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

CONTENTS

SECTION A. General description of the project

A.1. Title of the project:

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Associated petroleum gas utilization at the Urengoy oil-gas condensate field, Russian Federation

Sectoral scopes:

> 1. Energy (renewable/non-renewable sources)
> 10. Fugitive emissions from fuels (solids, oil and gas).

Version: 04
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A.2. Description of the project:

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Situation existing prior to the starting date of the project

The project is aimed at the efficient utilization of low-pressure associated petroleum gas (APG) that otherwise would have been flared at the central production facilities (CPFs) № 1 and № 2 of the Urengoy oil-gas condensate field located in 20 km north-westward from the city of Novy Urengoy, Yamal-Nenets Autonomous Okrug (Area).

The Urengoy oil-gas condensate field being one of the largest world's oil and gas deposits has been under development since 1966. Commercial production started in 1978. The field is being developed and operated by Gasprom dobytcha Urengoy, Limited Liability Company.

In process of oil treatment at the central production facility associated petroleum gases of high pressure (above 3.0 MPa) and of low pressure (below 3.0 MPa) are separated from the crude oil. At present it is only a high-pressure APG is utilized at the unified oil treatment plants (UOTPs). A low-pressure APG is burnt at the flaring device that leads to GHG gases emissions including CO_2 and CH_4 (due to incomplete combustion of APG in the flare).

Baseline scenario

In absence of the project activity the low-pressure APG would have been burned in the flare stacks leading to CO_2 and CH_4 emissions. For gaslift purpose the gas from the neighbouring valanzhin[1] gas pools would have been used.

A possibility of this scenario is supported by the following facts:

- Lack of sufficient incentives for realization of the project: low level of environmental payments for APG flaring does not stimulate the company to make considerable investments in any emission reduction activities.

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[1] In Western Siberia valanzhin deposits of natural gas are partially mining. Often this natural gas is located under unique senomanian deposits on the depth more than 2000 meters. Self-cost of valanzhin gas mining is higher than senomanian. This gas contains methane, ethane, propane, butane and more heavy fractions that is called gas condensate. Gas from valanzhin deposits should be refined for extraction of heavy fractions.

- Lack of investment attractiveness of the project as economic efficiency indicators do not correspond to investment criteria adopted in Gazprom.
- License agreement for development of the Urengoy field does not include a provision on the obligatory efficient use of APG.

Project scenario

Having at disposal a considerable APG resource Gasprom dobytcha Urengoy Company undertakes activities for its efficient use. For this purpose the project envisages the construction of two compressor plants (CS № 1 and CS № 2) at the Urengoy oil-gas condensate field. The turbocompressors being a part of CS will maintain a desired pressure (compressing) and treatment (gas drying) of the incoming low-pressure APG. One part of APG (commercial APG) after drying will be directed into gathering gas pipelines and will be further delivered into the gas transport system of Gazprom. The other part (gaslift APG) will be used for the oil recovery displacing the APG (from valanzhin pools) that is currently used. Thus, the considerable amount of APG will not be flared that will prevent CO_2 and CH_4 emissions.

As a fuel for driving the turbocompressors low-pressure APG will also be used. Such utilization will cause project CO_2 emissions.

Figure A.2.1. Compressor station at Urengoy oil-gas condensate field

The electricity for the needs of CS № 1 and CS № 2 will be supplied from the centralized grid that will bring CO2 emissions at the grid power plants.

In below table the main indicators on low-pressure APG balance at CPFs № 1 and № 2 are provided.

Table A.2. Low-pressure APG balance at CPFs № 1 and № 2 of Urengoy oil-gas condensate field[2]

CPF-1				
Item	2009	2010	2011	2012
APG recovery, ths. m^3	364000	367000	379000	400000
APG at CS-1, ths. m^3	91000[3]	367000	379000	400000
APG for gaslift, ths. m^3	53250	203000	189540	194090
APG for fuel at CS-1, ths. m^3	5610	22440	22440	22440
APG for sale, ths. m^3	32140	141560	167020	183470
CPF-2				
APG recovery, ths. m^3	520000	514000	490000	455000
APG at CS-2, ths. m^3	130000[4]	514000	490000	455000
APG for gaslift, ths. m^3	62500	238000	222000	192000
APG for fuel at CS-2 , ths. m^3	11073	44290	44290	44290
APG for sale, ths. m^3	56428	223860	215990	210870

The history of the project

Technical documentation was elaborated in May, 2007. The decision on the project realization under JI mechanism was made on 22.04.08 at Gazprom's Coordinating committee meeting concerning environment questions. The construction works started in May, 2008. The start of CS-1,2 stations is in 4th Quarter, 2009. Now stations work according to technological mode.

Emission reductions

As a result of the project activity the low-pressure APG that otherwise would be flared will be efficiently utilized: **2.2.bn m^3 of APG will be utilized in 2009-2012** and **7.8 bn m^3 of APG in 2013-2020.** That will result in a considerable amount of GHG emission reductions. Expected reductions in 2009-2012 and in 2013-2020 are **6 159 242 tCO2 equivalent and 16 954 255 tCO2** respectively.

A.3.   Project participants:

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Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A - Russian Federation (Host Party)	Gazprom dobytcha Urengoy, LLC	No
Party B – no	-	-

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[2] Information source: the forecast balance provided in the technical documentation "CS for APG utilization at CPF 1,2 of Urengoy NGCF", TyumenNIIgiprogaz, Volume 1, p.20, table 5.2.

[3] The start of CS-1 -October 2009

[4] The start of CS-2 -October 2009

A.4. **Technical description of the project:**

A.4.1. Location of the project:

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A.4.1.1. Host Party(ies):

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Russian Federation

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

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The project is being realized in Pur district, Yamal-Nenets Autonomous Okrug (YNAO), Tyumen oblast, which is a subject of the Russian Federation. YNAO is located in the Arctic zone of West-Siberian Plain and occupies a vast area of 769,250 square kilometres. The capital of YNAO is the city of Salekhard that is located 1976 km north-east from Moscow. The population of YNAO is 543,651 people. It is more than a half of YNAO is located behind the Polar Circle; a smaller part is situated at east side of Ural Mountains.

Figure A 4.1.2. Yamal Nenets Autonomous Okrug on the map of Russian Federation
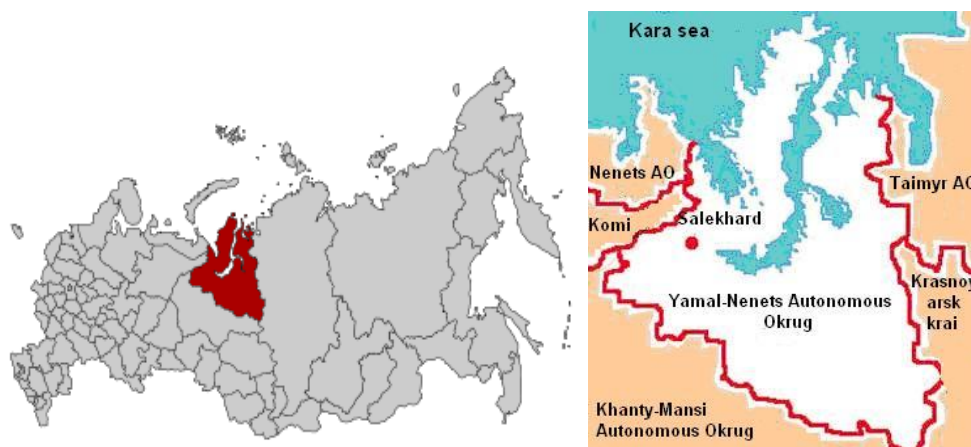
Permafrost and proximity to the Kara sea determines the local climate that is characterized by lengthy winters (up to 8 months), short summers, strong winds and small depth of snow cover.

A main natural wealth of YNAO is the huge resource of hydrocarbons including gas, oil and condensate. YNAO is the world's largest gas province.

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

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LAYOUT of PUR DISTRICT

Urengoy oil-gas condensate field is located in Pur district, YNAO, in the heart of Nadym-Pur-Taz oil-gas area between 65th and 68th parallels of the northern latitude. The field stretches from the north to the south for 250 km, with 30-60 km in breadth.

90% of oil and 50% of gas is produced on the territory of the Pur district. Out of 175 gas, gas-condensate and oil fields explored in YNAO 114 fields are located on the territory of the Pur district.

