Monitoring report

on Joint Implementation project

«TECHNICAL RE-EQUIPMENT OF TYUMEN' CHPP-1 WITH PUTTING INTO OPERATION OF A COMBINED-CYCLE GAS PLANT»

Monitoring period: 01.01.2012 – 30.09.2012

Version 1.1 (final after verification)

Date of preparation: 24 October 2012

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Section A. General information on project activity

A.1. Introduction

The aim of this report – representation of the results of monitoring and calculation of volume of Emission Reduction Units (ERUs) generated as a result of realization of the Joint Implementation project "Technical re-equipment of Tyumen' CHPP-1 with putting into operation of a combined-cycle gas plant" for the period from 1st January 2012 to 30th September 2012.

The technical realization of the project is to build at Tyumen Combined Heat and Power Plant-1 (Tyumen CHPP-1) a combined cycle gas turbine power generating block 190/220 MW, plant number 2. Act on the acceptance of the block equipment after comprehensive testing was signed December 21, 2010.

The considered project was approved in Russian Federation as a Host Party by the order of Ministry of economic development #709 of 30th December 2010. The Letter of Approval from Finland YM20/44/2011 has been received by 13th January 2012.

A.2. Brief description of the project

The project consists a reconstruction of the existing of Tyumen CHPP-1 with the replacement of obsolete equipment. There were decommissioned: three boilers type "BKZ-210-140f" ##4-6 и two turbines type "PT-60-130/13" ##3,4. Instead a second combined cycle gas plant with power capacity 190/220 MW (in heat/condensed mode) was installed in the axes of the main building ##13-28. The combined cycle plant includes:

- Gas turbine V 64.3 A by the company «Ansaldo»;
- Steam turbine T-130/160-12,8 by JSC «Silovie machini»;
- Steam boiler E-500-13,8-560 GN produced by JSC "AMAlliance"

Since 2004 Tyumen CHPP-1 has been operating a CCGT energy block with same capacity, plant #1. A main and reserve fuel for the CCGT energy blocks #1 and #2 as well as basic part of the other energy generation equipment of Tyumen CHPP-1 is natural gas.

The project reduces greenhouse gas emissions by displacing electricity produced in the Integrated Power Systems (IPS) of the Urals and the Mid Volga by power plants burning fossil fuels with traditional technologies of electricity generation mainly using steam turbines (Rankine cycle). Thermal energy from the considered CCGT block comes in the form of hot water into the existing district heating system of the city of Tyumen. An additional amount of heat supplied as a result of the project from CCGT block #2 would abandon the construction of new boiler houses and the expansion of existing sources of heat generation in the city.

Table A.2.1. Status of the project implementation

Stage	**Status**
The contract # 1987 of the general contracting for the construction of "turnkey" power block # 2 of the Tyumen CHP-1 for the needs of JSC "TGC-10" Tyumen CHPP-1	Signed by 4th February 2008 between OJSC "TGC-10" (previous owner of the plant) and CJSC "KVARZ-Tyumen"
Act of formal acceptance of the completed construction by the acceptance committee	Approved 21st December 2010 by acceptance committee of the OJSC "Fortum"
Act of the working committee on acceptance of the equipment after comprehensive testing	Approved by 21st December 2010 by working committee from representatives of customer and

	contractors
Certificate of compliance of the reconstructed objects of capital construction with requirements of technical regulations, other regulations and design documentation # P-1316	Issued to OJSC "Fortum" by North-Urals Department of Federal Service on environmental, technological and nuclear supervision by 31st December 2010

A.3. Emission reduction for monitored period

Detailed calculations of the generation of Emission Reduction Units are presented in Section D.

Actual volume:

from 1st January to 30th September 2012: 134 288 tonnes CO_{2eq}

According to the PDD, version 6 of 14/09/2010 the estimated volume of ERUs:

from 1st January to 31st December 2011: 443 389 tonnes CO_{2eq}

The actual formation of ERUs is less than calculated in PDD due to the transfer of the commissioning of the CCGT block #2 to December 2010 which affected the volume of production of electric and thermal energy due to debugging of equipment during 2011.

