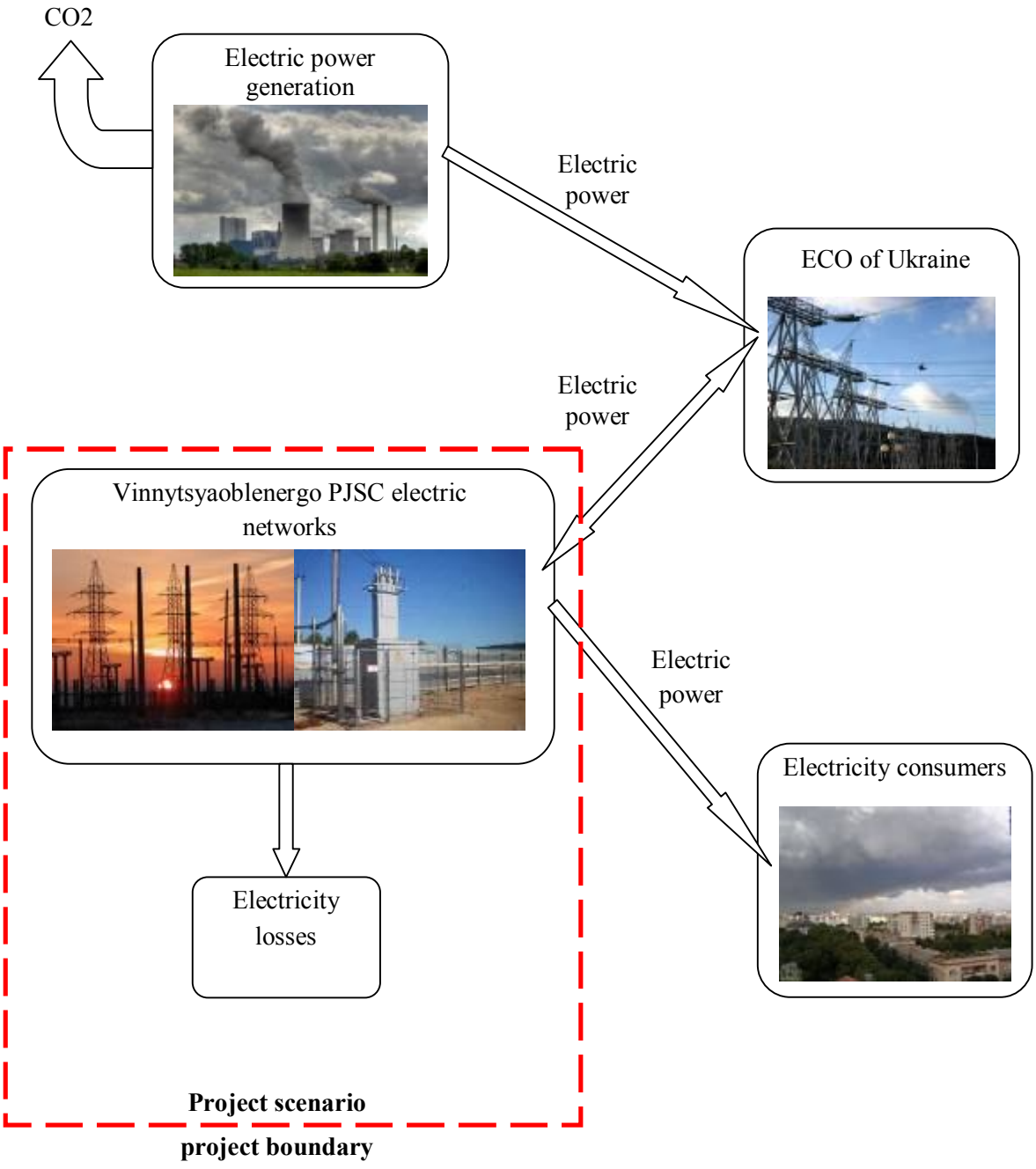

Figure 3b Project boundary of project scenario

Equipment within the project boundaries is given in the table:

Designation	Unit	Quantity	Capacity MVA
Power grid total length, incl.:			
air:	***km***	***49 665,774***	
110 kV	*km*	*2182,25*	*---*
35 kV	*km*	*2102,49*	*---*
10 kV	*km*	*15291,16*	*---*
6 kV	*km*	*61,406*	*---*
0.38 kV	*km*	*30028,468*	*---*
cable:	***km***	***1525,402***	
35 kV	*km*	*11,63*	*---*
10 kV	*km*	*961,61*	*---*
6 kV	*km*	*11,89*	*---*
0.38 kV	*km*	*540,272*	*---*
Substation total number:			
110/35 kV	*pcs*	*191*	*2051,7*
110 kV	*pcs*	*82*	*1552,4*
35 kV	*pcs*	*109*	*499,3*
Transformer total number:			
110/35 kV	***pcs***	***271***	***2051,7***
110 kV	*pcs*	*118*	*1552,4*
35 kV	*pcs*	*153*	*499,3*
Substation total number:			
SCTP,KTP,ZTP 6-10/0,38kV	***pcs***	***10 108***	***1894,446***
Single-transformer SCTP	*pcs*	*544*	*67,623*
KTP	*pcs*	*8050*	*1096,465*
No transformers	*pcs*	*---*	*----*
One transformer	*pcs*	*8048*	*1094,885*
Two transformers	*pcs*	*2*	*1,58*
ZTP	*pcs*	*1514*	*730,358*
No transformers	*pcs*	*---*	*---*
One transformer	*pcs*	*786*	*218,122*
Two transformers	*pcs*	*728*	*512,236*
Transformer total number:			
10-6 kV	***pcs***	***10897***	***1915,121***
Distribution plant total number 10kV:	***pcs***	***56***	***20,675***
No transformers	*pcs*	*16*	*---*
One transformer	*pcs*	*21*	*5,365*
Two transformers	*pcs*	*19*	*15,31*

The list of the sources and the greenhouse gases that were included into the boundaries of the project is given in the table 4.

Table 4: Sources of emissions and greenhouse gases included or excluded from the project boundary

	Source	Gas	Included / Excluded	Justification / Explanation
Baseline emissions	Ukrainian ECO electric power stations that consume fossil fuel.	CO_2	Included	Emission is caused by burning of the fossil fuel by the Ukrainian ECO electric power stations to generate electricity which is necessary to make amends for consumption in the electrical network of Vinnytsyaoblenergo PJSC in the baseline.
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
Project emissions	Emissions related to the equipment installed in the project	SF_6	Excluded	Insulating gas (SF6), used in circuit breakers and other equipment Vinnytsyaoblenergo PJSC is toxic and is listed as gas circulation and utilization of which is under the control of state environment organizations. Equipment containing Insulating gas is hermetically sealed and prevents leakage of gas into the atmosphere. In the case of it failure or decommissioning SF6 will be collected and reused by filling in new similar equipment. In connection with all the above SF6 emissions were excluded from the calculations.
	Ukrainian ECO electric power stations that consume fossil fuel	CO_2	Included	Emission is caused by burning of the fossil fuel by the Ukrainian ECO electric power stations to generate electricity which is necessary to make amends for technological power consumption in the electrical network of Vinnytsyaoblenergo PJSC after the reduction of the technological power consumption volume as a result of the project activity.
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

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

Finalization date of the baseline developing – 25/10/2011**.**

Baseline was set by Ltd «EES»

Table 5. Project developer - personal information

Organisation:	Ltd " Ekologichni Energetychni Systemy "
Street/P.O.Box:	Mitskevycha
Building:	8
City:	Lviv
State/Region:	Lviv region
Postal code:	79000
Country:	Ukraine
Phone:	0324 451601, 0322 427545
Fax:	0324 451601, 0322 444462
E-mail:	ecoees@mail.ru, peklviv@meta.ua
Title:	Director
Last Name:	Shpak
First Name:	Yaroslav
Middle Name:	Fedorovych
Phone (direct):	0324 451601, 0322 427545
Fax (direct):	0324 451601, 0322 444462
Mobile:	0504315929

Ltd «EES» is not Project Participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

April 2002

26.04.2002 – start date of the project

The investment programme of Vinnytsyaoblenergo PJSC for the year 2003 was approved by the NCPR resolution №424 of 26.04.2002.

C.2. Expected operational lifetime of the project:

25 years (300 months) or more – the program provides perpetual realization of the measures towards the reduction of technological power consumption in the electrical network of Vinnytsyaoblenergo PJSC

C.3. Length of the crediting period:

Duration period is 22 years (264 months):

2004-2007 – Early crediting period (the project will qualify for an early test of quotas in accordance with Article 17 of the Kyoto Protocol);

2008-2012 – crediting period (the period of commitment);

2013-2025 – post-commitment period (period of credit extension beyond 2012 requires approval by the project Host country).

Period ERU generation will begin only on 01.01.2008 and will not exceed the lifetime of the project.

Date of the crediting period January 1, 2004 End Date December 31, 2025

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

Data collected for monitoring will be stored electronically and/or paper form. All measurements carried used calibrated measuring equipment according to relevant industry standards.

The main parameter that objectively reflects CO2 emission reductions is reducing technological power consumption in electricity networks of the Vinnytsyaoblenergo PJSC. The rate of technological power consumption reflects electricity that being spent in total electricity received by the network.

The main parameters that are monitored during the crediting period and parameters to be determined once for the entire crediting period and not subject to monitoring are presented below. Other parameters not included in the monitoring are derived and should be calculated using the initial parameters.

The monitoring project emission includes such parameters:

Not applicable

Parameters for the project emission that are calculated only once for the whole financing period:

Not applicable

Parameters for the project emission that are calculated only once for the whole financing period:

Not applicable

Parameters for the baseline emission monitoring:

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

This parameter is defined according to the valid norms, rules and approved methodology based on the company's statistical data. This parameter is an objective quantitative representation of the project implementation results.