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

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Figure. A.4.1.4. Schematic diagram of the project activity
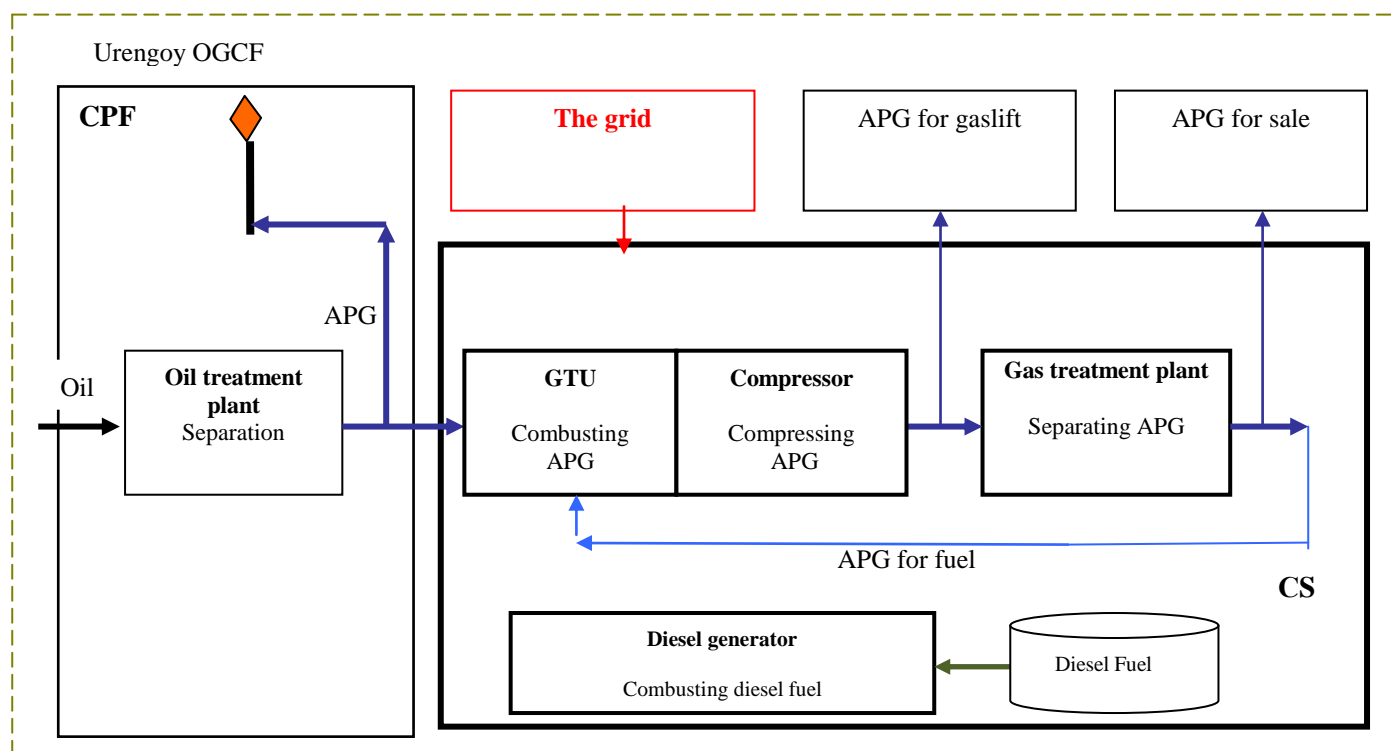
Compressor stations (CS-1,2) are located in the proximity of the central production facilities (CPF1,2). Associated petroleum gas (APG) being currently flared will be compressed and directed a) to cover oil field needs in gaslift gas, b) after having been dried to the gas transport system.

Part of APG after treatment will supplied as a fuel for driving gas turbine units (GTUs).
Electricity for the project facilities needs including CS and gaslift and commercial APG pipelines will be imported from the centralized grid.

 In emergency cases with the electricity supply a back-up diesel power station is provided for.

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

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The works for construction and mounting of CS-1,2 started in May of 2008. At present the commissioning of GTUs and LTSs is under way. Each compressor station includes:

CS-1: 2 turbocompressor units (one idle) activated by gas turbine units (GTUs) of 8 MW each, as well as a low-temperature gas separation plant (LTS).

CS-2: 3 turbocompressor units (one idle) activated by gas turbine units (GTUs) of 8 MW each, as well as a low-temperature gas separation plant (LTS).

Table A 4.2.1 Characteristics of CS-1

Items	2009	2010	2011	2012
Low-pressure APG to be used, ths. m^3	91,000[5]	367,000	379,000	400,000
Total compressor units, (in operation + idle), pcs.	2 (1+1)	2 (1+1)	2 (1+1)	2 (1+1)
GTU capacity, MW	8	8	8	8

Table A.4.2.2 Characteristics of CS-2

Items	2009	2010	2011	2012
Low-pressure APG to be used, ths. m^3	130,000[6]	514 000	490 000	455 000
Total compressor units, (in operation + idle), pcs.	3 (2+1)	3 (2+1)	3 (2+1)	3 (2+1)
GTU capacity, MW	16	16	16	16

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[5] The start of CS-1 -October 2009

[6] The start of CS-2 -October 2009

Рис. A.4.2.3. APG utilization process layout
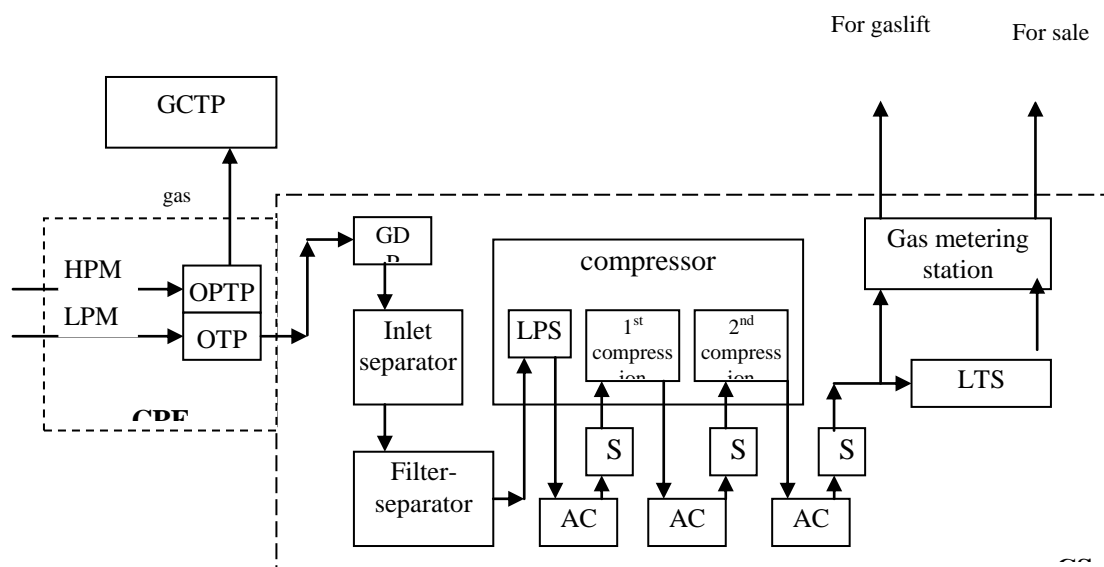
CPF – central production facility
HPM – high pressure manifold
LPM – low pressure manifold
GCTP – gas complex treatment plant
OPTP – oil pre-treatment plant

OTP – oil treatment plant
GDP – gas distribution point
LPS – low pressure stage
S – separator
AC – air cooler
LTS –low-temperature separation
CS – compressor station

Process description

APG enters CS from the first stage of OTP CPF with a pressure of 0.6MPa and temperature of 3-6 °C through the heat-insulated pipeline and shut-down valves. In the GDP the pressure is reduced up to 0.3 MPa and APG goes to the inlet separator where the deentrainment of dropping liquid and liquid obstructions is carried out. Further on APG enters the inlet of filter-separator where final gas purification from liquid and impurities (up to 10 mkm according to technical conditions for compressor) is produced.

Having passed filter-separator APF goes to the inlet of the compressor units. For APG compressing turbocompressor units (TCU) activated by the gas turbine units (GTU) are provided for. Each TCU includes GTU driver and two compression stages: low-pressure stage (LPS) and high-pressure stage (HPS). In the compression stages APG is being compressed up to 1.16 MPa and 8.16 MPa appropriately.

After LPS intercooling of APG up to 40 °C is provided at air-coolers. Having passed HPS APG is cooled at the end air-coolers up to 25°C.

Further on the part of APG with the pressure of 8.0 MPa is directed for gaslift oil recovery system, the remaining part enters the low-temperature separation plant (LTSP) for drying. LTSP includes:

- recuperative heat exchanger;
- pressure regulator;
- low-temperature separator.

The compressed APG after extracting for gaslift enters the inlet of the recuperative heat exchanger where is cooled down to minus 3 or 5 °C. After that APG comes in the pressure regulator where the pressure drops down to 5.75 MPa. At the same time the temperature is reducing down to minus 17 °C providing the necessary dew point in terms of liquid and hydrocarbons in compliance with the standard OST 51.40-93. At the LTSP outlet the safety valves are provided for preventing above- working- pressure rise and designated for the full output of the separator.

After separation the dried gas comes in the gas metering station (GMS) for commercial measurements. Operational measurement of the gaslift APG is provided the same GMS. After metering APG flows are directed:

- At CPF-1 - in gathering gas pipelines, a connection point located at GCTP-6 under the pressure of 5.75 MPa in summer and of 5.55 MPa in winter; the gaslift gas enters the block valve station at the CPF-1 under the pressure of 8.0 MPa.

- At CPF-2 in gathering gas pipelines, a connection point located at GCTP-3 under the pressure of 5.75 MPa in summer and of 5.55 MPa in winter; the gaslift gas enters the block valve station at the CPF-2 under the pressure of 8.0 MPa.

For providing electrical needs of the compressor units, gaslift and commercial gas pipelines and electrical heaters the electric power imports from the grid is provided. Electric power will be channelled through 6 kV indoor switch gears (ZRU-6kV) over single transmission lines.

In emergency cases the automated operation of a back-up diesel power plant is provided for. For ensuring 15 day operation (considering a 223g/kWh consumption rate) two 25 m^3 diesel fuel reservoirs is provided at each CS.

Personnel training (the involved qualified employees having operational experience with gas and compressor units) on operational activity with compressor installation passed in process of starting-up and adjustment works.