The actual formation of ERUs in annual calculation is less than in PDD due to the fewer generation of electricity and heat energy and exaggerated technical and economic performance of energy block operation in the project documentation.

A.4. Contact information of project participants

Representative of the project owner:

Organisation:	OJSC "Fortum" branch Tyumen CHPP-1 of
Street/P.O.Box:	Odesskaya
Building:	1
City:	Tyumen
State/Region:	-
Postal code:	625023
Country:	Russian Federation
Phone:	+7 (3452) 798-359
Fax:	+7 (3452) 41-50-37
E-mail:	prm.ttec1@fortum.ru
URL:	www.fortum.ru
Represented by:	
Title:	Director of Tyumen CHPP-1
Salutation:	Mr.
Last name:	Gusakov
Middle name:	Sergey Gennadievich

Representative of consultant of the project owner and developer of the monitoring report:

Organisation:	CTF Consulting, LLC
Street/P.O.Box:	Schipok
Building:	9/26, building 1
City:	Moscow

State/Region:	-
Postal code:	115054
Country:	Russia
Phone:	+7 (495) 984-59-51
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E-mail:	konstantin.myachin@carbontradefinance.com
URL:	http://www.carbontradefinance.com/
Represented by:	
Title:	Carbon projects manager
Salutation:	
Last name:	Myachin
Middle name:	Konstantin Yurevich

B. System of monitoring of greenhouse gases emission reduction

B.1 Information on the collection and archiving of information on the environmental impacts of the project

In accordance with Federal Law № 7-FZ of 10.01.2002 "On Environmental Protection" heads of organizations and professionals who are responsible for making decisions in the exercise of economic activities that have a negative impact on the environment must be trained in the field of environmental protection and environmental safety. In the staff of the Tyumen CHPP-1 there is an engineer for the protection of the environment which is responsible for ensuring compliance of the enterprise with environmental rules and regulations and acquisition of state permits for emissions and discharges of hazardous substances, waste disposal

In accordance with the requirements of Art. 14, 22 of the Federal Law "On Environmental Protection" Tyumen CHPP-1 of OJSC "Fortum" has a plan of normatives for maximum permissible emissions (MPE), approved by the decree № 180 of the Office of Technological and Environmental Supervision of Rostechnadzor for the Tyumen region on May 15, 2009. Validity of the plan - until April 1, 2013 Rostechnadzor issued a permit for emission of harmful substances (pollutants) into the air # 180, effective from May 15, 2009 to April 1, 2013. Emissions of harmful substances (pollutants) do not produce the maximum permissible concentration and therefore temporarily agreed emissions have not been established.

Periodic monitoring of environmental impacts is performed in accordance with the Schedule of monitoring of compliance with MPE by sources of industrial emissions of Tyumen CHPP-1 for 2011-2012 (instrumental measurements are carried out jointly with the Federal State Organization in the Tyumen Region " TsLATI in the Ural Federal District") and Internal control plan for compliance with the MPE by Tyumen CHPP-1 for 2011-2012 approved by the chief engineer of the Tyumen CHPP-1.

Monitoring of compliance with the norms for maximum allowable discharges into the River Tura is performed in accordance with the Program of regular observations on the water body and water protection area (discharge number 1 and number 2) approved by the director of Tyumen CHPP-1 together with the head of the department of water resources in the Tyumen region of the Federal water resources Agency.

B.2 Methodological approach for the monitoring

Monitoring of greenhouse gases emission in the project and baseline was performed in accordance with PDD, version 6 of 14/09/2010.

Project applies JI specific approach in accordance with principles of Guidance on criteria for baseline setting and monitoring, version 03.