CEF_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.

Scheme of data collection and data management is provided in Section D.3.

Emission reduction units verification will be based on annual data. Responsible for documentation and submission to Accredited Independent Entities (AIEs) is Ltd "EES".

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*	Data variable	Source of data	Data unit	Measured (m), calculated (c),	Recording	Proamount of data to be	How will the data be archived?	Comment

numbers to ease cross-referencing to D.2.)				estimated (e)	frequency	monitored	(electronic/ paper)	
1. PE_y	Greenhouse gasses project emission	Greenhouse gases emission monitoring	tCO2e	c	yearly	100 %	Electronic and paper	

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

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.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	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proamount of data to be monitored	How will the data be archived? (electronic/ hard copy)	Comment
2. BE_y	Baseline emissions	Greenhouse gases emission monitoring	tCO2e	c	annually	100 %	Electronic and paper	

3. V_y	Power loss reduction in power distribution system during period *y*	Greenhouse gas emission monitoring	MWh	c	annually	100 %	Electronic and paper	Calculated in line with approved methodology ($V_y = \Delta A_{ALamount}^{emissions}$, see Annex 3)
4. CEF_y	t CO_2 e emission factor in UES of Ukraine for the the power replacement projects in the year y	Default value	t CO_2e/MWh	e	annually	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):

Therefore, the baseline emissions are:

$$BE_y = V_y \cdot CEF_y, \quad (1)$$

where

BE_y = baseline emissions (tCO2e);

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

CEF_y = CO_2 emission factor in UPS of Ukraine for the the power replacement projects in the year y, tCO_2e/MWh;

y = the year for which estimates are made.

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	Proamount 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:

Increase of the greenhouse gas emission outside the project, which may be caused by the project activity is not anticipated.

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	Proamount of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

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):

Emissions reductions are defined by the following equation:

$$ER_y = BE_y - (PE_y + LE_y), \quad (2)$$

Where:

ER_y = emission reduction during the year y, t CO2e;
BE_y = baseline emission of the greenhouse gases in the year y, t CO2e;
PE_y = greenhouse gases emission caused by the project activity in the year y, t CO2e;
LE_y = escape emission in the year y , t CO2e.

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 project implementation does not require gathering of information on the influence on the environment in excess of information collected at the company prior to the project inception.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Table D.1.1.3.4	low	Defined according to the approved methodology as in Appendix 3 based on the company's statistical data
Table D.1.1.3.5	low	Only officially approved factors have been used for estimation

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

The monitoring plan does not anticipate any additional measures neither of any measuring equipment installation nor of any additional parameters collection, except those that are being taken in the company. Data collection scheme according to the monitoring plan is shown on the Figure 4.

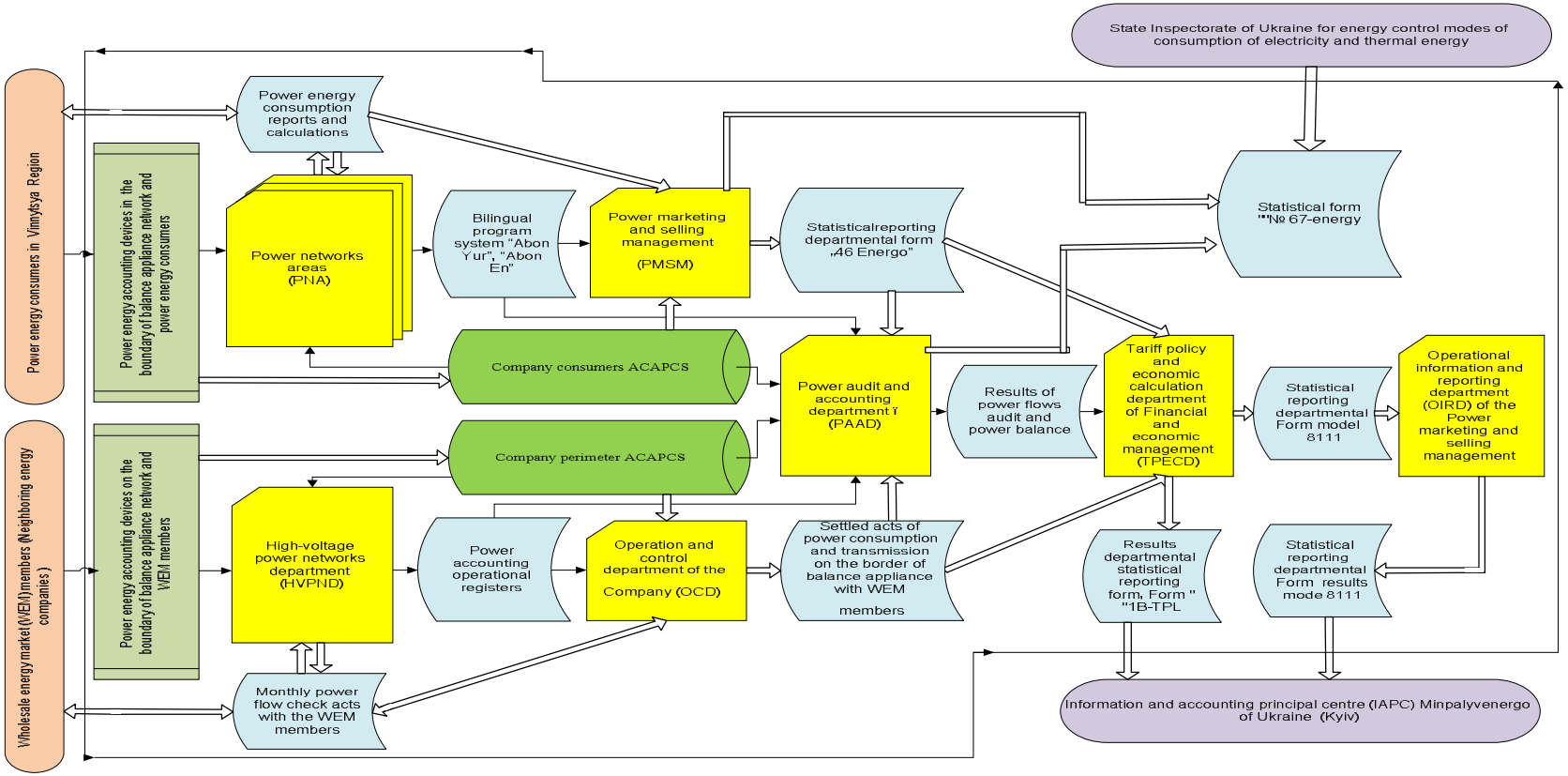

Figure 4 Scheme of data collection for the monitoring of the project parameters

Reduction of power losses in the grids of Vinnytsyaoblenergo PJSC is annually calculated by the specialists of the technical counselor (Ltd «EES»), using the approved technology «Methodology of compiling of the power balance structure in the grids 0,38-150 kV, analysis of its components as well as the regulation of technological power losses GND 34.09.104-2003 on the basis of statistical data of the company.
The monitoring plan does not anticipate any additional measures on installation of any new measuring equipment or collecting any new parameters except those already existing in the company.
To calculate the monthly balance of power in Vinnytsyaoblenergo PJSC such steps should be taken:
1.During the whole month the structural units of Vinnytsyaoblenergo PJSC measure the amount of power consumed (on the basis of indexes of the meters— this information is provided by the consumers, by the company workers, who take the indexes from the power, ASCAPC data). At the end of the month the monthly amount of effective power transmission is calculated and passed to the power registration and realization service of the Company registration apparatus;
2.During the whole month Vinnytsyaoblenergo PJSC takes control over the power bought on the Wholesale power market of Ukraine (WPM) according to the data of ASCAPC of the company perimeter;
3.Every first day of a month after the calculation one, the Company workers fix the indexes of the meters for WPM as well as the indexes of the meters which count the flows in the company grids; indexes of the meters for WPM are compared with the perimeter data of ASCAPC;
4.On the basis of the indexes taken, the amount of flows through the structural subunits of the Company is calculated;
5.According to the amount of flows and to the annual effective power transmission the report form 1B-TPL is formed for a structural subunit which is submitted to the Administration Apparatus of Vinnytsyaoblenergo PJSC (balance and regime department);
6.In the Administration apparatus the report forms 1B-TPL and 2-NKRE are formed on the basis of 1B-TPL.
The data collected are submitted to «EES» for preparing of Monitoring Reports.
All data that will be collected during the monitoring process must be kept on paper and electronic media in the archives of PJSC Vinnytsaoblenergo for at least 2 years after the ending of period of transfer ERU to the purchaser, and along with the issue of an appropriate order on the regional energy companies and mentioning the persons that will be responsible for storage.
Actuality of the indirect coefficient of carbon dioxide specific emissions connected with the power losses in the process of its transmission to the power networks of Ukraine will be yearly checked by the representatives of the technical (Ltd «EES»). If needed the coefficient will be renewed.

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

Vinnytsyaoblenergo PJSC (Project Paticipant)
Hrushko Borys
Leading engineer, distribution network department
Phone/Fax: (0432) 52-50-12

Ltd "Ekologichni Energetychni Systemy" (not Project Participant)
Technical director
Prots Roman
tel: +38024451601)

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

According to D.1.1.2

$PE_y = 0$

E.2. Estimated leakage:

Leakage is not expected.

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

Since the leakage LEy = 0, and the project emissions $PE_y = 0$ the sum of the leakage and project emissions $PE_y + LE_y = 0$.