Table A.4.2.1. Technical characteristics of equipment under the project activity

Type of equipment	Q-ty	Parametes	Description
Gas treament			
Filter-separator station	2 pcs.	P_{nom} = 1.0 MPa Q = 3,3 mln m^3/day V = 32 m^3	Designated for capturing liquids and impurities in APG
Low-temperature separation station	2 pcs.	P_{nom} = 8,0 MPa Qr = 3,3 mln m^3/day V= 16 m^3	Designated for making a flow of dried gas needed to cool the compressed APG in heat exchanger
Turbocompressor unit			
Turbocompressor unit TCU-C-8BD/0.3-8.16 with gas turbine engine	CS-1: 2 pcs.	Qr = 1.141 mln.m^3/day P_{inlet} = 0.3 MPa P_{outlet} = 8.16 MPa	Turbocompressor unit TCU-C-8BD/0.3-8.16 with gas turbine engine NK-14ST of 8 MW capacity, with booster, centrifugal gas compressor,

	CS-2: 3pcs.	N = 8.0 MW	designated for compressing APG with pressure from 0.3 MPa up to 8.16 MPa.
First section separation station	3 pcs.	P_{nom} = 2.5 MPa Qr= 1.14 mln m^3/day V = 6m^3	
Second section separation station	3 шт.	$P_{nom.}$ = 6.3 MPa Qr= 1.14 mln m^3/day V = 4,5 m^3	
End separation station	3 pcs.	P_{nom} = 8.5 MPa Qr= 1.14 mln.m^3/day V= 1.7 m^3	
Air-coolers			
Air cooler (after first compression stage)	3 pcs.	P_{nom} = 3.5 MPa Qr =1.14 mln.m^3/day S = 5,900 m^2 Nab. = 75 кW	
Air cooler (after second compression stage)	3 pcs.	$P_{nom.}$ = 5.3 MPa Qr = 1.14 mln.m^3/day S = 5,690 m^2 Nab. = 75 кW	
Final air cooler	3 pcs	$P_{nom.}$ = 8.6 MPa Qr = 1.14 mln.m^3/day S S = 8,530 m^2 Nab. = 112.5 kW	

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:

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Flaring of APG in Russia is the cheapest and the easiest alternative for oil gas utilization because today:
-standards and legislative norms concerning the useful APG utilization are absent in Russia[7]

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[7] Management of APG utilization is according to standards, laws, orders of Russian Government, directives of former State Committee of Environment protection. Russian laws and orders of the Government are not set norms of APG consumption. They define fees for natural resources usage and also sanitary norms of air quality (shown in maximum concentration limit of hazardous substance in the air. As a matter of fact these documents permit to flare APG but natural resources must be paid and hazardous emissions in the nearby layers of atmosphere can't be higher than maximum concentration limits.

Standard and law document concerning APG:

1.Law "Mineral resources" from 1992 with amendments till the August of 2004.

2.Order of VSRF # 3314.1 from June 15, 1992. "Concerning the order of getting the license for mining".

3.Law of Khanty-Mansiysk # 15.03 from April 18, 1996 . "Subsurface resources management".

4.RD 39-108-91 "Methodological tool for oil gas technological losses calculation in the process of its mining, capturing, preparation and transportation".

5 Order of Russian Government from June 12 2003.#344 "Concerning norms for air emission penalties from stationary and mobile sources, poisonous releases in surface and undersurface waters, waste storage"

6.Order of Russian Government from July 1, 2005 #410 "Concerning changes in annex 1 in Order of Russian Government from June 12"

7. Order of Russian Government # 7 from January 8, 2009 "Concerning measures for stimulating of air contamination by products of oil gas flaring"[7]

In all laws mentioned above including Project of new law "Mineral resource" there are no prescriptions for APG and its utilization. Therefore, one can say that in Russia is absent norm and law base for APG effective usage.

-there is no clear state policy for fixing the problem of rational APG usage
-there are no responsibilities for subsurface resources management concerning the rational APG usage; not all valid licenses set level of APG burning.

Oil companies that have licenses for obligatory APG utilization continue to flare it as payments for oil gas (consider new Order of Russian Government #7 from January 8, 2009 "Concerning measures for stimulating of hazardous emissions from oil gas flaring"[8] cannot be compared with investments for APG infrastructure construction. [9]

Moreover, among main reasons of APG flaring can be mentioned following:
-low price of APG in comparison with investments on useful oil gas usage[10]
-monopoly of transport, refining and trade market of APG
 -absence of developed infrastructure for APG refining and transportation in regions of hydrocarbons mining
-priority providing for natural gas against APG in access to system of trunk pipelines. Low competitiveness of APG can be explained that market is formed by natural gas, expenses for its mining and for connecting to systems of trunk pipelines are considerably lower in comparison with useful utilization of APG.

According to described above one can conclude that the existing state policy for oil gas usage and low prices for APG are not positive stimuli for rational APG utilization.

As per baseline scenario all low-pressure APG extracted at the Urengoy CPF-1,2 would have been flared that would lead to considerable emissions of GHG gases including CO_2 и CH_4. Atmospheric CH_4 emissions occur due to incomplete combustion of APG at the flare. 2006 IPCC Guidelines for National Greenhouse Gas Inventory prescribes to use 98% efficiency factor when estimating GHG emissions from incomplete flaring combustion[11].
In favor of the baseline scenario the following arguments are speaking:

- Lack of sufficient incentives for realization of the project: low level of environmental payments for APG flaring does not stimulate the company to make considerable investments in any emission reduction activities.
- Lack of investment attractiveness of the project as economic efficiency indicators do not correspond to investment criteria adopted in Gazprom. The project hasn't passed internal financial-economic expertise.
- License agreement for development of the Urengoy field does not include a provision on the obligatory efficient use of APG.

Under the project activity all low-pressure APG will be efficiently used through both: injection into the field's gaslift system and transportation via gas pipeline to customers.

Therefore, the realization of the project will lead to the total flaring reduction of low-pressure APG of CPF-1,2 and, consequently, to the prevention of CO_2 and CH_4 emissions.

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[8] http://government.ru/gov/results/6475/
[9] By the baseline annually in the atmosphere would be emitted about 15 mln m3 of methane. Penalties for over limits APG burning would be 12 mln.rub/year or 106,03 mln.rub for a period 2012-2020. This cannot be compared with the project investments - 6 648 mln. rub.

[10] According to order of Ministry of Economy development "Wholesale prices for oil (associated) gas selling to gas refineries", price for oil (associated) gas was regulated according to concentration of liquid fraction in it. It was in the range from 73 to 442 rub/ 1000 m3. Price of every component produced from APG while refining in particular stripped gas (analog of natural gas) and a wide fraction of light hydrocarbons is higher than APG tremendously (taking into account investments for it refining, compression, rectification and transportation by trunk pipelines.
[11] 2006 IPCC Guidelines for National Greenhouse Gas Inventory (Subsection 4.2. "Fugitive emissions from oil and natural gas systems".

In the absence of the project activity it would be impossible to reach the mentioned reductions as an increase in APG production would lead to a rise of GHG emissions due to APG flaring.

All these facts as well as the argumentation provided in B section evidence that Gazprom dobytcha Urengoy Company would not reduce APG flaring in another way apart from as described in the project.

A.4.3.1. Estimated amount of emission reductions over the <u>crediting period</u>:

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	Years
Length of the crediting period: 2009-2012	4
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2009	482,404
2010	1,922,562
2011	1,893,937
2012	1,860,338
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	6,159,242
Annual average of emission reductions over the crediting period (tonnes of CO_2 equivalent)	1,539,810

In case of adoption of a new post-kyoto agreement the emission reductions for the crediting period of 2013-2020 were estimated.

	Years
Length of the crediting period: 2013-2020	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	1,931,588
2014	2,076,406
2015	2,202,456
2016	2,250,888
2017	2,306,491
2018	2,167,024
2019	2,070,014
2020	1,949,389
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	16,954,255
Annual average of emission reductions over the crediting period (tonnes of CO_2 equivalent)	2,119,282

A.5.	Project approval by the Parties involved:

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Until recently the approval of potential JI projects has been suspended. On 28.10.2009 the Russian Government issued Decree № 843 and Regulations "On Realization of Article 6 of Kyoto Protocol to United Nations Framework Convention on Climate Change.

Under Regulations a project proponent should submit an application to Sberbank of Russian Federation, *a prime commercial bank,* that is nominated as Operator of Carbon Units (OCU). The application should include PDD, Determination Expert Opinion, the justification of environmental and energy efficiency criteria, the availability of technical and financial potential, estimated economic and social effects and other.

After consideration and evaluation of the application OCU forwards recommendations on the project application to Coordination Centre, i.e. the Ministry of Economic Development of Russian Federation. Coordination Centre should make a decision of the approval of the project.

SECTION B.	**Baseline**

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

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As appropriate, project participants may, but are not obliged to, apply approved clean development mechanism (CDM) baseline and monitoring methodologies. Based on that a JI specific approach regarding baseline setting is used. This approach is based on the provisions of Guidelines for users of the JI PDD Form (Version 03) and includes the following steps:

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

Step. 2. Application of the approach chosen.

The following is a detailed presentation of the two steps:

Step. 1. Indication and Description of the Approach Chosen Regarding the Baseline Setting

The baseline is determined through considerations of various alternative scenarios with regard to the proposed project activity. As criteria for choosing the baseline scenario the key factors will be determined. All alternatives will be considered in terms of influence on them of these factors. The most plausible baseline scenario will be an alternative that is influenced by the factors at the least. Therefore, the following stages of determining the baseline scenarios are envisaged:

a) *Description of alternative scenarios.*

b) *Description of the key factors.*

c) *Analysis of the influence of the key factors on the alternatives.*

d) *Choosing the most plausible alternative scenario.*

The alternative that passes all mentioned stages is regarded as the baseline scenario.

Step. 2. Application of the Scenario Chosen

As alternatives the following two scenarios are considered:

Alternative scenario 1. Continuation of the current situation, i.e. the combustion of APG in the flares at CPF-1,2 of the Urengoy oil-gas condensate field.

Alternative scenario 2. The project itself (without being registered as a JI activity), i.e. the construction of compression stations (CS) and of the low-temperature separation systems for utilization of APG through injection in gaslift oil recovery system and delivery to gas pipeline.

Analysis does not consider variants related to installation of APG-fuelled power generating capacities, f. e. gas turbine power plants. There is no deficit of power at the Urengoy field, the electricity is imported from the centralized grid and distributed through the well-developed transformation and distribution system.

Compliance of the chosen alternatives with the current legislation and regulations

According to the Russian legislation, the APG combustion in a flare is regulated by the federal government. Companies that burn APG must pay 50 rubles per ton of methane within the limits of maximum emissions allowed, and 250 rubles as payments for temporarily approved emission limits[12].

It should be noted that the license agreement for developing the Urengoy oil-gas condensate field is not restricted to the mandatory utilization of APG.

The projects related to construction of compression stations (CS) and of the low-temperature separation systems, comply with the current legislation.

Conclusion: None of the alternatives contradict the current legislation and may be discussed in the further analysis.

a)   Description of alternative scenarios.

Alternative scenario 1. Continuation of the current situation, i.e. the combustion of APG in the flares at CPF-1,2 of the Urengoy oil-gas condensate field.