Project boundary include (see. Pic. B.2.1 below):

- New CCGT block, plant #2;
- Auxiliary equipment of new CCGT block;
- Thermal power plants of Integrated Power Systems of Urals and Mid Volga (see Annex 2 of the PDD version 6 of 14/09/2010);
- New gas fired boilers at the boiler houses of Tyumen city in the absence of the CCGT plant #2 project

Picture B.2.1 Project boundary with monitoring points

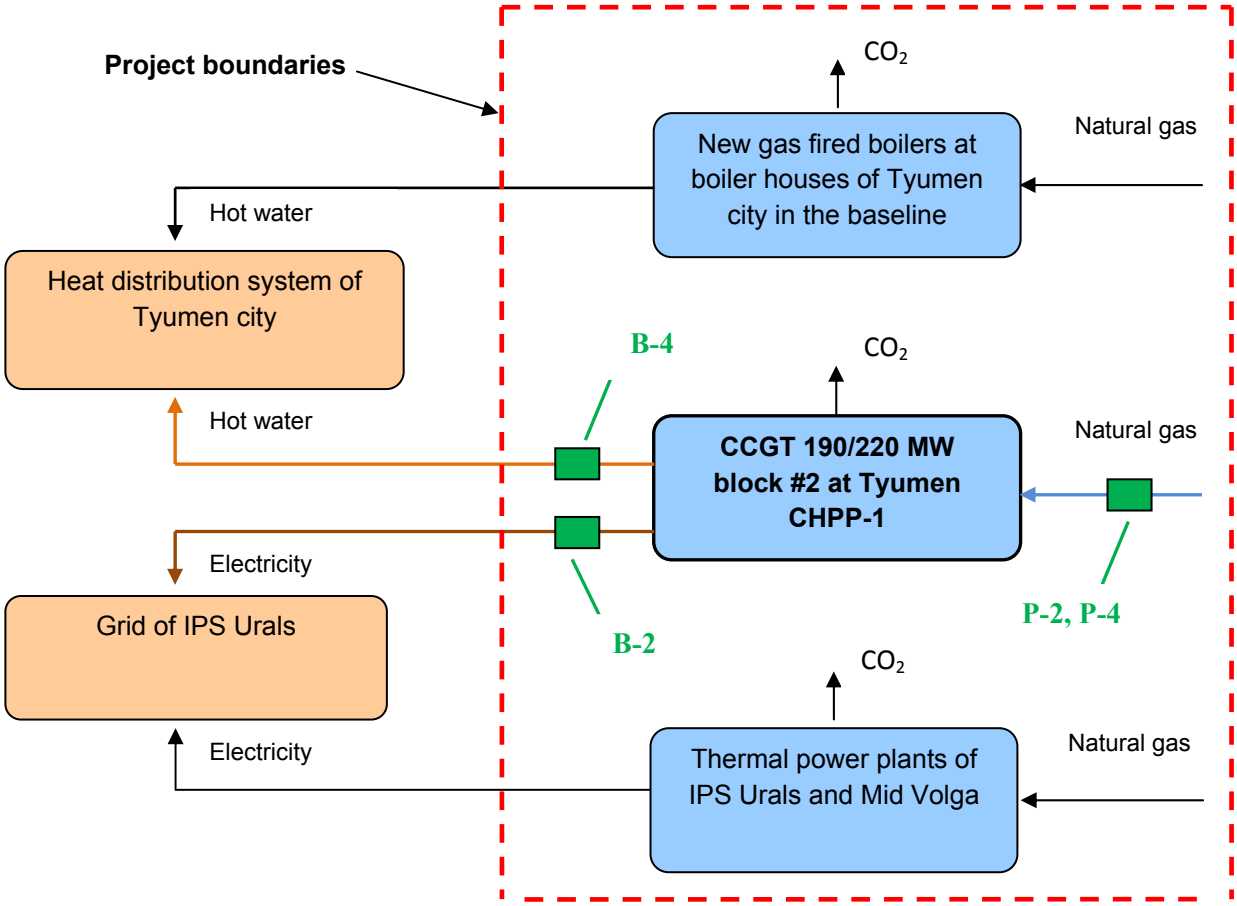

Table B.2.1. Parameters monitored during crediting period

# of point[1]	Parameter, unit of measurement	Designator	Periodicity of measurement	Source of data at Tyumen CHPP-1
P-2	Consumption of natural gas by CCGT-190/220 MW energy block #2, ths. m^3	$FC_{NG,y}$	Constantly	Full-plant system of technological monitoring "Delta/8" by data of Automated system of process control (ASPC) "KI-2EB-Tyumen CHPP-1-Fortum" of CCGT block #2
P-4	Net calorific value of natural gas, kcal/m^3	$NCV_{NG,y}$	Established by natural gas supplier	Monthly passport of gas quality, Tyumen department of "Gazprom transgas Surgut", LLC
B-2	Output of electricity to external consumers from CCGT-190/220 MW energy block #2 of	$EG_{PJ,y}$	Constantly	Full-plant system of technological monitoring "Delta/8" by data of System of automated information-