E.4. Estimated baseline emissions:

Estimate of the baseline emissions was done according to the formulae shown in D.1.1.4.
Results of the calculation are shown in the table below. The calculations are in the «VIN-1БТВЕ-2002-2010-01-11-2011-km=1-ok-КП» file, attached hereto.
For usability of calculation of emission reductions in the Excel file «VIN-1БТВЕ-2002-2010-01-11-2011-km=1-ok-КП», all values are rounded to integers. Therefore, the summation of the emission reductions that are listed in Tables № № 6,7,8,9,10,11,12,13,14, may slightly differ .
In Table 6,7,8 estimated baseline emissions are shown.

Table 6 Baseline emissions by 01/01/2004 - 31/12/2007

Year	Estimated baseline emissions (tCO_2 equivalent)
2004	81191
2005	108675
2006	163588
2007	196448
Total for :	**549902**
Average amount of emissions:	**137475**

Table 7 Baseline emissions by 01/01/2008 - 31/12/2012

Year	Estimated baseline emissions (tCO2 equivalent)
2008	267313
2009	269346
2010	201561
2011	246057
2012	246057
Total for:	**1230334**
Average amount of emissions:	**246067**

Table 8 Baseline emissions by 01/01/2013 - 31/12/2025

Year	Estimated baseline emissions (tCO2 equivalent)
2013	246057
2014	246057
2015	246057
2016	246057

2017	246057
2018	246057
2019	246057
2020	246057
2021	246057
2022	246057
2023	246057
2024	246057
2025	246057
Total for:	**3198735**
Average amount of emissions in:	**246057**

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

Emission reductions are calculated according to the formula (2) hereinbefore. The results are shown in the table 9,10,11 hereinafter.

Table 9 Emission reductions by 01/01/2004 – 31/12/2007

Year	Sum of the project leakage and emissions tCO2e	Estimated baseline emissions tCO2e	Estimated emission reductions tCO2e
2004	0	81191	81191
2005	0	108675	108675
2006	0	163588	163588
2007	0	196448	196448
Total for:	**0**	**549902**	**549902**
Average number of cuts:	**0**	**137475**	**137475**

Table 10 Emission reductions by 01/01/2008 - 31/12/2012

Year	Sum of the project leakage and emissions tCO2e	Estimated baseline emissions tCO2e	Estimated emission reductions tCO2e
2008	0	267313	267313
2009	0	269346	269346
2010	0	201561	201561
2011	0	246057	246057
2012	0	246057	246057
Total for:	**0**	**1230334**	**1230334**
Average number of cuts:	**0**	**246067**	**246067**

Table 11 Emission reductions by 01/01/2013 - 31/12/2025

Year	Sum of the project leakage and emissions tCO2e	Estimated baseline emissions tCO2e	Estimated emission reductions tCO2e
2013	0	246057	246057
2014	0	246057	246057
2015	0	246057	246057
2016	0	246057	246057
2017	0	246057	246057
2018	0	246057	246057
2019	0	246057	246057
2020	0	246057	246057

2021	0	246057	246057
2022	0	246057	246057
2023	0	246057	246057
2024	0	246057	246057
2025	0	246057	246057
Total for:	**0**	**3198735**	**3198735**
Average number of cuts:	**0**	**246057**	**246057**

E.6. Table of values obtained from the aforementioned formula:

Table 12 Emission reductions by 01/01/2004 – 31/12/2007

Year	PEy tCO2e	LEy tCO2e	BEy tCO2e	ERy tCO2e
2004	0	0	81191	81191
2005	0	0	108675	108675
2006	0	0	163588	163588
2007	0	0	196448	196448
Total for:	**0**	**0**	**549902**	**549902**
Average number of cuts:	**0**	**0**	**137475**	**137475**

Table 13 Emission reductions by 01/01/2008 - 31/12/2012

Year	PEy tCO2e	LEy tCO2e	BEy tCO2e	ERy tCO2e
2008	0	0	267313	267313
2009	0	0	269346	269346
2010	0	0	201561	201561
2011	0	0	246057	246057
2012	0	0	246057	246057
Total for:	**0**	**0**	**1230334**	**1230334**
Average number of cuts:	**0**	**0**	**246067**	**246067**

Table 14 Emission reductions by 01/01/2013 - 31/12/2025

Year	PEy тCO2екв	LEy тCO2екв	BEy тCO2екв	ERy тCO2екв
2013	0	0	246057	246057
2014	0	0	246057	246057
2015	0	0	246057	246057
2016	0	0	246057	246057
2017	0	0	246057	246057
2018	0	0	246057	246057
2019	0	0	246057	246057
2020	0	0	246057	246057
2021	0	0	246057	246057
2022	0	0	246057	246057
2023	0	0	246057	246057
2024	0	0	246057	246057
2025	0	0	246057	246057
Total for:	**0**	**0**	**3198735**	**3198735**
Average number of cuts:	**0**	**0**	**246057**	**246057**

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:

1.The verification of the requirements of the environmental protection laws (EPL) observance in Vinnytsyaoblenergo PJSC is carried out by The State environmental inspection board in Vinnytsia region biennially.

Address: 19, 600-richchya street, Vinnytsia Tel: (0432) 46-67-58

2.List of the ecological reportings of the company:

- atmospheric air protection report;
- water usage report;
- report balance of the groundwaters usage;
- report of the environmental protection expenses and the ecological payments;
- report of the formation, handling and utilization of the I-III hazard classes wastes;
- monthly reports from all SU about the carrying out of the environmental protection measures;
- wastes registration is carried out in every SU according to the approved typical form № 1-VT;
- package of documents is made to receive the permission and the limit for the formation and location of the wastes; permission for the emission of pollutants into the atmospheric air; permission for the special water usage.

3. Process of the wastes utilization is carried out in every SU of the company.

Wastes utilization procedure:

- a person in charge of the ecological problems proposes the company administration the offers of several firms, which have the economic activity licences in the sphere of the hazard wastes handling (storage, transportation, utilization) ;
- every SU chooses the firm with which it is easy to work, signs an agreement and hands over the wastes for the utilization once in a quarter and receives tax invoices as well as the acts of performed works.

Implementation of the works will not cause any substantial influences on the environment exept the reduction of greenhouse gasses emissions into the atmosphere.

Transboundary impacts on the environment by the project activity are not anticipated.

The project activities will not have transboundary environmental impacts.

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:

According to the standard mass threshold for identification of hazardous substances of high-risk determined by the Resolution of CMU №956 of 11th of July, 2002, the specialized organization has defined the categories of equipment having characteristics that refer them to the hazardous substances (Form SHR-1). These are toxic substances of the 3rd group (harmful for people and the environment), namely: nickel compounds (fine-dispersed powder), quicksilver and its compounds, lead and its compounds, sulfuric acid, which can be found in fluorescent lamps and storage batteries; and of the 1st group (explosive substances).

Other equipment which has the characteristics of hazardous substances of high-risk is not found.

There are specially equipped places on the enterprise for storage of such equipment, which are inspected and adjusted by the appropriate resolutions of the sanitary-and-epidemiological control and environmental protection bodies.

Measures preventing harmful environmental impact of carbon oxide and nitric oxide escaping from boiler houses:

exploitation of boilers according to the regime map;

prohibition to regulate units and blocks of the equipment on one's own;

timely carrying out of the technical inspection according to the recommendations of the equipment manufacturer;

periodical quality control of the combustion materials to detect the exceeding limits of emissions;

control and registration of gross emissions.

Measures preventing harmful environmental impact of fumes of highly inflammable substances from fuels and lubricants namely :

timely carrying out of the technical inspection according to the recommendations of the equipment manufacturer;

intensification of the control over the technological regime of the equipment, evolving emissions;

- reducing the burden of the equipment.

According to the registration card № 391 of 07.04.2010 the enterprise is one of the waste generation objects (WGO) and according to the permission it temporarily holds the wastes within the set limits (before their utilization or removal) by the specialized enterprizes. The enterprise does not utilize any wastes.

The main part of scrap metal is formed by exploitation of transformer substation, a part of which after refitment and regeneration of transformer oil is put into operation again and other part which is beyond repair and its regenerated oil is unfit, is discharged and submitted for utilization to the specialized enterprises according to concluded agreements.

Starting from the year 2006 Vinnytsyaoblenergo PJSC have started the replacement of the outdated, fire-hazardous and explosive equipment, in particular, the replacement of the air and oil switches 35-110 kV for the modern sulfur hexafluoride circuit-breakers. To prevent the leakage of the insulating gas the sulfur hexafluoride seeking device was bought. Works on the equipment setting and putting into operation were carried out by the the service centres as well as by the stuff of the producer factories in Ukraine.

Within the project activities there were installed electrical equipment containing in its composition insulating gas (SF6) which is a toxic gas. In the operation insulating gas dose not loose its properties, so after the life of the equipment or in case of its decommission for other reasons, insulating gas is disposed by pumping-out and then re-used in new equipment. To prevent unauthorized leaks of insulating gas at all the sites where relevant equipment is present the sensors of insulating gas leaks are installed.

Service of the control and technological management means as well as the teleautomatics service (CTMM and TA) in Vinnytsyaoblenergo PJSC are using 13 storage batteries for the reservation of the connection and teleautomatics equipment. According to the instruction the lifetime of the storage battery type SK is 15 years. Actual lifetime of the SB is 20-25 years.

In the most of the SB due to the long operational period the positive electrodes have increased by 1.5 – 2 sm in all the units, the displacement of the sealing coushions between the outlets and the lids of the units is observed, the positive plates are swelling, and the progressive sulfitation of the positive electrodes also takes place. Due to the the long operational period and the electrochemical reaction the electrodes have been reduced tn thickness by 1.5 – 2 mm. The tension and the density of the electrolyte in the storage batteries does not meet the admissible norms in the current charging (1,6-2,1 V, 1,18 – 1,21 g/sm3).

In the chemical composition of the electrolyte the elements of chlorine as well as the excess of the iron by 0,014% were detected. In the process of the estimation of the SB technical state with the help of the impulsive current of the one-hour discharge during the 5-second it was revealed that the decrease of the tension on one of the elements of the battery is 0,7-0,8 V. Overwhwlming capacity of a storage battery is 50% of the specified capacity.