Gazprom dobytcha Urengoy Company is producing oil and gas at Urengoy field. In process of oil treatment at the central production facility associated petroleum gases of high pressure and of low pressure are extracted from the crude oil. High-pressure APG is efficiently utilized through delivery to the gas pipeline. For gaslift purposes the gas from neighbouring the natural gas-condensate pools is used.

Low-pressure APG extracted at CPF-1,2 is totally flared leading thus to considerable GHG and harmful substance emissions. The APG volumes that would be flared under this scenario are presented in the following table:

Table B.1.1. APG to be flared at CPF-1,2 in 2009-2012

Item	Unit	2009	2010	2011	2012
CPF-1	Ths. m^3	364,000	367,000	379,000	400,000
CPF-2	Ths. m^3	520,000	514,000	490,000	455,000
Total	Ths. m^3	884,000	881,000	869,000	855,000

Under environmental legislation an enterprise is required to calculate the quantities of polluting emissions including methane, carbon oxide, nitrogen oxides etc and to make quarterly environmental payments according to norms set by Russian Government's Decree № 344 dd 12/06/2003[13] and by partially revised Decree № 410 dd. 01/07/2005[14]. In below table the environmental payments having been made by Gazprom dobytcha Urengoy Company for APG flaring in the previous 6 years are presented.

Table B 1.2. Environmental payments for APG flaring[15]

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[12] Resolution 344 of the Government of the RF on 12 July 2003 (as amended on 1 July 2005)

[13] «On norms of payments for the emissions in atmospheric air of the polluting substances by stationary and mobile sources, for discharge of polluting substances in surface and underground water objects, for disposal of production and consumption waste»

[14] «On alterations in annex # 1 to the Decree of the Government of Russian Federation dd 12/06/2003 # 344»

[15] Information was presented by the environmental departwhere of Gazprom dobytcha Urengoy Company

Payments	2003	2004	2005	2006	2007	2008
In ths rubles.	944.53	1,938.78	3, 214.53	3, 812.92	4,389.92	4,847.01

The governmental regulation № 7 of the 8 January 2009 "On measures to stimulate the reduction of air pollution products from the flaring of associated gas in flares" implements new rules for the ecopayments calculation. 95 % of emissions from the APG burning will be calculated as above-limit emissions with coefficient 4.5 starting with January 1, 2012.

In the baseline scenario about 15 mln m3/year of methane will issues in the atmosphere. Ecopayments will be about 12 million rubles / year or 106.03 million rubles for the period 2012-2020. It can not be comparable with CAPEX - 6 648 mln rubles.

Table B 1.3 Calculations of ecopayments for the APG flaring

	CH4 volume into the atmosphere as the result of the underburning	Coefficient (governmental regulation № 7 8 January 2009)	Coefficient (governmental regulation №344 12 June 2009)[16]	CH4 part for the taxing	Amount of ecopayments
1	2	3	4	5	6
	ths m3		rubel / t	%	mln rub/ year
2012	14 912,23				10,63
2013	15 444,47				11,01
2014	16 471,44				11,74
2015	17 363,20				12,38
2016	17 690,58	4,5	250	95	12,61
2017	18 073,10				12,88
2018	17 041,10				12,15
2019	16 320,91				11,63
2020	15 426,58				11,00
	148 743,62				**106,03**

**Alternative scenario 2. The project itself (without being registered as a JI activity), i.e. the construction of compression stations (CS) and of the low-temperature separation systems for utilization of APG through both injection in gaslift oil recovery system and delivery to gas pipeline.**

Having at disposal a considerable APG resource Gasprom dobytcha Urengoy Company undertakes activities for its efficient use. For this purpose the project envisages the construction of two compressor plants (CS № 1 and CS № 2) at the Urengoy oil-gas condensate field. The turbocompressors being a part of CS will maintain a desired pressure (compressing) and treatment (gas drying) of the incoming low-pressure APG. One part of APG (commercial APG) after drying will be directed into gathering gas pipelines and will be further delivered into the gas transport system of Gazprom. The other part (gaslift APG) will be used for the oil recovery displacing the APG (from valanzhin pools) that is currently used and directed to gas transport

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[16] http://government.consultant.ru/doc.asp?ID=17975&PSC=1&PT=1&Page=1

system of Gazprom. The given action don't given additional consumption (and accordingly additional extraction) equivalent volume of natural gas.

The main direction of APG utilization are presented in the following tables:

Table B 1.4 The balance of low-pressure APG at CPF-1

Item	2009	2010	2011	2012
Total APG use at CS-1	91000[17]	367000	379000	400000
APG for gaslift	53250	203000	189540	194090
APG for own use	5610	22440	22440	22440
APG for sale	32140	141560	167020	183470

Table B 1.5 The balance of low-pressure APG at CPF-2

Item	2009	2010	2011	2012
Total APG use at CS-1	130000[18]	514000	490000	455000
APG for gaslift	62500	238000	222000	192000
APG for own use	11073	44290	44290	44290
APG for sale	56428	223860	215990	210870

For realization of this alternative the sum of 6 648.55 mln. Rubles[19] ($215.5 mln) are necessary to invest.

b)   Description of the key factors.

As criteria for choosing the baseline scenario out of mentioned above alternatives the following factors are considered:

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[17] The start of CS-1 -October 2009

[18] The start of CS-2 -October 2009

[19] According to a feasibility study.

Table B 1.6 Description of the key factors

Key factor	Description
Requirement of license agreement to efficiently utilize APG	For enforcing sub-soil users to efficiently utilize APG some regional governments in Russia include in license agreements provisions on 95% compulsory utilization of APG produced. .
Level of costs related to APG utilization	Under legislation environmental payments for polluting emissions are envisaged (see above); therefore they are considered as the costs for APG flaring. In case of realization of measurements related to APG efficient utilization the costs include all expenses to cover the installation of the appropriate equipment.
A 6-year pay-back period	Under Provisional methodical guidelines adopted in Gazprom new technology realization projects are to meet a 6- year payback recommendation 20.

c)   *Analysis of the influence of the key factors on the alternatives*
The factor: Requirement of license agreement to efficiently utilize APG

Alternative 1	No influence	The license agreement of the Company does no contain the requirement on efficient utilization of APG. Therefore, Alternative 1 could be realized further without breaking this agreement. That also means that the development of Alternative 2 has not been dictated by the requirement.
Alternative 2	No influence	

The factor: Level of costs related to APG utilization

Alternative 1	The least influence	Level of environmental payments for APG utilization is about $162 thousand under Alternative 1. That is incommensurably lower as compared with investments under Alternative 2 ($214 mln).
Alternative 2	The influence is considerable	

The factor: A 6-year pay-back period

Alternative 1	No influence	Alternative 1 (current situation) is not an investment project, therefore this factor does not influence it.

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[20] Provisional methodological guidelines on a determination of the commercial efficiency of new technology in JSC Gazprom», valid from 01.09.2001; JSC Gazprom, Moscow, 2001.

Alternative 2	The influence is considerable	According to the evaluation of the investment efficiency[21] a simple pay-backs for CS-1 is 8 years, for CS-2 is 7 years.

Investment efficiency of the CS

Project	(NPV)	(IRR)	Discount payback period
CS-1	356,68 mln. rub.	11,11%	12
CS-2	- 219,75 mln. rub.	8,17%	14

As a result of investment analysis made by "TumenNIIgiprogaz" LLC were got the following results:
It is necessary to mention that discounted periods of these two projects are also above 6 year payback period that was recommended by Provisional methodological instructions for commercial effectiveness analysis of new technologies in OJSC "Gazprom". Besides discount rate 0.10 approved by "TumenNIIgiprogaz" LLC is lowered as projects on utilization of low pressure APG are the first for Gazprom Group. This projects should be evaluated considering higher risk as technical solutions used in the projects (treatment,compression and purification of APG) are new and not profile in companies' activity that included in Gazprom Group. Therefore adequate discount rate is 0,12[22]. Using this discount rate investment attractiveness of the project "Construction of KS on CPS 1" is under the question, as NPV fell to 3,06 mln. rubles and internal rate of return is equal to discount rate[23].

d)   Choosing the most plausible alternative scenario.

Based on the conducted analysis it is clear that the Alternative 1 is the least influenced by the key factors, therefore this Alternative, i.e. the combustion of APG in the flares at CPF-1,2 of the Urengoy oil-gas condensate field is **the baseline scenario**.

The key information and data used to establish the baseline

Data/Parameter	Amount of low-pressure APG supplied to the CS-1
Data unit	ths.m 3 (at standard condition)
Description	Low-pressure APG is produced as a result of oil separation at the Urengoyskoye CPC-1. The total amount of low-pressure APG (at standard condition) produced in the Urengoy oil -gas field is flared according to the baseline
Time of determination/monitoring	Constant
Source of data (to be) used	Flow meter

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[21] Investment Efficiency Section of the Feasibility Study, page 14, Volume 2. Technical documentation "CS for APG utilization at CPF 1,2 of Urengoy NGCF", TyumenNIIgiprogaz, ТЗ 1520К-ПЗ

[22] Provisional methodological guidelines on a determination of the commercial efficiency of new technology in JSC Gazprom», valid from 01.09.2001; JSC Gazprom, Moscow, 2001.