[1] Tables D.1.1.1. и D.1.1.3. of PDD, version 6 of 14/09/2010

	Tyumen CHPP-1, ths. kWh			measuring for commercial accounting of electric power (SAIIM CAEP)
B-4	Output of heat to external consumers from CCGT-190/220 MW energy block #2 of Tyumen CHPP-1, Gcal	$HG_{PJ\,y}$	Constantly	Full-plant system of technological monitoring "Delta/8" by data of ASPC "KI-2EB-Tyumen CHPP-1-Fortum" of CCGT block #2

Table B.2.2. Data and parameters fixed ex-ante in the PDD, version 6 of 14/09/2010

# of point[2]	Parameter, unit of measurement	Designator	Value
P-5	Coefficient of CO_2 emission for natural gas, tones CO_2/TJ	$EF_{CO2,\,NG,\,y}$	56,1
B-3	Combined CO_2 emission factor for grid electricity produced in IPS of Urals and Mid Volga, tonnes CO_2/MWh	$EF_{CO2\,grid\,y}$	0,5772
-	Efficiency of new gas fired boilers at the boilers houses of Tyumen city in the baseline, %	η_{boiler}	93,3

Tyumen CHPP-1 was commissioned by 17th November 1960 and to date has a different set of installations:

- 2 energy blocks of CCGT,
- 3 steam turbines,
- 7 power boilers,
- 4 hot-water boilers

Installed power capacity – 662 MW, heat capacity – 1631 Gcal/h. Power plant has two Gas Distribution Points (GDP) and one Gas Treatment Point (GTP) for supplying of the gas turbines of CCGT #1 and #2 with purified high pressure gas. Despite the fact that GDP and GTP have verified metering units with commercial class counting their data is impossible to apply for the monitoring of considered project as it represent the total natural gas consumption by all equipment.

For monitoring of the consumption of natural gas by CCGT block # 2 considered in this project the technical class metering units separate on the boiler and gas turbine are used. These units have a chamber orifice plate, temperature and pressure sensors that measure the temperature of the gas passing through the orifice, the gas pressure and the differential pressure of gas on the orifice. Bringing the gas flow to normal conditions is performed by Automated system of process control (ASPC) "KI-2EB-Tyumen CHPP-1-Fortum" performed on base of controllers "SPPA-T3000" installed as a part of the equipment package of energy block #2. Date from ASPC is transferred to the full-plant system of technological monitoring "Delta/8" and archived there.

Measurement of the electricity output from energy block #2 is performed by eighteen multifunctional three-phase electric energy meters "Alpha 1800" integrated into the certified System of automated information-measuring for commercial accounting of electric power (SAIIM CAEP).

[2] Tables D.1.1.1. и D.1.1.3. of PDD, version 6 of 14/09/2010

Output of the heat energy to the external consumers from CCGT block #2 is carried out by means of two successively installed horizontal heaters of grid water (HHGW) and one parallel installed water-water heat exchanger (WWHE). The calculation of the amount of the heat output is done by measurement of the grid water flow through HHGW-1,2 and difference of the grid water temperature before and after HHGW-1,2. The method for the WWHE is same. The CCGT energy block #2 does not have heat removal points for internal needs and all heat output is directed to the external consumers through the main plant collector.

B.3 Organization of the monitoring implementation

OJSC "Fortum" has several projects registered as Joint Implementation in Russian Federation and coordinates the work on them on the corporate level.

For operation of the project monitoring at Tyumen CHPP-1 in 2011 there was no need for introduction of the new reporting forms. Existing sources of data are used (see Table B.2.1.). Main function for data processing and preparation of respective reporting is hold by Production and Technical Department. The plant operates the document exchange in electronic form.