On the grounds of the aforementioned the committee consisting of the specialists of the company came to conclusion that the storage batteries which were installed in the power objects are useless for further operation, that they are ecologically dangerous and are to be submitted to the utilization by the specialized firms.

In 2010 the company signed the Agreement №323 of 28.09.2010 with SOE «Ekolet-Zhytomyr» in Zhytomyr about «The handing over and the acceptance of the storage batteries srap and the storage batteries with the electrolyte». This enterprize has the appropriate licences of the chemical current sources wastes storage as well as of the storage and processing of the nonferrous metals scrap.

According to the Agreement of 2010, 4 atorage batteries were utilized in Mohyliv Podilskyi PN and Kalynivskyi PN power objects.

In 2011one storage battery was utilized in Vinnytsia high-voltage PN.

It is planned to utilize all the storage batteries in the nearest future.

The project will make a positive influence on the environment comparing with the current state, as the reconstructions will improve the effectiveness of the power recourses usage and will reduce the emission of the pollutants into the air. In such a way the imfluence from the reconstructon is unsignificant.

The list of the main reporting documentation on the environmental impact of the company's operation is given in the Section F.1.

SECTION G. Stakeholders' comments

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

The stakeholders in the realization of the project are the inhabitants of Vinnytsia Region who were informed about the project through the mass-media.

In the public address of the executives of the company in the mass-media (television, press, radio, etc) the attention was payed to the TPL reduction problem.

According to the Decree of NCPR №121 of 23.12.10 "Of the provision of the information according to the monitoring forms of the services quality indexes" the Company carries out the work of the considering of the citizrns' applications. In the appropriate reports on the services quality indexes monitoring, the complaints connected with the TPL reduction have not been revealed.

Any negative responses about the the implementation of the project were not received by the company.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Project owner:

Organization:	«Vinnytsiaoblenergo» PJSC
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State/Region:	Vinnytsia Region
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Represented by:	
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Salutation:	
Last name:	Nitsak
Middle name:	Grygorovych
First name:	Mykola
Department:	Energetics department
Fax (direct):	(0432) 52-50-11
Phone (direct):	(0432) 52-50-50
Mobile:	0504615050
Personal e-mail:	kanc@voe.com.ua

Partner of the project:

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Building:	14
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State/Region:	
Postal code:	35-105
Country:	Poland
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Represented by:	
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Salutation:	
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Personal e-mail:	jwarchol@wp.pl

Annex 2

BASELINE INFORMATION

See Section B

1. Key information and data used for baseline setting

ID number	Description	Data variable
Table D.1.1.3.3.	Total reduction of technical power losses in the power grid during the period y of the project scenario compared with the baseline scenario	V_y
Table D.1.1.3.4.	Carbon dioxide emission factor for projects of power loss reduction in power transport networks of Ukraine	CEF_y

2. Emission factor in the Ukrainian ECO (tonnes of CO2 equivalent)

NATIONAL ENVIRONMENTAL INVESTMENT AGENCY OF UKRAINE

ORDER

Kyiv

28.03.2010 № 43

About indices confirmation,

of carbon dioxide specific emissions in 2010

In order to execute clause 2.1 of the decree dated 21.03.2011 № 39 " About the carbon dioxide specific emissions, during power production on power plants and its consumption , calculation methodology confirmation" and to normalize the calculation of carbon dioxide specific emissions, during power production on power plants and its consumption,

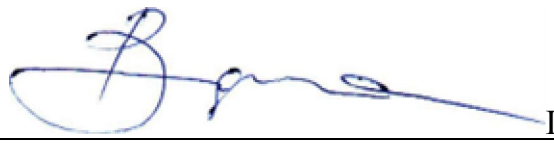
Hereby I decree:

1) To establish the following indices of carbon dioxide specific emissions in 2010:
   - carbon dioxide specific emissions, during power production on the thermal electric power station, that are linked with the Unified Energy System of Ukraine - 1,067 kg CC>2/kW*h;
   - indirect carbon dioxide specific emissions during power consumption by users that refer to the 1class according the Users class determination arrangement, approved by the NERC of Ukraine decree of 13.08.1998 № 1052 - 1,093 kg C02/kW*h;
   - indirect carbon dioxide specific emissions during power consumption by users that refer to the 2class according to the Users class determination arrangement, approved by the NERC of Ukraine decree of 13.08.1998
   - № 1052 - 1,225 kg C02/kW*h;

- indirect carbon dioxide specific emissions, connected with the power losses during its transmission by the local networks - 1,093 kg C02/kW*h.

2) Carbon dioxide specific emissions indices in 2010, that were indicated in the clause № 1 of the given decree, are recommended to be used during the preparation of:
   - project proposal concerning anthropological GHG emissions reduction, project technical documentation, emissions reduction scopes annual reports, that are worked out according to "Projects, directed on the anthropological GHG emissions reduction preparation, examination, approval and realization order", sanctioned by the Ukraine Cabinet of Ministers decree of 22.02.2006 № 206 ;
   - GHG planned emissions reduction calculations, that are worked out according to the Order of projects examination, approval and realization, directed on the ecological investments, and proposals concerning suchlike projects, and obligations discharge by the parties of Kyoto protocol to the UN Framework Convention on Climate Change, sanctioned by the Ukraine Cabinet of Ministers decree of 22.02.2008 № 221, and actual GHG emissions, as the result of suchlike projects realization, reduction calculation.

3) Kyoto protocol flexible mechanisms administration (Shevchenko O.V) and Ecological investments and market development scheme administration (Yermakov V.M.) are to be directed by this decree during the JI and ecological investments projects documents verification.
4) GHG national accounting system administration (Khabatu'k O.P.) is to be directed by this decree during the JI projects, that are verified according the Instruction about the procedures concerning JI documents examination and arrangement, sanctioned by the Nacecoinvestagenstvo decree of 08.12.2010 № 184.
5) Public relations and mass media department (Zaets' I.V.) is to ensure this decree placement on the Nacecoinvestagenstvo web site.

Reorganization commission chairman  I.Varga

Annex 3

MONITORING PLAN

Detailed description of the monitoring plan presented in Section D of this PDD. The Methodology of technical power losses amount determination, in 0.38-150 kV power grids power supply company for the indirect carbon dioxide emission estimation that has been used to monitoring plan develop presented below.

Ltd " EKOLOGICHNI ENERGETYCHNI SYSTEMY "

THE METHODOLOGY

OF TECHNICAL POWER LOSSES AMOUNT DETERMINATION, IN 0.38-150 kV POWER GRIDS POWER SUPPLY COMPANY FOR THE INDIRECT CARBON DIOXIDE EMISSION ESTIMATION

Lviv
2011

PREFACE

1	ORDERED	Ltd " Ekologichni Energetychni Systemy "
2	DEVELOPED	OJSC " LvivORGRES"
3	EXECUTOR	Y.Koval
4	COORDINATED	Energy conservation and management institution
		National technical university of Ukraine "KPI", A.Prakhovnyk

Chief executive officer

OJSC "LvivORGRES" I.Kavych

Chief operative officer

OJSC " LvivORGRES " V.Kondratenko

Quality manager

OJSC " LvivORGRES " V.Kaminskyi

Electrical department manager

OJSC " LvivORGRES " I.Lutsyk

Electrical department sector supervisor

OJSC " LvivORGRES ",

Responsible executor Y.Koval

APPROVED

Ltd " Ekologichni Energetychni Systemy " director

_____ Y.Schpak

"_____"_____2011

APPROVED

Energy conservation and management institution
National technical university of Ukraine "KPI"

_____ A.Prakhovnyk

"_____"_____2011

CONTENTS

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

1 APPLICATION

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 (hereafter – Methodology) is used for the determination of technical power losses amount in 150-0.38 kV power grids power supply company for the indirect carbon dioxide emissions estimation during the transportation and supply of power.

2 NORMATIVE REFERENCES

Law of Ukraine «On electric power engineering» as of October, 16 1997, № 575/97-VR with subsequent amendments.

NST 6570-96 Electric counters of active and reactive power, motor meter. General technical conditions.

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.

Electrical equipment arrangement regulations. Chapter 1.5 Electric power calculation.

Regulations of electric power usage, are sanctioned by Electric power engineering regulation national committee decree as of 31.07.96 №28 (with supplements and changes as of 17.10.2005 № 910)

The methodology of carbon dioxide specific emissions, during power production and its consumption, estimation is sanctioned by the National agency of ecological investments decree of

March, 21 2011 № 39

GND 34.09.104-2003 Power balance structure in the 0,38-150 kV power grids, arrangement methodology, balance components analyses and technological power losses normalization.

Alteration № 1 to GND 34.09.104-2003 Power balance structure in the 0,38-150 kW power grids, arrangement methodology, balance components analyses and technological power losses normalization.

GND 34.09.203-2004 Power losses for 35-750 kW substations personal needs normalization and 6-10 kW distributive points.

Instructions to the power accounting procedure (Appendix 10 to the Contract between Wholesale Power Market members) approved by the Annual assembly on 21.02.2003 and by NCER Decree dated 30.05.2003 with subsequent amendments.

Instruction on compilation, reporting, and analyses of departmental 1B-TVE reporting form data "Power balance structure and technological power losses for the transition on power grids ", sanctioned by the Ministry of electrification and power engineering of Ukraine, on September, 09 1997.

Form № 67 – "Report on consumers electric power accounting system organization as of 01.01.20__ and about establishment in the consumers power grids and power transition organizations of automated power accounting systems and local data collecting and processing equipment (LDCPE)", sanctioned by the Ministry of fuels and energy of Ukraine decree of July, 01 2008 № 352 in the concordance with Ukrainian State Committee on Statistics.