[23] The Information Note to the meeting of Gazprom Coordination Committee on 22/04/08;

Value of data applied (for exante calculations/determinations)	**2009**	**2010**	**2011**	**2012**	
	91 000	367 000	379 000	400 000	

Justification of the choice of data or description of measurement methods and procedures (to be) applied	The entire amount of the low-pressure APG burned in flares is one of the major emission sources. For this reason, the amount of the produced low-pressure APG is the main parameter that allows the calculation of basic emissions. Low-pressure APG metering will be performed by accurate and regularly checked instruments.
QC/QA procedures (to be) applied	The instruments are calibrated 1 times in 2 years of FGU «Tyumen SMC center»; The metrological control is carried out by metrological service «Urengoygazprom».
Any comment	-

Data/Parameter	Amount of low-pressure APG supplied to the CS-2
Data unit	ths.m 3 (at standard condition)
Description	Low-pressure APG is produced as a result of oil separation at the Urengoyskoye CPC-2. The total amount of low-pressure APG (at standard condition) produced in the Urengoy oil -gas field is flared according to the baseline
Time of determination/monitoring	Constant
Source of data (to be) used	Flow meter

Value of data applied (for exante calculations/determinations)	**2009**	**2010**	**2011**	**2012**	
	130 000	514 000	490 000	455 000	

Justification of the choice of data or description of measurement methods and procedures (to be) applied	The entire amount of the low-pressure APG burned in flares is one of the major emission sources. For this reason, the amount of the produced low-pressure APG is the main parameter that allows the calculation of basic emissions. Low-pressure APG metering will be performed by accurate and regularly checked instruments.
QC/QA procedures (to be) applied	The instruments are calibrated 1 times in 2 years of FGU «Tyumen SMC center»; The metrological control is carried out by metrological service «Urengoygazprom».
Any comment	-

Data/Parameter	Chemical composition of low-pressure APG at CPFs № 1
Data unit	%
Description	Chemical composition (at standard condition) of low-pressure APG required for the calculation of emissions factor from flaring at CPFs № 1
Time of determination/monitoring	1 times in month
Source of data (to be) used	chemical-analysis laboratory TC (technical center) (Lab analysis gas chromatograph)

Value of data applied (for exante calculations/determinations)	-
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The chemical composition is needed to identify the volume fraction of carbon, methane and VOC and calculate the GHG emission rates due to the combustion of the given gas.
QC/QA procedures (to be) applied	TC accredited with state standard R ISO/IEC 17025-2000
Any comment	-

Data/Parameter	Chemical composition of low-pressure APG at CPFs № 2
Data unit	%
Description	Chemical composition (at standard condition) of low-pressure APG required for the calculation of emissions factor from flaring at CPFs № 2
Time of determination/monitoring	1 times in month
Source of data (to be) used	chemical-analysis laboratory TC (technical center) (Lab analysis gas chromatograph)
Value of data applied (for exante calculations/determinations)	-
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The chemical composition is needed to identify the volume fraction of carbon, methane and VOC and calculate the GHG emission rates due to the combustion of the given gas.
QC/QA procedures (to be) applied	TC accredited with state standard R ISO/IEC 17025-2000
Any comment	-

Data/Parameter	ρ_{CO_2}
Data unit	kg/m3
Description	Carbon dioxide (CO_2) density under the standard condition
Time of determination/monitoring	Fixed parameter
Source of data (to be) used	Methodology of the calculation of the pollution emissions into the atmosphere during the associated petroleum gas flaring, Research institute "Atmosphere", 1998.
Value of data applied (for exante calculations/determinations)	1,831
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Density of CO2 required for the calculation of emissions factor from flaring at CPFs № 1,2
QC/QA procedures (to be) applied	-

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

Any comment	-

Data/Parameter	ρ_{CH4}
Data unit	kg/m3
Description	Metane (CH4) density under the standard condition
Time of determination/monitoring	Fixed parameter
Source of data (to be) used	Methodology of the calculation of the pollution emissions into the atmosphere during the associated petroleum gas flaring, Research institute "Atmosphere", 1998.
Value of data applied (for exante calculations/determinations)	0,667
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Density of CH4 required for the calculation of CH4 emissions factor from flaring at CPFs № 1,2
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	APG flaring efficiency
Data unit	%
Description	APG flaring efficiency required for the calculation of emissions factor from flaring the low-pressure apg at CPFs № 1,2
Time of determination/monitoring	Fixed parameter
Source of data (to be) used	2006 IPCC guidance (2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Chapter 4 (Subsection 4.2. "Fugitive emissions from oil and natural gas systems", adapted equations 4.2.4 page 4.45).
Value of data applied (for exante calculations/determinations)	98
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The flaring efficiency is needed to calculate the GHG emission rates due to the combustion of the low-pressure gas.
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	Global Warming Potential of methane
Data unit	t CO_2/t CH_4
Description	Global Warming Potential of methane required for the calculation of CH4 emissions factor from flaring the low-pressure apg at CPFs № 1,2
Time of	Fixed parameter

determination/monitoring	
Source of data (to be) used	**Decision 2/CP.3** **http://unfccc.int/resource/docs/cop3/07a01.pdf#page=31** Climate Change 1995, The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group I Report, page 22. http://unfccc.int/ghg_data/items/3825.php
Value of data applied (for exante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Global Warming Potential of methane is needed to calculate the CH4 emission rates due to the combustion of the low-pressure gas.
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	Methane emission factor by APG flaring at CPF-1
Data unit	tCO2e/ths. m^3
Description	Methane emission factor is needed to calculate the GHG emission rates due to the combustion of the given low-pressure gas at CPF-1.
Time of determination/monitoring	monthly
Source of data (to be) used	2006 IPCC guidance (2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Chapter 4 (Subsection 4.2. "Fugitive emissions from oil and natural gas systems", adapted equations 4.2.4 page 4.44).
Value of data applied (for exante calculations/determinations)	-
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methane emission factor is needed to calculate the GHG emission rates due to the combustion of the low-pressure gas.
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	Methane emission factor by APG flaring at CPF-2
Data unit	tCO2e/ths. m^3
Description	Methane emission factor is needed to calculate the GHG emission rates due to the combustion of the given low-pressure gas at CPF-2
Time of determination/monitoring	monthly
Source of data (to be) used	2006 IPCC guidance

	(2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Chapter 4 (Subsection 4.2. "Fugitive emissions from oil and natural gas systems", adapted equations 4.2.4 page 4.44).
Value of data applied (for exante calculations/determinations)	-
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The flaring efficiency is needed to calculate the GHG emission rates due to the combustion of the low-pressure gas.
QC/QA procedures (to be) applied	-
Any comment	-

B.2.   Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

>>
This section demonstrates that the project provides reductions in emissions by sources that are additional to any that would otherwise occur, using the following step-wise approach

Step 1. Indication and description of the approach applied

Step 2. Application of the approach chosen

Step 3. Provision of additionality proofs

Below this approach is provided in the greater detail.

Step 1. Indication and description of the approach applied

A JI-specific approach is chosen for justification of additionality. JISC' guidance on criteria for baseline setting and monitoring prescribes in this case to provide traceable and transparent information showing that the baseline was identified on the basis of conservative assumptions, that the project scenario is not part of the identified baseline scenario and that the project will lead to reductions of anthropogenic emissions by sources or enhancements of net anthropogenic removals by sinks of GHGs.

Step 2. Application of the approach chosen

Analysis provided in the subsection B1 clearly demonstrates that the baseline scenario is the continuation of low-pressure APG flaring at CPF-1,2. The project activity is not a part of the baseline scenario that can be evidenced by the following facts:

- License agreement for the development of Urengoy oil-gas condensate field does not include a requirement on a compulsory APG utilization.

- Environmental payments for APG flaring cannot be considered as a motivation for realizing the project as a level of the project costs more than in 2500 times exceeds those payments.

- The project is unattractive from investor's point of view as the payback exceeds a 6-year threshold set by Gazprom for investment projects.

Common practice analysis.

This stage of justification is additional for the previous analysis for the sake of additionality justification. The analysis of APG usage by the direction into gathering gas pipelines in the particular geographical sector (oil-gas industry) is the criteria of additionality for the project activity.

Description of situation common in the industry

According to the evaluation of Industrial and Energy industry of Russian Federation quantity of APG flared in 2007 was 15 billion cubic meters. For to encourage flaring reduction and useful utilization the Government in some regions includes in mining licenses articles on obligatory utilization of 95% of mined APG, but usually not all mining companies fit this condition due to the particular reasons.
Among the reasons of insufficient usage of APG are factors that pose increase of its self-price in comparison with natural gas (especially from senomanian deposits, that form most of all natural gas stream).

These are:

-much less debits of oil wells on gas in comparison with debits of gas wells

-much less pressure of APG (if gas from the first stages of oil separation has energy resource for transportation without compression on 40-50 kms, therefore gas from the end stages (low pressure gas) of oil separation extracted almost under normal pressure)

-availability of significant quantities liquid hydrocarbons

-necessity of construction more wide spread system of gas collecting mining pipelines because of remote location of some minefield from regional centers of gas transportation

In other words direction of APG in the system of trunk pipelines needs significant finance for collection, treatment and compression of APG for direction to consumer into the gathering pipelines. That's why most of such projects are not efficient.

Main role in origination of natural gas flow in Russian Federation is played by senomanian gas from Yamalo-Nenets region[24]. Most of all companies with gas and oil condensate mining in Yamalo-Nenetsky autonomous okrug are very important for the existing of towns. These companies ("Gasprom dobytcha Urengoy" LLC and "Gasprom dobytcha Yamburg" LLC) are included in the Gazprom structure.

Principal difference

Project activity of "Gasprom dobytcha Urengoy" LLC differs from activity of another oil companies for useful APG utilization by:

Oil companies that make projects on APG utilization as usual fulfill conditions of license agreements so these projects are implemented as a particular responsibilities of license holders.

Just the other way round license agreement given to "Gasprom dobytcha Urengoy" LLC on exploitation of Urengoy oil field doesn't contain conditions for obligatory APG utilization. So implementation of the Project is voluntary activity made by license holder.

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[24] http://www.adm.yanao.ru/9/1/7932/

For oil companies mining of low pressure APG is their profile activity. But mining of oil and gas condensate deposits by gas company is not profile activity and financially unattractive. Because of low financial output from such projects due to high investments for construction of infrastructure for low pressure APG and due to low prices on it

Companies included in OJSC "Gazprom" structure don't implement such project due to reasons described above.

This project is the first of its kind for the Gazprom's companies including "Gazprom dobycha Urengoy" LLC and "Gazprom dobycha Yamburg".

Conclusion: based on the facts mentioned above we can conclude

- This activity is not a result of state policy for the encouragement of oil companies to utilize APG.

- Project activity is not widely spread in the particular geographical sector (gas-oil industry) of Russia.

Therefore, project activity is not a common practice that is another justification of additionality of the Project.