Nevertheless to ensure a better compliance of the plant departments with the requirements to the Joint Implementation project the director of Tyumen CHPP-1 has signed an Order #151 of 08/06/2012 «On appointment of responsible persons for monitoring conduction" which also approved an integrated project reporting form of higher hierarchy which include monthly actual values of all the parameters used for monitoring. Data from this integrated reporting form is used for preparation of the Monitoring report.

Storage of all records on monitoring for JI project (describing the period from January 1, 2011 to December 31, 2012) in paper/electronic form is provided until January 1, 2015.

B.4 Metrological support of the monitoring for CCGT block #2

Table B.4.1. Measurement equipment and systems used for monitoring and status of their verification/calibration

Type of the device	Accuracy class	Date of the previous verification/calibration	Periodicity of verificaton/calibration	Note
Consumption of the natural gas by the boiler				
Chamber orifice plate DK, d_{20}=243,69 mm	-	06.11.2008	4 years	
Resistance thermometer TMT-1-1, plant designation 02HHG10CT001	Class B	13.06.2010	3 years	
Differential pressure sensor YOKOGAWA EJX110A, plant designation 02HHG10CF001, 02HHG10CF002	0,075%	17.11.2009	3 years	
Pressure sensor YOKOGAWA EJA530A, plant designation 02HHG10CP002	0,2%	19.05.2010	3 years	Periodicity of verification of 3 years for this model has been confirmed by the manufacturer
Consumption of natural gas by gas turbine				
Chamber orifice plate DKS-10-150, d_{20}=95,3663 mm	-	23.08.2010	4 years	
Resistance thermometer TMT-1-1, plant designation 02MBP12CT001	Class B	20.01.2010	3 years	
Differential pressure sensor Sapphire -22MT-2440, plant designation 02MBP12CF001, 02MBP12CF002	0,5%	19.05.2010	3 years	
Pressure sensor Sapphire-22MT-2160, plant designation 02MBP12CP001	0,25%	20.05.2010	3 years	
Heat output, direct grid water from HHGW-1,2				
Orifice plate DBS, d_{20}=449,63 mm	-	21.01.2010	4 years	
Resistance thermometer TMT-1-3, plant designation 02NDA10CT002, 02NDB10CT001	Class B	05.04.2010	3 years	

Differential pressure sensor Sapphire-22MT, plant designation 02NDA10CF001	0,25%	04.02.2012	2 years	Previous verification by 01.03.2010
Heat output, grid water from WWHE				
Chamber orifice plate DKS-10-350, d_{20}=201,14 mm	-	01.06.2010	4 years	
Resistance thermometer TMT-1-3, plant designation 02NDB40CT001, 02NDB40CT002	Class B	30.03.2010	3 years	
Differential pressure sensor Sapphire-22MT, plant designation 02NDB40CF001	0,25%	04.02.2012	2 years	Previous verification by 01.03.2010
Output of electricity to external consumers				
Multifunctional three-phase electric energy meters Alpha 1800 (A1802RALXQV-P4GB-DW-4), serial number (electricity transmission line):				
01214602 (2G-1)	0,2S/0,5	21.10.2010	12 years	
01214613 (2G-2)	0,2S/0,5	21.10.2010	12 years	
01214607 (Centralnaya-1)	0,2S/0,5	21.10.2010	12 years	
01214624 (Centralnaya-2)	0,2S/0,5	21.10.2010	12 years	
01214615 (Tyumen-1)	0,2S/0,5	21.10.2010	12 years	
01214638 (Tyumen-2)	0,2S/0,5	21.10.2010	12 years	
01214625 (Tyumen -3)	0,2S/0,5	21.10.2010	12 years	
01214601 (Domostroitelnaya)	0,2S/0,5	21.10.2010	12 years	
01214605 (Montazhnaya-1)	0,2S/0,5	21.10.2010	12 years	
01214634 (Montazhnaya -2)	0,2S/0,5	21.10.2010	12 years	
01214647 (Motorny-1)	0,2S/0,5	21.10.2010	12 years	
01214637 (Motorny-2)	0,2S/0,5	21.10.2010	12 years	
01214606 (TCHPP2-1)	0,2S/0,5	21.10.2010	12 years	
01214603 (TCHPP2-2)	0,2S/0,5	21.10.2010	12 years	
01214610 (Voinovka)	0,2S/0,5	21.10.2010	12 years	
01214650 (Granichnaya)	0,2S/0,5	21.10.2010	12 years	
01211378 (OV-1)	0,2S/0,5	20.08.2010	12 years	
01214619 (OV-2)	0,2S/0,5	21.10.2010	12 years	
The system of automated information-measuring for commercial accounting of electric power (SAIIM CAEP) of OJSC “Fortum” branch Tyumen CHPP-1 #229	Registered in the State register of measuring instruments under # 48342-11 of 06.12.2011 (Certificate of type approval of measuring RU.E.34.004.A # 44602)			