3 TERMS AND NOTIONS

The following are terms used in this method and definition of concepts designated by them:

3.1 power return

The electric energy amount, that is returned by the licensee transferor and consumer and also lost for the economic needs

3.2 power issue (consolidated income) into the grid

The electric energy amount, which consists of the values sum of power for consumers return, for economic needs and reporting value of technical power losses, according to GND 34.09.104-2003

3.3 power losses for economic needs of local grids

Power consumption under the average purchase price for the ensuring of licensed activity on the transmitting and supply of power (power supply under the regulated tariff according agreement, concluded between the supplier and consumer (legal entity) respectively with the requirements of "Rules of power usage ", is not realized) , according to the GND 34.09.104-2003

3.4 power transmitting organization (licensee-transferor)

Economic entity, that received the NERC license for the right to go into business of power transmitting by the transnational power grids or by local grids, as well as power suppliers under the regulated tariff, that carry out their activity on the settled territory, according to GND 34.09.104-

2003

3.5 **power characteristics**

The aggregate data reflecting the power balance structure of a power supply company in the reported year.

3.6 **power supply company**

A power transporting company transporting power by local power grids and supplying it at regulated tariff in a fixed area.

3.7 reported relative technological power losses in power grids

Quotient determined in the percent from the division of reporting value of technological power consumption and issue value of power into the grid, according to GND 34.09.104-2003

3.8 reported value of technological power losses in power grids

Power amount, that is determined by the difference between the sum of income value and sum of power return value, that are determined under the indices of calculated power account means, according to GND 34.09.104-2003

3.9 reported value of technological power consumption for substation and distributive points own needs

Constituent part of reporting value of technological power consumption that is equal to the power amount, lost for the substation and distributive points personal needs, that is determined under the indices of calculated power account means, according to GND 34.09.104-2003

3.10 Value of nontechnical power losses in the power grids

Constituent part of reporting value of technological power consumption (for the – conditionally reporting value of technological power consumption), that is equal to the difference between reporting value of technological power consumption and normative value of technological power consumption according GND 34.09.104-2003

3.11 reduction factor (scaling)

The quotient of the division of a power sale total for the reported year by that of the previous or following year.

3.12 conservative approach

The approach when selecting the TVE component calculation option used for CO2 emission reduction estimation only those options are taken into account aimed at reducing the resulting amounts of TVE components.

3.13 main power grid

Power grid, used for power transmitting from the producer to the linking points of local grids, according to the Law of Ukraine «On electric power engineering»

3.14 power grid

Collection of electrical equipment for power transference and distribution, according the Law of Ukraine «On electric power engineering»

3.15 metrological power losses

Constituent of the nontechnical power losses, stipulated by the power income and return measuring errors, according GND 34.09.104-2003

3.16 local power grid

Joined power grid, aimed at power transfer from the transnational power grid to the consumer, according the Law of Ukraine «About electric power engineering»

3.17 power receipt

Power amount, received by the licensee-transmitter under the balance belonging from the neighboring licensee-transmitters, generating sources and power consumers substations, according to GND 34.09.104-2003

3.18 GHG indirect emissions (energetic mediated GHG emissions)

GHG emissions during power production, that is used by the economic entity or physical entity from the power grid, according to ISO 14064-1:2006

3.19 Non-technical power losses in the power grids

Part of the reporting technological power consumption, that arises during the power supply and is stipulated by the errors of income and power return measurement by the accounting devices, as well as power return understatement for the consumers at the actual payment with the use of retail prices for the electricity, errors during the determination of power consumption amount for the calculated month at the weighted values of power consumption by the consumers without power accounting devices indices taking down, in this calculated period, nonsimultaneous power accounting devices taking down, seasonal component presence and accounting devices with the estimation errors work, that excel their standard values, according to GND 34.09.104-2003

3.20 normative value of technological power consumption in the power grids

Reporting value of technological power consumption constituent, that is equal to the sum of technical calculated values in the power grids elements and normative power losses for the substations and distributive points personal needs, according to GND 34.09.104-2003

3.21 relative normative technological power consumption in the power grids

Quotient determined in the percent from the division of normative value of technological power consumption and issue value of power into the grid, according to GND 34.09.104-2003;

3.22 power transfer

Power transmitting with the help of grids under the agreement, according the Law of Ukraine «About electric power engineering»;

3.23 power supply

Consumer providing with the power with the help of technical means of power transportation and distribution under the agreement, according the Law of Ukraine «About electric power engineering»;

3.24 reference year

The year for which the components of the reported power balance structure are defined in accordance with the norms and used to reduce the power balance structure of the previous or following years to the same power characteristics

3.24 calculated period

Calendar section of time (month, quarter, year), predictable or reporting, for which the calculations of normative technological power consumption values, are carried out, according to

GND 34.09.104-2003;

3.25 power accounting devices

Power accounting means, that are used for commercial calculations, according the Regulations of power usage;

3.26 power consumer

Economic entities and legal entities, that use power for their personal needs, under the agreement on its sell and purchase, according the Law of Ukraine «About electric power engineering»;

3.28 power balance structure

Licensee-transmitter indices system for the calculate period, that is composed on the ground of accounting devices indexes, and characterizes total power income, return, and transformation values with the spaces on every level and reporting value of technological power consumption structure, according to GND 34.09.104-2003;

3.29 neighboring power transmitting organization (neighboring licensee-transmitter)

Power transmitting company, that is the subject number two, on the balance belonging scale, between power transmitting organizations, according to GND 34.09.104-2003;

3.30 technical calculated power losses in the elements of power grids

Power amount, that is lost for the physical processes of grids elements current supply parts heating, during current running through them, magnetic wires heating and electric equipment elements constructions separate parts, and electricity line crown discharge, that is determined by calculation, taking into account definite conditions and assumptions, that are established by this normative document, according to GND 34.09.104-2003;

3.31 technological power consumption in the power grids

Power amount, that is equal to the sum of power losses in the power grids elements, that arise in them while power transfer, power losses for the substations and distributive points personal needs, and power losses for the glazed frost melting, accordint to GND 34.09.104-2003;

3.32 power transformation

Power amount that is transferred through the transformers from one level to the other in the scale of licensee-transferor grids, according to GND 34.09.104-2003.

4 ABBREVIATIONS

The following abbreviations were used in this methodology:

RVTVE – reporting value of technological power consumption in the power grids;

NPL – nontechnical power losses value in the power grids;

EM – electricity meter

LEP – transmission line;

NVTVE	–	normative value of technological power consumption in the power grids;
NERC	–	National Electricity Regulation Commission of Ukraine;;
NCTVE	–	normative characteristic of technological power consumption in the power grids;
PUE	–	Rules for electrical installation
TVE	–	technological power consumption in the power grids;
CT	–	current transformer;
VT	–	voltage transformer;

5 MAIN PRINCIPLES

5.1 Methodology of the specific emissions of carbon dioxide in the process of the power production by the thermal electric power stations and its consumption (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- TVE "Power balance structure and technological power consumption for the power transfer through the grids " (1B-TVE 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 TVE 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 TVE in the 150-0.38 kV 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 TVE form for the respective year. So

the use of the data of line 19 is expected "RVTVE percent from the power issue into the grid" form 1-B TVE.

5.2 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 , RVTVE (total value and significance of voltage levels), NVTVE (total value and significance levels of voltage), calculated on the bypass power LEP and transformers for voltage levels and releasing (saldovane 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 TVE "Power balance structure and TVE 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 TVE value" of forms 1-B TVE 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 "TVE normalization for transference through 154-0.38 kV 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 TVE for the respective years should be made according the data of form 1-B TVE 2010.

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

5.3 Applying the conservative approach, while it is evident, that grids technical characteristics in 2010, from the TVE 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 TVE forms for the previous calculated years with the use of data provided in chapters 1,2 and 3 and provided normative TVE (NCTVE) characteristics that is practically impossible because of necessity to develop for each previous year NCTVE 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:

5.3.1. 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;

5.3.2. 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;

5.3.3. 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).

5.3.4. 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).

5.3.5. 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).

5.4. 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 TVE 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 TVE 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 TVE form data.

The criteria of the 1-B TVE 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 TVE percentage from the power issue into the grid (line 19) in forms 1-B TVE for the respective year before and after 1-B TVE form data providing.

5.5. 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-TVE 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-TVE 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).

5.6. For the years after 2010 the reduction of the data in Chapters 1,2,3 of 1-B TVE 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 TVE form are reduced to equal conditions after 2010. the data in Chapters 8 and 9 are reduced as follows:

5.6.1. 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;

5.6.2. 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;

5.6.3. 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.

5.7. If the data in Chapters 1, 2, 3 of 1-B TVE 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.

5.8 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 [1], and Recommendations Appendix A [1] is taken no more than 1,15.

5.9. Structure of RVTVE 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 untechnical losses. Untechnical power losses in the main grids are conditioned by the metrological losses, which under the quantitative estimation of the structure of the untechnical losses are to be calculated on the basis of the actual metrological characteristics of the accounting devices. Thus RVTVE 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 RVTVE 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 untechnical 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 untechnical 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 150-0.38 kV 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 untechnical 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; unsumuultaneous 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 RVTVE, 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 untechnical 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, RVTVE in the local power grid of the power supply company (data of the line 19 "The percentage of reporting TVE (RVTVE) from the power supply to the grid" form 1-B TVE) 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.

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

5.11 In the process of the development of the RVTVE 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 RVTVE calculation, of the component of the nontechnical power losses, conditioned by the faults of power supply organization, etc, but also of the NVTVE 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 NVTVE structure calculation, the results are provided as the determined indexes.