Step 3. Provision of additionality proofs

The information to support above documentation is contained in the following documents:

- License agreement for the development of Urengoy oil-gas condensate field.

- Feasibility study.

- Provisional Methodological guidelines on a determination of the commercial efficiency of new technology in JSC Gazprom, valid from 01.09.2001; JSC Gazprom, Moscow, 2001

This documentation can be provided to AIE on request.

Explanations on how GHG gases emission reductions are archived

Baseline GHG emissions

Under the baseline scenario all the low-pressure APG produced at CPF-1,2 of Urengoy oil-gas condensate field would be flared. At that GHG gases including carbon dioxide CO_2 and methane CH_4 would be emitted. Flare stacks are not able to provide complete combustion and non-oxidized hydrocarbons including methane contained in APG are partially released to the atmosphere. For the estimates of incompleteness of APG combustion at flare stacks, the 2006 IPCC Guidelines recommend to consider the efficiency of such combustion equal to 98%[25].

Project GHG emissions

Under the project activity all low-pressure APG will be efficiently used through both: injection into the field's gaslift system and transportation via gas pipeline to customers.

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[25] 2006 IPCC Guidelines for National Greenhouse Gas Inventory (Subsection 4.2. "Fugitive emissions from oil and natural gas systems", adapted equations 4.2.4 and 4.4.5).

A part of APG will be used for own needs as a fuel for gas turbine engines. As the combustion of APG will be highly efficient in this case, it is burned completely. It is only CO_2 emissions will be considered then.

Also CO_2 emissions happening in the grid are taken into account where the electricity is produced to supply the project activity. In the project activity will occur potential leakage from fugitive CH4 emissions associated with extraction, processing, transportation and distribution of fossil fuels (natural gas) used in the grid power plants.

GHG emission reductions

Emission reductions will occur due to low-pressure APG flaring reduction (considerable APG volume will be efficiently utilized through the injection into the gaslift system and the delivery to gas pipeline) under the project.

The mechanism applied to estimate emission reductions for the period 2009-2012 is shown in the following tables (please also refer to the calculations in the section E.).

Table B 2.1. Mechanism of estimate of emission reductions at CPF-1 in 2009-2012

Item	Units.	Baseline	Project	Reductions
APG resource	ths. m^3	1,237,000	1,237,000	
Combustion (at flares in baseline and in GTUs in the project)	ths. m^3	1, 237,000	72,930	
CO_2 emission factor	tCO$_2$/ths. m^3	2.10	2.40	
CO_2 emissions	tons of CO_2	2,596,411	174,818	2,421,593
CH$_4$ emission factor	tCO2e/ ths. m^3	0,25	-	
CH$_4$ emissions (in terms of CO_2)	tons of CO_2e	309,364		309,364
Gaslift APG	ths. m^3		639,880	
Commercial APG	ths. m^3		524,190	
Electricity supply	MWh		32,729	
CO_2 grid emissions	tons of CO_2		17777	-17,777
Result	**Tons of CO_2**	**2,905,775**	**192,596**	**2,713,180**

Table B 2.2. Mechanism of estimate of emission reductions at CPF-2 in 2009-2012

Item	Units.	Baseline	Project	Reductions
APG resource	ths. m^3	1,589,000	1,589,000	
Combustion (at flares in baseline and in GTUs in the project)	ths. m^3	1,589,000	143,943	
CO_2 emission factor	tCO_2/ths. m^3	2.13	2.14	
CO_2 emissions	tons of CO_2	3,377,472	308,298	3,069,174
CH_4 emission factor	tCO_2e/ ths. m^3	0.25	-	
CH_4 emissions (in terms of CO_2)	tons of CO_2e	394,824		394,824
Gaslift APG	ths. m^3		714,500	
Commercial APG	ths. m^3		707,148	
Electricity supply	MWh		33,021	
CO_2 grid emissions	tons of CO_2		17,935	-17,935
Result	**Tons of CO_2**	**3,772,295**	**326,233**	**3,446,062**

Thus, GHG emission reductions due to the project activity are obvious, considerable and additional.

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

>>
The project boundary embraces GHG emission sources attributed to the project activity. It is only those sources are taken into account emissions from which are above 1% in the overall quantity of GHG emissions. In the following table the emission sources and GHG types are considered as to including them in the baseline or project boundary.

Table B 3.1. GHG emission sources

Scenario	Source	GHG type	Include/Do not include	Comment
Baseline	Low-pressure APG flaring	CO_2	Include	Main baseline emission source
		N_2O	Do not include	Negligibly small
		CH_4	Include	Incomplete burning (2% of APG volume to be flared)
Project	APG for own use	CO_2	Include	Main project emission source
		CH_4	Do not include	Negligibly small
		N_2O	Do not include.	Negligibly small
	Use of electricity from the grid	CO_2	Include	Emissions in the power grid from combustion of fossil fuel for supplying electricity for the project needs
		CH_4	Do not include	Negligibly small
		N_2O	Do not include.	Negligibly small
	Diesel fuel consumption	CO_2	Include	Emissions from operation of diesel power plant are possible in the emergency situation with electricity supply; therefore they are determined *ex-post*.

Schematically the project boundary embrace CPF-1,2 of Urengoy oil-gas condensate field including CS-1,2.

Figure B.3.1. The project boundary
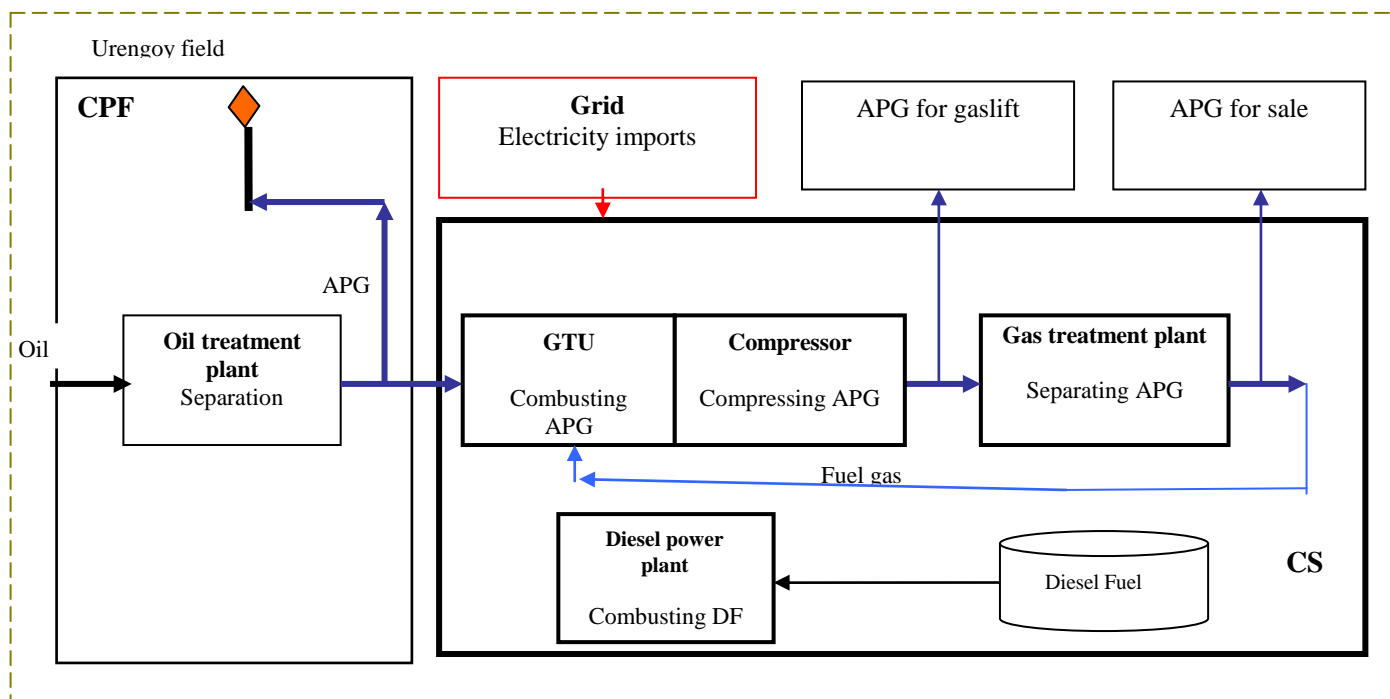
B.4.   Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

>>
Date of baseline setting: 20/09/2009.

The baseline has been designed by:
National Carbon Sequestration Foundation – (NCSF, Moscow);

Contact persons:

Marat Latypov,
Head of Project Development Department
Tel.   +7 499 788 78 35 ext. 103
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Timofey Besedovskiy,
Lead expert of Project Development Department;
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E-mail: BesedovskiyTN@ncsf.ru

National Carbon Sequestration Foundation is not a participant of the Project.

SECTION C.   Duration of the project / crediting period

C.1.   Starting date of the project:

\>>
The project's starting date is 01.06.2008. This first date of construction and installation works[26].

C.2.   Expected operational lifetime of the project:

\>>
Expected operational lifetime of the project is 12 years 138 months: from 30 October 2009 till 31 December 2020.

C.3.   Length of the crediting period:

\>>
Crediting period is determined within the budget period of Kyoto Protocol from 01 November 2009 till 31 December 2012 and making 3 years and 3 months.

Subject to adoption by the Parties to UNFCCC of a new post-kyoto agreement and to further appropriate development of a JI-mechanism a new crediting period from 01 January 2013 till 31 December 2020 will be then determined.

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[26] Approved complex plan construction and installation works of CS-1 «Yamalgasinvest».

SECTION D.	Monitoring plan

D.1.	**Description of monitoring plan chosen:**

>>
For description and justification of the monitoring plan it is a JI specific approach is used for this project. This approach is based on the provisions of the Section D (Monitoring Plan) of JI guidelines on baseline setting and monitoring and includes the following steps:

Step 1. Indication and description of the approach chosen regarding monitoring

Step 2. Application of the approach chosen

Below the approach chosen is provided in a greater detailed.