Full-plant system of technological monitoring	
Computer complex Delta/8	Rospatent Certificate of official registration of software № 2003610158. Registered in the Registry of Computer Programs January 14, 2003
Automated system of process control of block #2	
Equipment of automated system of process control at the thermal power plant type SPPA-T3000	Certificate of conformity of Gosstandard of Russia № ROSS DE.AB68.A00472 to 30.11.2009. Issued for "Siemens AG". Address: Siemensstrasse 84, 76187 Karlsruhe, Germany

C. Revision of monitoring plan

This monitoring report contains a revision of the monitoring plan presented in section D of PDD, version 6 of September 14, 2011 (on this version of PDD the Bureau Veritas Certification Holding SAS issued a determination report # Russia-DET/0082/2011 version 01 of September 16, 2010). The changes have been made to adapt a monitoring plan and represent the actually existing situation according to the "Guidance on criteria for baseline setting and monitoring" (Version 03). All the rest parameters and formulae are in compliance with PDD.

Mentioned in PDD	Implemented in practice	Explanation
Section D. Table D.1.1.1., Table D.1.1.3. The annual monitoring of key parameters of power plant operation is prescribed for: - Volume of natural gas consumption, - Output of electricity, - Output of heat energy.	Monitoring of the key parameters of the project is done monthly. The monitoring report is prepared for 9 months of 2012.	Preparation of the monitoring report for the mentioned period better corresponds to the needs of the project owner. As soon as a power plant monthly reports on the key parameters used in monitoring the revision of the monitoring plant does not impair its accuracy and applicability. Moreover by an Order #151 of 08/06/2012 Tyumen CHPP-1 approved an integrated project reporting form of higher hierarchy to be signed by the responsible personnel of the power plant. This reporting form was used for preparation of the considered Monitoring report and includes monthly actual values of all the parameters required for monitoring based on the data sources mentioned in Table B.2.1. (see also section B.3.).

D. Calculation of emission reduction

D.1 Project CO_2 emissions

$$PE_y = FC_{NG,y} * COEF_{NG,y}$$ (formula **1** in PDD)

Where:

PE_y	Project emissions for the period *y*, tonnes CO_2
$FC_{NG,y}$	Total amount of fuel consumed by the project power plant for the period y, m^3
$COEF_{NG,y}$	Volumetric coefficient of CO_2 emission for the natural gas, tonnes CO_2/m^3, calculated as:

$$COEF_{NG,y} = NCV_{NG,y} * EF_{CO2NG}$$ (formula **2** in PDD)

Where:

$NCV_{NG,y}$:	Net calorific value of natural gas, GJ/m^3
EF_{CO2NG}:	Coefficient of CO_2 emission for natural gas, tonnes CO_2/GJ

D.2 Baseline CO_2 emission

$$BE_y = BE_{grid\,y} + BE_{heat\,y}$$ (formula **20** in PDD)

Where:

BE_y	Total baseline emissions for the period y, tonnes CO_2
$BE_{grid\,y}$	Baseline CO_2 emissions from production of electricity in IPS of Urals and Mid Volga, tonnes CO_2
$BE_{heat\,y}$	Baseline CO_2 emissions from production of heat by new gas fired boilers at the boilers houses of Tyumen city in the baseline, tonnes CO_2/year

$$BE_{grid\,y} = EG_{PJ\,y} * EF_{CO2\,grid\,y}$$ (formula **21** in PDD)