6 REDUCTION OF POWER BALANCE STRUCTURE DURING THE ESTIMATED PERIODS TO EQUAL CONDITIONS, AND RVTVE ADJUSTMENT IN THE 0.38-150 kV POWER GRID OF POWER SUPPLY COMPANY

6.1 Structure and principal power balance equations

6.1.1 According to the principles of GND 34.09.104-2003 the power balance structure is the system of the indexes of the power transmission organization (licensed-transmitter) within the calendar (computation) period, compiled according to the indexes of the accounting devices and characterizes the amounts of delivery, transmission and transformation of power and RVTVE structure.

6.1.2 RVTVE ΔA_{AL} is equal to the difference between the sum of the power delivery and the sum of power transmission to the licensed-transmitters (neighboring structural units), consumers as well as to the power for the proper needs, measured by the power accounting devices:

$$\Delta A_{AL} = A_D - A_T^{Neig} - A_T^C, \quad (1)$$

where ΔA_D - Amount of power delivered to the grid;

A_T^{Neig} - Amount of power transmitted to the neighboring licensed-transmitters;

A_T^C - Amount of power transmitted to the consumers and power used for the proper needs.

6.1.3 Delivery (consolidated delivery) of power to the grid A_{DG} is the amount of power transmitted to the consumers, used for the proper needs and for RVTVE

$$A_{DG} = A_T^C + \Delta A_{AL} \quad (2)$$

6.1.4 Reported relative technological power losses in the grids ΔA_{AL}^* are calculated in the interest as the quotient from the division of RVTVE and the amount of power delivery to the network:

$$\Delta A_{AL}^* = (\Delta A_{AL} | A_{DG}) \times 100\% \quad (3)$$

6.1.5 Untechnical power losses ΔA_{UT} is equal to the difference between RVTVE and NVTVE:

$$\Delta A_{UT} = \Delta A_{AL} - \Delta A_{NATPL} = \Delta A_M + \Delta A_K , \quad (4)$$

and consists of:

- amount of metrological power losses ΔA_M , calculated by the formula

$$\Delta A_M = \pm UB_D \cdot A_{DG} , \quad (5)$$

where UB_D - assumptive power unbalance in the grid;

- amount of the nontechnical power losses ΔA_K , produced in the process of power transmission and is equal to the difference between the amount of nontechnical power losses and the amount of metrological power losses:

$$\Delta A_K = \Delta A_{UT} - \Delta A_M . \quad (6)$$

6.2 **Power supply company official statistical reporting list containing input data for the RVTVE correction**

6.2.1 According to the principles of DAEI Methodology the calculation of indexes is carried according to the actual results of activity of the thermal electric power stations, of the main power grids operator as well as of the power supply companies. That is why in the process of calculation of RVTVE amount in the power grids of the company, that are transferred to the indirect carbon dioxide emissions only the data of the official statistical report should be used.

6.2.2 Reduction to equal conditions of the power structure balance is carried out using the data of the official statistical report of the power supply company according to:

- report form 1-B TVE "Structure of the power balance and the technological power losses in the process of its transmission in the power grids " within the year, which is compiled according to the Regulations of compiling and provision of reports and analysis of the data of the report form 1B-TVE;

- form No 67 – energo “Report of the organization of the active power registration system of the consumers as of 01.01.20__ and of the installation of the systems of the automatized power

registration and the local devices of the data collection and processing in the consumers' power grids and in the power transmission companies" within the year.

6.2.3 In case of absence of the data of the official statistical report of the year the usage of the estimated amounts, calculated by the substantiated assumptions is admissible.

6.2.4 Annual report data from the power supply company of the quantity of domestic power consumers.

6.3 Input data for the RVTVE correction

6.3.1 From the report form 1-B TVE "Structure of the power balance and the technological power losses in the process of its transmission in the power grids" data is used according to:

- power delivery to the grid, MW·h;

- power transmission to the consumers, MW·h;

- power transmission to the neighboring licenced-transmitters, MW·h;

- amount of RVTVE in the grid, MW·h;

- amount of NVTVE in the grid, MW·h;

- amount of NPL in the grid, MW·h;

- delivery (consolidated delivery) of power to the grid, MW·h;

- relative amount of RVTVE in the grid before delivery (consolidated delivery) of power to the grid, %.

6.3.2 From the form No 67 – energo "Report of the organization of the active power registration system of the consumers as of 01.01.20__ and of the installation of the systems of the automatized power registration and the local devices of the data collection and processing in the consumers' power grids and in the power transmission companies" the data of the amount of meters installed for the domestic users is used:

- single-phase induction meters of the appropriate accuracy class;

- three-phase induction meters of the appropriate accuracy class;

- single-phase electronic meters of the appropriate accuracy class;

- three-phase electronic meters of the appropriate accuracy class.

- data of the total amount of all the types of meters with the overdue term of the state control.

6.4 Reduction to equal conditions of power balance structure during the estimated periods in 1B-TVE form, for the periods prior to 2010

6.4.1 The reduction factor is calculated which is equal to one in 2010, for others previous computation years it is equal to the quotient of the division of the delivery (consolidated delivery) of power to the grid in 2010 (chapter 18 total) and the delivery (consolidated delivery) of power to the grid for the previous computation year (chapter 18 total).

6.4.2. The relative values of the power sale structure on voltage levels, calculated by Chapter 3 data as percentage of power sale of the respective year, are calculated for 2010 and each computation period.

6.4.3. Based on the analysis of the data calculated under 6.4.1 and 6.4.2 if the conditions of 5.4 are satisfied, the decision is taken on the reduction to equal conditions of the data from Chapters 1,2,3 of the power structure balance.

6.4.4. If the reduction to equal conditions of data in Chapters 1,2,3 and chapters 8 and 9 is to be made, then:

6.4.4.1 Amount of power delivery to the grid for the previous computation year in the chapter 1 (lines 1.1 – 1.12 in columns 10-15) is divided by the reduction factor.

6.4.4.2 Amount of the power transformation for the corresponding previous computation year in chapter 2 (lines 2.7 – 2.12 in columns 10-14) is divided by the reduction factor.

6.4.4.3 Amount of the effective power transmission for the corresponding previous computation year in chapter 3 (lines 3.1.1 – 3.1.10 and 3.2.1 – 3.1.11 in columns 10-16) is divided by the reduction factor.

6.4.4.4 Variable technical power computation losses in LEP (line 8.1 in columns 10-15) for the corresponding previous computation year are equal to the amount in 2010 (line 8.1 in columns 10-15) with the corresponding voltage degree multiplied by the square of the computation transference in LEP for the corresponding previous year (chapter 12 in columns 10-15) with the corresponding voltage degree divided by the square of the computation transference in LEP in 2010 with the corresponding voltage degree (chapter 12 in columns 10-15);

6.4.4.5 Variable technical power computation losses in the transformers (line 8.3.1 in columns 10-14) for the corresponding previous computation year are equal to the amount in 2010 (chapter 8.3.1 in columns 10-14) with the corresponding voltage degree multiplied by the square of

the computation transference in the transformers for the corresponding previous year (chapter 13 in columns 10-14) with the corresponding voltage degree divided by the square of the computation transference in the transformers in 2010 with the corresponding voltage degree (chapter 13 in columns 10-14);

6.4.4.6 Conditionally-constant technical computation power losses in the transformers (line 8.3.2 in columns 10-14) for the corresponding previous computation year with the corresponding voltage degree are equal to the amount in 2010 (line 8.3.2 in columns 10-14) with the corresponding voltage degree; (for a leap year the Conditionally-stable technical calculated power losses in transformers shall be multiplied by 8784 hours and divided by 8760 hours).

6.4.4.7 Other conditionally-constant power losses in others units (line 8.4.3 in columns 10-15) for the corresponding previous computation year with the corresponding voltage degree are equal to the amount in 2010 (line 8.4.3 in columns 10-15) with the corresponding voltage degree; (for a leap year the Conditionally-stable technical calculated power losses in transformers shall be multiplied by 8784 hours and divided by 8760 hours).

6.4.4.8 Normative power losses for the proper needs of the substations (chapter 9 in columns 10-14) for the corresponding previous computation year with the corresponding voltage degree are equal to the amount in 2010 (chapter 9 in columns 10-14) with the corresponding voltage degree (for a leap year the Conditionally-stable technical calculated power losses in transformers shall be multiplied by 8784 hours and divided by 8760 hours).

6.4.4.9 The amount of power delivery (consolidated delivery) to the grid is verified (chapter 18) for the corresponding previous computation year, which should be equal to the amount of power delivery (consolidated delivery) to the grid (chapter 18) in 2010. If this condition is not fulfilled the error should be found.

6.4.4.10 The equality of the report TVE percentage of the power delivery to the grid is verified (line 19) in the forms 1-B TVE for the corresponding previous year before the reduction and after the reduction.

6.4.5. If only the data of Chapters 8 and 9 are to be reduced to equal conditions the calculation is done according to 6.4.4.4-6.4.4.8/

6.4.6 Technical calculated energy losses (line 8 in column total) is multiplied by a coefficient of deterioration in electrical indexes over time.

6.4.7 Data of the implemented forms 1-B TVE for the prior to 2010 calculation periods is used for the calculations in 6.6.

6.5. Reduction to equal conditions of power balance structure during the estimated periods in 1B-TVE form, for the periods following 2010

6.5.1. If the reduction to equal conditions is performed for the data from Chapters 1,2,3 of 1-B TVE form of the previous to 2010 periods, so for the subsequent periods the reduction factor is calculated equal to the quotient of the power sale in 2010 (Chapter 18 total) divided by power sale (Chapter 18 total) in the subsequent period.

6.5.2. The data in Chapters 1.2.3 and Chapters 8 and 9 are reduced to equal conditions as follows:

6.5.2.1. Amount of power delivery to the grid for the subsequent computation year in the chapter 1 (lines 1.1 – 1.12 in columns 10-15) is divided by the reduction factor.