Step 1. Indication and description of the approach chosen regarding monitoring
Under baseline scenario all low-pressure APG extracted at the Urengoy CPF-1,2 would have been flared that would lead to considerable emissions of GHG gases including CO_2 и CH_4. Atmospheric CH_4 emissions occur due to incomplete combustion of APG at the flare. 2006 IPCC Guidelines for National Greenhouse Gas Inventory prescribes to use 98% efficiency factor when estimating GHG emissions from incomplete flaring combustion[27]. Under the project activity all low-pressure APG will be efficiently used through both: injection into the field's gaslift system and transportation via gas pipeline to customers. For this purpose two compressor stations CS-1,2 are being installed at the Urengoy oil-gas condensate field that will provide a necessary compression. A part of APG will be used as a fuel for gas turbine units that activate compressors. That will cause CO_2 emissions.
Electricity to cover the project activity will be supplied from the grid leading to CO_2 and $CH4$ emissions at the grid plants. In emergency cases with electricity supply the on-site diesel power plant will be automatically switched on that will cause CO_2 emissions too.
Based on that, the monitoring of the following parameters should be provided:

1. Amount and composition of APG delivered to CS-1,2.
2. Amount of APG directed to gaslift system and for sale.
3. Amount and composition of APG for GTUs.
4. Electricity consumption at CS-1,2.
5. Diesel fuel consumption at the back-up diesel power plant.

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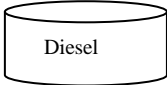
[27] 2006 IPCC Guidelines for National Greenhouse Gas Inventory (Subsection 4.2. "Fugitive emissions from oil and natural gas systems".

For determining the baseline and project GHG emissions the following monitoring points will be used:

Figure D.1.1. Monitoring points
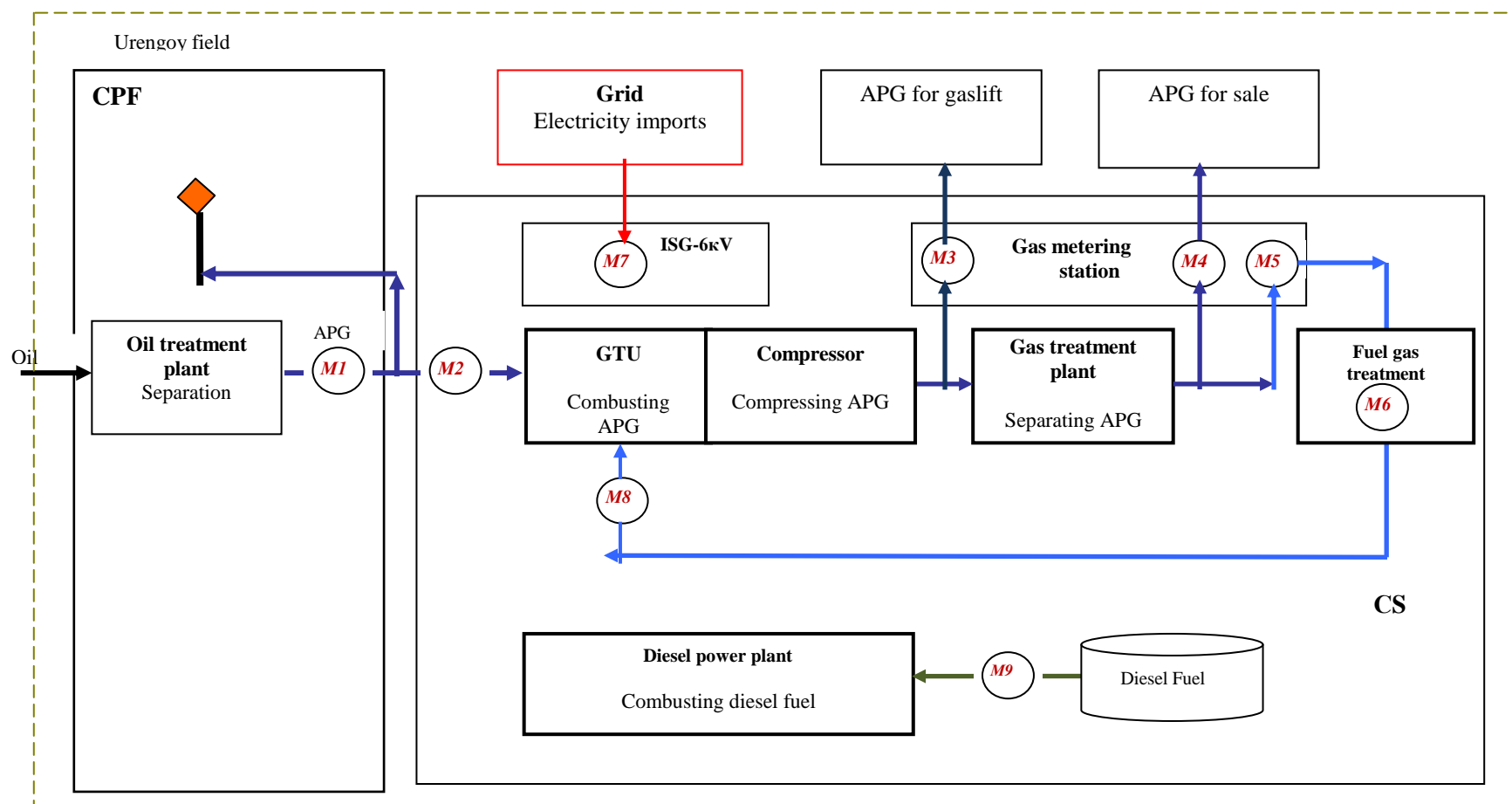
Legend

Mn	Monitoring points	→	Stream of low-pressure APG after Oil Treatment Plant
◆	Low-pressure APG flaring	→	Stream of compressed APG for gaslift
Diesel	Reservoirs for diesel fuel	→	Stream of compressed APG for sale
CPF	Central production facility	→	Stream of compressed air for fuel supply
CS	Compression station	→	Electricity import from the grid
ISG-6 кV	Indoor switch gear – 6кV	→	Diesel fuel supply for on-site diesel power plant

Description of the monitoring points

M1	M2	M3	M4	M5	M6	M7	M8	M9
Low-pressure APG delivered in CS-1,2 from OTP of CPF	*Chemical composition of low-pressure APG at CPF-1,2*	*APG for gaslift*	*APG for sale*	*fuel APG*	*APG composition at fuel gas treatment plants of CS-1,2*	*Electricity imported from the grid for the project needs*	*APG combusted in GTUs of CS-1,2*	*Diesel fuel consumption at diesel power plants of CS-1,2*

For defining CO_2 and CH_4 emission factors of APG burned in flares, the approaches proposed in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Subchapter 4.2. Fugitive emissions from oil and natural gas systems) are applied. CO_2 and CH_4 emissions are defined as a product of APG amount to be utilized under the project and appropriate CO_2 or CH_4 emission factor.

The grid emissions are defined as a product of the electricity consumed for the project needs and a CO2 emission factor provided in Operational Guidelines for Project Design Documents of Joint Implementation Projects and proposed by Ministry of Economic Affairs of the Netherlands, May 2004.

Step 2. Application of the approach chosen

See the following subsections.

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

D.1.1.1. Data to be collected in order to monitor emissions from the <u>project</u>, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
M5	*fuel APG*	*Flow meter*	m^3	*m*	*monthly*	*100%*	*Paper and electronic*	*Measured at GMS by shift operator and*

									fixed in mode log
M6	*fuel APG composition*	*Gas chromatograph*	*% vol.*	*m*	*monthly*	*100%*	*Paper and electronic*	*Analysis is made in the chemical – analytic laboratory*
M7	*Electricity imported from the grid for the project needs*	*Electricity meter*	*kWh*	*M*	*monthly*	*100%*	*Paper and electronically*	*-*
M8	*APG combusted in GTUs of CS-1,2*	*Flow meter*	*m³*	*m*	*monthly*	*100%*	*Paper and electronically*	*-*
M9	*Diesel fuel consumption at DPP of CS-1,2*	*Measuring stick*	*tons*	*m*	*monthly*	*100%*	*Paper and electronically*	*Measurements are fixed in inventory certificate of remaining diesel fuel*

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO$_2$ equivalent):

>>

Project GHG emissions from the electricity consumption at CS-1,2:

(D.1)
$$PE_{EC} = PE_{EC,CS-1} + PE_{EC,CS-2}$$

CO2 emissions from electricity consumption at CS-1, $PE_{EC,CS-1}$:	CO2 emissions from electricity consumption at CS-2, $PE_{EC,CS-2}$:
(D.1.1) $PE_{EC, CS-1} = (\Sigma EC_{CS-1}/1000)\cdot EF_{CO2}$	(D.1.1') $PE_{EC, cp-1} = (\Sigma EC_{CS-2}/1000)\cdot EF_{CO2}$
$PE_{EC, CS-1}$ – CO2 emissions from the electricity consumption at CS-1, t CO$_2$	$PE_{EC, CS-2}$ – CO2 emissions from the electricity consumption at CS-2, t CO$_2$
ΣEC_{CS-1} – total electricity consumption at CS-1, kWh	ΣEC_{CS-2} – total electricity consumption at CS-2, kWh

EF_{CO2} - CO_2 emission factor recommended to apply when calculating emissions in the grid of Russia, tCO2/MWh.[28]. Below are the values of those factors provided by Operational Guidelines:

Parameter	Indication	Unit	2009	2010	2011	2012
CO_2 emission factor	EF_{CO2}	tCO$_2$/MWh	0.557	0.550	0.542	0.534

Project GHG emissions from the consumption of APG for own energy needs (GTUs CS-1,2 at CPF 1.2), PE_{EN} :