Where:

$EG_{PJ\,y}$	Output of electricity to external consumers from CCGT block #2 of Tyumen CHPP-1, ths. kWh
$EF_{CO2\,grid\,y}$	Combined CO_2 emission factor for grid electricity produced in IPS of Urals and Mid Volga, tonnes CO_2/MWh

$$BE_{heat\,y} = HG_{PJ\,y} \bullet EF_{NG} * 4.1868/\eta_{boiler}$$ (formula **22** in PDD)

Где:

$HG_{PJ\,y}$	Output of heat to external consumers from CCGT block #2 of Tyumen CHPP-1, Gcal
η_{boiler}	Efficiency of new gas fired boilers at the boilers houses of Tyumen city in the baseline, %
EF_{CO2NG}	Coefficient of CO_2 emission for natural gas, tonnes CO_2/GJ;
4.1868	Conversion factor from calories to Joules

D.3 Emission reduction

$$ER_y = BE_y - PE_y$$ (formula **36** in PDD)

Где:

ER_y	Emission reduction for the period *y*, tonnes CO_{2eq}
BE_y	Baseline emissions for the period *y*, tonnes CO_2
PE_y	Project emissions for the period *y*, tonnes CO_2

D.4 Tables demonstrating the results of calculation on presented formulae

Monthly reporting data of Tyumen CHPP-1 for 2012

CCGT 190 MW energy block #2				For all plant	
Year 2012	**Natural gas consumption, ths. m3**	**Electricity output from bars, ths. kWh**	**Heat output, Gcal**	**Net calorific value of natural gas, kcal/m3**	**Net calorific value of natural gas, MJ/m3**
January	41 106	134 899	126 930	7 988	33,45
February	25 967	79 892	69 548	7 986	33,44
March	29 658	105 004	63 790	7 978	33,4
April	22 274	75 396	36 981	7 978	33,4
May	35 313	132 867	31 687	7 977	33,4
June	32 380	116 213	3 555	8 007	33,52
July	34 045	121 621	14 786	8 010	33,54
August	31 793	117 119	9 570	8 071	33,79
September	28 527	97 912	26 315	8 032	33,63
Totally	**281 063**	**980 923**	**383 162**	**8003**	**33,51**

Parameters fixed ex-ante in the PDD, version 6 of 14/09/2010

Combined CO_2 emission factor for grid electricity to be replaced, ths CO_2/MWh	**0,5772**
Efficiency of new gas fired boilers at the boiler houses in the baseline,%	**93,3%**
CO_2 emission factor for natural gas, tonnes CO_2/TJ	**56,1**

Generation of Emission Reduction Units in 2012

Year 2011	Project emissions from natural gas consumption, tonnes CO_{2eq}	Baseline emissions for electricity, tonnes CO_{2eq}	Baseline emissions for heat, tonnes CO_{2eq}	Total baseline emissions, tonnes CO_{2eq}	Emission Reduction Units generation, tonnes CO_{2eq}
January	77 137	77 864	31 954	109 818	32 681
February	48 714	46 114	17 508	63 622	14 908
March	55 571	60 608	16 059	76 667	21 096
April	41 736	43 519	9 310	52 829	11 093
May	66 167	76 691	7 977	84 668	18 501
June	60 890	67 078	895	67 973	7 083
July	64 059	70 200	3 722	73 922	9 863
August	60 267	67 601	2 409	70 010	9 743
September	53 820	56 515	6 625	63 140	9 320
Totally	**528 361**	566 190	96 459	**662 649**	**134 288**

Annex 1

List of abbreviations

ASPC	Automated System of Process Control
CCGT	Combined-Cycle Gas Turbine
CHPP	Combined Heat and Power Plant
GDP	Gas Distribution Point
GTP	Gas Treatment Point
ERU	Emission Reduction Unit
IPCC	Intergovernmental Panel on Climate Change
LLC	Limited Liability Company
IPS	Integrated Power System
MPE	Maximum Permissible Emission
OJSC	Open Joint-Stock Company
PDD	Project Design Document
SAIIM CAEP	System of Automated Information-Measuring for Commercial Accounting of Electric Power