6.5.2.2. Amount of the power transformation for the corresponding subsequent computation year in chapter 2 (lines 2.7 – 2.12 in columns 10-14) is divided by the reduction factor.

6.5.2.3. Amount of the effective power transmission for the corresponding previous computation year in chapter 3 (lines 3.1.1 – 3.1.10 and 3.2.1 – 3.1.11 in columns 10-16) is divided by the reduction factor.

6.5.2.4. Variable technical power computation losses in LEP (line 8.1 in columns 10-15) for the corresponding subsequent computation year are equal to the amount in 2010 (line 8.1 in columns 10-15) with the corresponding voltage degree multiplied by the square of the computation transference in LEP for the corresponding previous year (chapter 12 in columns 10-15) with the corresponding voltage degree divided by the square of the computation transference in LEP in 2010 with the corresponding voltage degree (chapter 12 in columns 10-15);

6.5.2.5. Variable technical power computation losses in the transformers (line 8.3.1 in columns 10-14) for the corresponding subsequent computation year are equal to the amount in 2010 (chapter 8.3.1 in columns 10-14) with the corresponding voltage degree multiplied by the square of the computation transference in the transformers for the corresponding previous year (chapter 13 in columns 10-14) with the corresponding voltage degree divided by the square of the computation transference in the transformers in 2010 with the corresponding voltage degree (chapter 13 in columns 10-14);

6.5.2.6. Conditionally-constant technical computation power losses in the transformers (line 8.3.2 in columns 10-14), other conditionally-constant power losses in others units (line 8.4.3 in columns 10-15) and normative power losses for the proper needs of the substations (chapter 9 in columns 10-14) are taken as equal to the reported values.

6.5.2.7. The amount of power delivery (consolidated delivery) to the grid is verified (chapter 18 total) for the corresponding subsequent computation year, which should be equal to the amount of power delivery (consolidated delivery) to the grid (chapter 18 total) in 2010. If this condition is not fulfilled the error should be found in the reduction of receipts, transformation and effective power transmission in 6.5.2.1-6.5.2.3.

6.5.2.8. The equality of the report TVE percentage of the power delivery to the grid is verified (line 19) in the forms 1-B TVE for the corresponding subsequent year before the reduction and after the reduction.

6.5.3. If the data in Chapters 1, 2, 3 of 1-B TVE form for the years after 2010 are equal to reported values. i.e. reduction using the reduction factor is not applied than the data in Chapters 8 and 9 are also equal to reported values.

6.4.6 Technical calculated energy losses (line 8 in column total) is multiplied by a coefficient of deterioration in electrical indexes over time.

6.5.5. The reduced data in 1-B TVE form for the subsequent to 2010 periods are used for calculation according to 6.6.

6.6 RVTVE correction procedure

6.6.1 Calculation of the admissible normative unbalance of power in the grid

6.6.1.1 The amount of the admissible non-balance of power in the grid UB_D is calculated according to the annex E GND 34.09.104-2003 using the formula:

$$UB_D = \pm\sqrt{\sum_{i=1}^{N_н} \delta_{нi}^2 d_{нi}^2 + \sum_{j=1}^{N_в} \delta_{вi}^2 d_{вi}^2}\ , \qquad (7)$$

where $\delta_{нi}^2$ ($\delta_{вi}^2$) - Correspondingly total relative error of the first (j) measuring complex which consists of the measuring current and transformers and a meter, which measures power delivery (transmission);

$d_{нi}^2$ ($d_{вi}^2$) - Amount of power, delivered (transmitted) through the first (j) measuring complex;

$N_{нi}$ - Amount of measuring complexes, used to measure the amount of power delivered;

$N_{вi}$ - Amount of measuring complexes, used to measure the amount of power transmitted.

While calculating the amount of power unbalance the calculation scheme provided in "Directions of the commercial power registration scheme" should be used.

6.6.1.2 The total relative error of the first (j) measuring complex is calculated using the formula:

$$\delta_i = \sqrt{\delta_{CTi}^2 + \delta_{TTi}^2 + \delta_{met}^2}, \quad (8)$$

where δ_{CTi} - Relative error for the measuring current transformers of the first (j) measuring complex, which corresponds to the appropriate precision class, %;

δ_{TTi} - Relative error for the measuring current transformers of the first (j) measuring complex, which corresponds to the appropriate precision class, %;

δ_{met} - Relative error for the meter of the first (j) measuring complex, which corresponds to the appropriate precision class, %;

6.6.1.3 Portion of power delivered (transmitted) through the first (j) measuring complex on every current degree is calculated according to the data of the report form 1-B TVE of the power delivery and transmission to the neighboring licensed-transmitters and to the consumers with the with the corresponding degree.

6.6.1.4 Normative precision classes of the measuring complexes which are used for the registration of the power delivery and transmission to the neighboring licensed-transmitters and consumers while calculating the amount of the admissible normative unbalance are used according to the requirements of " Directions of the commercial power registration scheme" and chapter 1.5 PUE and are provided in the table 1.

Table1 - Set precision classes of the measuring complexes

ID number	Index	Name of equipment	Precision class, %
1	Set precision classes of the measuring complexes, used to register power delivery (all the degrees)	CT	0,5
		TT	0,5

		Meter	0,5
2	Set precision classes of the measuring complexes, used to register power transmission to the neighboring licensed-transmitters (all the degrees)	CT	0,5
		TT	0,5
		Meter	0,5
3	Set precision classes of the measuring complexes, used to register power transmission to the consumers with the degree 110 (150) kV	CT	0,5
		TT	0,5
		Meter	0,5
4	Set precision classes of the measuring complexes used to register power transmission to the consumers with the degree 35 kV	CT	0,5
		TT	0,5
		Meter	1,0
5	Set precision classes of the measuring complexes, used to register power transmission to the consumers with the degree 10(6) kV	CT	0,5
		TT	0,5
		Meter	2,0
6	Set precision class of the meters, used to register power transmission to the consumers with the degree 0,38 kV	Meter	2,0

6.6.1.5 The amount of the admissible normative power unbalance in the grid UB_{Dnorm} is calculated using the formula (7) under the condition that the metrological characteristics of the measuring complexes correspond to those provided in the table 1.

6.6.2 Calculation of the power non-technical losses component, conditioned by the existence of groups of the accounting devices of the same type, actual metrological characteristics of which differ from the normative ones

6.6.2.1 According to the data, provided in [2,3], the verification of the induction meters has shown that they have a low metrological reliability and exceed the bounds of the precision classes even during the interverification period.

Interverification period for the single-phase induction meters is 8 years, for the three-phase meters - 4 years.

6.6.2.2 Presuming that the average term of meters after the last repair is about 4 and 2 years, the average systematized error trend according to chapter [2,3] is about 0,2 relative units per year for both types of meters. Thus, the systematized error Δ_{met} for the induction meters of the corresponding type and precision class is calculated by the formula:

$$\Delta_{met} = -0,2 T_{ver} K_{met}, \text{ where} \quad (9)$$

T_{ver} - Meter service term after the last verification, years;

K_{met} - Meter precision class.

6.6.2.3 Systematized error for the electronic (statistic) meters $\Delta_{met} = 0$.

6.6.2.4 Using the conservative approach, the misregistration of power transmission is calculated only for the domestic consumers. Misregistration of power transmission for legal entities (industrial and non-industrial consumers) is equal to zero.

6.6.2.5 Misregistration of power transmission to the domestic consumers on one induction meter of the corresponding precision class, $A_i^{misregistr\ ation}$ per year is equal:

$$A_i^{misregistr\ ation} = (\Delta_{met} / 100) A_{aver}, \text{ where} \quad (10)$$

A_{aver} - Average annual power transmission to one domestic consumer.

6.6.2.6 Misregistration of power transmission to the domestic consumers, conditioned by the existence of accounting devices of the same type, the actual metrological characteristics of which differ from the fixed is equal to:

$$A_{misregistr\ ation} = \sum_{i=1}^{N_H} A_i^{misregistr\ ation} N_i, \text{ where} \quad (11)$$

N_i - Amount of induction meters of the corresponding type and precision class.

6.6.3 Calculation of the power non-technical losses component, conditioned by the existence of the sensitivity threshold in the inductive meters

6.6.3.1 Using the conservative approach, power misregistration is conditioned by the existence of the sensitivity threshold in the inductive meters, it is calculated only for the domestic consumers, where the most widespread meters of the precision class 2,5 are installed. According to the expert appraisal, it is presumed that the nominal current for 90% of the total number of such meters is 5A, and for the rest 10% - 10A. Misregistration of power transmission for the domestic consumers, equipped by the induction meters of precision 2,0 and 1,0, as well as for the legal entities (industrial and non-industrial consumers) is equal to zero.

6.6.3.2 Misregistration of power is conditioned by the existence of the sensitivity threshold in the inductive meters that is the minimal amount of current when the meter disc turns round constantly. Sensitivity threshold at State standard 6570 for the most widespread single-phase inductive meters of the precision class 2,5 is 0,85%. Total capacity of the devices of the domestic consumer (radiotelephones, radio and television equipment, etc, which are in the waiting mode) do not surpass the sensitivity threshold. The time, during which only the equipment which consume less than the sensitivity threshold is connected to the grid is more than 12 hours per day (night hours and the period when people are not at home during the working day). It is 4380 hours per year.

According to such assumptions, the misregistration of power for one single-phase meter of precision class 2,5 per year will be[3]:

$$\Delta A_{misregistr\ ation\ 2.5} = -(U_{nom} I_{nom} T_t (0{,}85 / 100) \text{, where} \qquad (12)$$

U_{nom} - Nominal current of the meter, 220 W;

I_{nom} - Nominal current of the meter, A;

T_t - Time, during which only the equipment which consume less than the sensitivity threshold is connected to the grid.

6.6.3.3 Misregistration of power transmission to the domestic consumers, equipped by the induction meters of the corresponding type , $A_{misregistr\ ation\ 2.5 sum}$ per year will be:

$$\Delta A_{misregistr\ ation\ 2.5 sum} = \Delta A_{misregistr\ ation\ 2.5} N_{met\ 2.5} \text{, where} \qquad (13)$$

$N_{met\,2.5}$ - Amount of single-phase inductive meters of precision class 2,5, for which the assumptions provided in chapter 6.4.3.1.are used.

If the data on 2.5 accuracy induction meters with nominal current 5A and 10A are missing, it shall be assumed that the amount of 5A meters is 90% while 10A meters are 10%.

6.6.4 Calculation of RVTVE amounts and untechnical losses

6.6.4.1 RVTVE amount $\Delta A_{ALamount}$, is calculated having reduced it by the absolute amounts of the misregistrations of power transmission to the consumers, conditioned by the existence of accounting devices of the same type, the actual metrological characteristics of which differ from the fixed and by the existence of the sensitivity threshold in the inductive meters:

$$\Delta A_{ALamount} = \Delta A_{AL} - \Delta A_{misregistr\ ation} - \Delta A_{misregistr\ ation\ 2.5}. \quad (14)$$

6.6.4.2 The amount of the relative RVTVE $\Delta A^*_{ALamount}$ is calculated using formula:

$$\Delta A^*_{ALamount} = (\Delta A_{ALamount} / A_{DG}) \cdot 100\%. \quad (15)$$

6.6.4.3 The amount of the relative NPL, is equal to the difference between the **relative** amounts of RVTVE and NVTVE:

$$\Delta A^*_{UTamount} = \Delta A^*_{ALamount} - \Delta A^*_{NATPL} \quad (16)$$

6.6.5 Calculation of the power untechnical losses component, conditioned by the faults in the power transmission organization

6.6.5.1 The relative amount of power untechnical losses component $\Delta A^*_{AUPLorg}$, conditioned by the faults in the power transmission organization, is calculated as the difference between the amount of the report relative TPL and the top bound of the admissible unbalance:

$$\Delta A^*_{AUPLorg} = \Delta A^*_{UTamount} - UB_{Dnorm}. \quad (17)$$

6.6.5.2 If the relative amount of the power untechnical losses component, conditioned by the faults in the power transmission organization $\Delta A^*_{AUPLorg}$, is more than zero, the amount of the of the power untechnical losses component, conditioned by the faults in the power transmission organization, MW·h. Is equal:

$$\Delta A_{AUPLorg} = A_{DG}(\Delta A^{*}_{AUPLorg} / 100) \quad (18)$$

6.6.5.3 If the relative amount of the power untechnical losses component, conditioned by the faults in the power transmission organization $\Delta A^{*}_{AUPLorg}$, is less or equals to zero, the amount of the of the power untechnical losses component, conditioned by the faults in the power transmission organization, MW·h. Should be equal to zero:

$$\Delta A_{AUOPLorg} = 0 \quad (19)$$

6.6.6 Calculation of RVTVE for its transition to the indirect carbon dioxide emissions

RVTVE for its transition to the indirect carbon dioxide emissions, which is corrected according to the amount of the nontechnical power losses, conditioned by the faults in the power transmission organization; is equal to the difference between the amounts of RVTVE, calculated by the formula (14) and the amount of the nontechnical power losses component, conditioned by the faults in the power transmission organization, calculate using the formula (18) or (19):

$$\Delta A^{emissions}_{ALamount} = \Delta A_{ALamount} - \Delta A_{AUPLorg} \quad (20)$$

7. Monitoring of TVE amount calculation results in 0.38-150 kV power grid in order to estimate indirect CO2 emissions

The monitoring of TVE amount in 0.38-150 kV power grids of a power supply company used for estimation of indirect CO2 emissions for respective periods is performed by checking:

- compliance of the official statistic reports of the power supply company in 1-B TVE form, form No. 67 as well as annual report of the company for the respective year with the data used for calculation;

- compliance of the TVE amount calculation procedure to that of the given methodology.

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8. SOU-H EE 11.315:2007 (IDPs 031/08-2007) Number of electric energy and electric power. A typical method of measurement

Annex 4

The list of new equipment that was installed in the networks of Vinnytsyaoblenergo PJSC since 2002.

ID number	Equipment	Year
1.	Single-phase meters SO-5000	2002
2.	Meters SOE-5020N	2002
3.	Power meters SO-I449 L1	2002
4.	Power measurement devices	2003
5.	Insulated wire for the inlets into the buildings10-16mm2	2003
6.	Transformers TM-40, TM-25	2003
7.	Insulators LM-1T06	2003
8.	Insulators LK 70/110-3	2005
9.	Wire AsXSn 4*16	2005
10.	Meter SE 680 3-phase	2005
11.	Technical measures complex programme RETOM-51	2005
12.	Transformers TFZM-35 200/5	2005
13.	Insulators LK 70/110	2005
14.	VVEL	2005
15.	Mcroprocessor devices MRZS, IP MRZS	2005
16.	Transformers NTMI-10	2005
17.	Power meters SM-EA09	2005
18.	Wire AsXSn 2*16	2005
19.	Relay PC40 M2-5/40	2005
20.	Controller PCMCIA Serial	2005
21.	Sulfur hexafluoride [SF6] circuit breakers 110 kV LTB-145 D1/B	2005
22.	Power meters CE 6803 1T 220B 5-50A 3-phase	2005
23.	Multiphase power meters STK-3-10Q2H4M	2005
24.	Vacuum circuit breakers VR 1-10-20/630 U2 with the adaptation set and surge suppressor	2005
25.	Curent transformer TFZM-110 B1 300-600/6	2005
26.	Spares of single-phase and three-phase power meters	2005
27.	Set d/LOE 5010 (El.board, shunt, reading mechanism)	2005
28.	Vacuum circuit breakers VR 1-10-20/630 U2 with the adaptation set and surge	2006
29.	Power meters SM-EA09	2006
30.	Multitariff power meters STK3-10Q2TZM A+, A-, ...100B	2006
31.	Transformers TPL-10 200/5	2006
32.	Transformer reserve protection TRP	2006
33.	UZA-AT-5111140	2006
34.	Set d/LOE 5010 (El.board, shunt, reading mechanism)	2006
35.	Power meters LM-1t 24	2006
36.	Transformers LTM 10-2 100/5	2006
37.	Devices MRZS-05-02	2006
38.	Insulators LK-70	2006

39.	Frequency relay UFR 3-0,3-0,1	2006
40	Vacuum circuit breakers VVEL 10 5/630 У2	2007
41.	Current transformers NTMI-10	2007
42.	Vacuum circuit breakers VR2-10-20/1000 with the adaptation set and surge	2007
43.	Transformer reserve protection TRP	2007
44.	Inlet circuit breaker 1600A with the adaptation set	2007
45.	Set d/LOE 5010 (El.board, shunt, reading mechanism)	2007
46.	Sulfur hexafluoride [SF6] circuit breaker 110 kV LTB-145 D1/B	2007
47.	Vacuum linear circuit breaker	2008
48.	Mcroprocessor devices MRZS-05	2008
49.	Polymeric Insulations LK	2008
50.	Two-phase device RZT	2008
51.	Current transformers TZRL-70	2008
52.	Current transformers NTMI-10	2008
53.	Vacuum circuit breakers BP35HC-35-20/600	2008
54.	Wire SIP-5 (4x35, 4x25)	2008
55.	Polymeric device UPP-40/110	2008
56.	Sulfur hexafluoride [SF6] circuit breaker 3AP1FG-145	2008
57.	Sets LOE 5010	2008
58.	Relay RT-81/1, RU-21/005	2008
59.	Single-phase meters	2008
60.	Three-phase meters	2008
61.	Multifunctional meters ASE 6000	2008
62.	Insulators LKC 70, LKC 120	2009
63.	Transformers TVLM-10, NTMI-10, NAMI-10	2009
64.	Vacuum circuit breakers VR-2-10	2009
65.	Commutation module with the vacuum circuit breakers VV/TEL-10	2009
66.	Wire SIP-5 (2x16)	2009
67.	Sets LOE 5010	2009
68.	Sets SOE -EA05R	2009
69.	Single-phase meters	2009
70.	Three-phase meters	2009
71.	Mcroprocessor devices MRZS-05	2009
72.	Vacuum recloser PBA/TEL-10	2009
73.	Polymeric device UPP 40-110	2009
74.	Transformers TLM-10	2009
75.	Three-phase meter "Merydian LTE-1.03T"	2009
76.	Microprocessor device RZL-03.2006	2009
77.	Vacuum circuit breakers 10 kV VVL-105/630У2	2009
78.	Sets for the meters "Modul-1"	2009
79.	Three-phase meter NIK	2009
80.	Sets for the single-phase meters	2010
81.	Wire SYP-5 (2x16, 4x50, 4x35,4x25)	2010
82.	Vacuum circuit breakers VR-2-10	2010
83.	Commutation module with the vacuum circuit breakers VV/TEL-10	2010
84.	Microprocessor devices MP3C-05	2010
85.	Polymeric insulations PPC 10/630	2010

86.	Insulators LKC 70, LKC 120	2010
87.	Sets SOE -EA05R	2010
88.	Sets for the meters "Modul-1"	2010
89.	Vacuum reclosers PBA/TEL-10	2010
90.	Polymeric device UPP 40-110	2010
91.	Transformers TOLU-10,TPLU-10, NTMI-10	2010
92.	Sets for single-phase	2011
93.	Wire SIP-5	2011
94.	Sets SOE -EA05R	2011
95.	Microprocessor device MRZS-05	2011
96.	Commutation module with the vacuum circuit breakers VV/TEL-10	2011
97.	Vacuum circuit breakers VR-1-10	2011