(D.2) $$PE_{EN} = PE_{EN, CS-1} + PE_{EN, CS-2}$$

GHG emissions from APG consumption at CS- 1and CPF-1: (D 2.1) $PE_{EN, CS-1} = PE_{EN, GTU, CS-1}$ $PE_{EN, GTU, CS-1}$ – emissions from APG combustion at GTU CS-1, tCO$_2$ **GHG emissions from APG combustion at GTU CS-1** (D 2.1.1) $PE_{EN, GTU, CS-1} = \cdot EF_{CO2, APG, CSp-1} \ \Sigma FC_{APG, GTUi, CS-1} / 1000$ $\Sigma FC_{APG, GTU\ CS-1}$ – total APG combusted at GTUs of CS-1, m^3 $EF_{CO2,APG,CS-1}$ – CO$_2$ emission factor by APG combustion at CS-1, tCO$_2$/ths. m^3 (D 2.1.2) $EF_{CO2,APG,CS-1} = (y_{CO2} + (Nc_{CH4}*y_{CH4} + Nc_{VOC}*y_{VOC}))*\rho CO_2 *FE_{GTU}$ $y_{CO2},\ y_{CH4}\ y_{VOC}$ – volumetric fractions of carbon, methane and volatile organic compounds VOC[1] in APG, (information source – gas test protocol at Fuel Gas Treatment Plant at CS-1). $Nc_{CH4,}\ Nc_{VOC}$ – quantity of carbon moles in a mole of methane and VOC accordingly.	**GHG emissions from APG consumption at CS- 2and CPF-2:** (D 2.1)' $PE_{EN,CS-2} = PE_{EN, GTU, CS-2}$ $PE_{EN, GTU, CS-2}$ – emissions from APG combustion at GTU CS-2, tCO$_2$ **GHG emissions from APG combustion at GTU CS-2** (D 2.1.1)' $PE_{EN, GTU, CS-2} = \cdot EF_{CO2, APG, CS-2} \ \Sigma FC_{APG, GTUi, CS-2} / 1000$ $\Sigma FC_{APG, GTU, CS-2}$ – total APG combusted at GTUs of CS-2, m^3 $EF_{CO2,APG,CS-2}$ – CO$_2$ emission factor by APG combustion at CS-2, tCO$_2$/ths. m^3 (D 2.1.2)' $EF_{CO2,APG, CS-2} = (y_{CO2} + (Nc_{CH4}*y_{CH4} + Nc_{ЛHOC}*y_{ЛHOC}))*\rho CO_2 *FE_{GTU}$ $y_{CO2},\ y_{CH4}\ y_{VOC}$ – volumetric fractions of carbon, methane and volatile organic compounds VOC[1] in APG, (information source – gas test protocol at Fuel Gas Treatment Plant at CS-1). $Nc_{CH4,}\ Nc_{VOC}$ – quantity of carbon moles in a mole of methane and VOC accordingly.

ρCO_2 –CO_2 density at 20°C is taken equal to 1.831 kg/m3.

FE –efficiency of APG combustion in a flare is taken equal to 0.98, for GTU it is equal to 1[29].

Project GHG emissions from consumption of diesel fuel at diesel power plant of CS 1,2, PE_{DF} :

(D.3) $$PE_{DF} = PE_{DF\_cp1} + PE_{DF\_cp2}$$

PE_{DF_CS-1} – emissions at diesel power plant of CS-1, tCO_2

PE_{DF_CS-2} – emissions at diesel power plant of CS-2, tCO_2

Emissions at diesel power plant of CS-1, $PE_{DF,CS-1}$	Emissions at diesel power plant of CS-2, $PE_{DF,\_CS-2}$
(D 3.1) $PE_{DF,CS\ 1}= \cdot EF_{DF}\ FC_{DF,CS\ 1}$	(D 3.1)' $PE_{DF,CS\ 2}= \cdot EF_{DF}\ FC_{DF,CS\ 2}$
$FC_{DF\_CS\ 1}$ – diesel fuel combusted at DPP CS-1, tons	$FC_{DF\_CS\ 2}$ – diesel fuel combusted at DPP CS-2, tons

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[29] 2006 IPCC Guidelines, Volume 2, Energy, Chapter 2, Stationary Combustion, p.2.14

EF_{DF} - CO_2 emission factor by diesel fuel combustion, fixed value 77,4 tCO2 /TJ[30]

Total GHG project emission, PE:

(D.4) $$PE = PE_{EC} + PE_{EN} + PE_{DF}$$

D.1.1.3. Relevant data necessary for determining the <u>baseline</u> of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
M1	*Low-pressure APG delivered in CS-1,2 from OTP of CPF*	*Flow meter*	*m^3*	*m*	*monthly*	*100%*	*Paper and electronically*	*-*
M2	*Chemical composition of low-pressure APG at CPF 1,2*	*Gas chromatograph*	*% vol.*	*m*	*monthly*	*100%*	*Paper and electronically*	*Analysis is made in the chemical – analytic laboratory*
M3	*APG for gaslift*	*Flow meter*	*m^3*	*m*	*monthly*	*100%*	*Paper and electronically*	*-*
M4	*APG for sale*	*Flow meter*	*m^3*	*m*	*monthly*	*100%*	*Paper and electronically*	*-*
M5	*Fuel APG*	*Flow meter*	*m^3*	*m*	*monthly*	*100%*	*Paper and electronically*	*-*

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[30] Default value. Information source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, chapter 2, page 2.18, table 2.2

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

>>

Baseline GHG emissions from APG flaring at CPF-1,2 of Urengoy oil-gas condensate field

(D.5) $$BE = BE_{F,CPF-1} + BE_{F,CPF-2}$$

$BE_{F, CPF-1}$ **-** baseline emissions from APG flaring at CPF-1, tCO_2e
$BE_{F, CPF-2}$ **-** baseline emissions from APG flaring at CPF-2, tCO_2e

Baseline CO_2 emissions from APG flaring at CPF-1	Baseline CO_2 emissions from APG flaring at CPF-2
(D.5.1) $BE_{F,CPF-1} = EF_{CO2, APG,F, CPF-1} * FC_{APG,BL,CPF-1}/1000$	(D.5.1)' $BE_{,F,CPF-2} = EF_{CO2, APG,F,CPF-2} * FC_{APG,BL,CPF-2}/1000$
$FC_{APG,BL,CPF-1}$ – total low-pressure APG that would be flared at CPF-1 under the baseline, m^3	$FC_{APG,BL,CPF-2}$ – total low-pressure APG that would be flared at CPF-2 under the baseline, m^3
(D. 5.1.1) $FC_{APG,BL,CPF-1} = FC_{gaslift\_CS-1} + FC_{trade\_CS-1} + FC_{fuel\_CS-1}$	(D. 5.1.1)' $FC_{APG,BL,CPF-2} = FC_{gaslift\_CS-2} + FC_{trade\_CS-2} + FC_{fuel\_CS-2}$
$FC_{gaslift\_CS-1}$ – delivery of compressed APG into gaslift system at CS-1 under the project activity, m^3;	$FC_{gaslift\_CS-2}$ – delivery of compressed APG into gaslift system at CS-2 under the project activity, m^3;;
FC_{trade_CS-1} – delivery of compressed APG into gas transport system at CS-1 under the project activity, m^3;	FC_{trade_CS-2} – delivery of compressed APG into gas transport system at CS-2 under the project activity, m^3;
FC_{fuel_CS-1}– delivery of compressed APG for consumption as a fuel at CS -1 under the project activity, m^3	FC_{fuel_CS-2}– delivery of compressed APG for consumption as a fuel at CS-2 under the project activity, m^3
CO_2 emissions factor by APG flaring at CPF-1, $EF_{CO2, APG,F,CPF-1}$	**CO_2 emissions factor by APG flaring at CPF-2, $EF_{CO2, APG,F,CPF-2}$**
(D 5.1.2) $EF_{CO2,APG,F,CPF-1} = (y_{CO2} + (Nc_{CH4} * y_{CH4} + Nc_{VOC} * y_{VOC})) * \rho CO_2 * FEf$ $y_{CO2}, y_{CH4} y_{VOC}$ – volumetric fractions of carbon, methane and volatile organic compounds VOC^1 in APG, (information source – gas test protocol at Oil Treatment Plant at CPF-1). $Nc_{CH4,} Nc_{VOC}$ – quantity of carbon moles in a mole of methane and VOC accordingly.	(D 5.1.2)' $EF_{CO2,APG,F,CPF-2} = (y_{CO2} + (Nc_{CH4} * y_{CH4} + Nc_{VOC} * y_{VOC})) * \rho CO_2 * FEf$ $y_{CO2,} y_{CH4} y_{VOC}$ – volumetric fractions of carbon, methane and volatile organic compounds VOC^1 in APG, (information source – gas test protocol at Oil Treatment Plant at CPF-2). $Nc_{CH4,} Nc_{VOC}$ – quantity of carbon moles in a mole of methane and VOC accordingly

ρCO_2 – density of CO2 at standard conditions s is accepted as equal to 1,831 kg/m3.

FEf – efficiency of APG combustion in a flare equals to 0.98[31]

CH4 emissions by incomplete burning of APG at CPF-1, $BE_{CH4, F, CPF-1}$	CH4 emissions by incomplete burning of APG at CPF-2, $BE_{CH4, F, CPF-2}$
(D. 5.2) $BE_{CH4, F, CPF-1} = EF_{CH4, F, cpc-1} * FC_{APG,BL,CPF-1}/1000$	(D. 5.2)' $BE_{CH4,F,CPF-2} = EF_{CH4, F, CPF-2} * FC_{APG,BL,CPF-2}/1000$
$EF_{CH4, F, CPF-1}$ - methane emission factor (in terms of CO2 equivalent) by APG flaring at CPF-1, tCO2e/ths. m^3	$EF_{CH4, F, CPF-2}$ - methane emission factor (in terms of CO2 equivalent) by APG flaring at CPF-2, tCO2e/ths. m^3
$EF_{CH4, F, CPF-1} = y_{CH4, CPF-1} * \rho CH_4 * (1-FE) * GWP_{CH4}$	$EF_{CH4, F, CPF-2} = y_{CH4, CPF-2} * \rho CH_4 * (1-FE) * GWP_{CH4}$

ρCH_4– the density of methane CH4 under standard conditions, equal to 0.667 kg/m^3
FE – APG flaring efficiency, equal to 0,98[32]
GWP_{CH4} – global warming potential for methane, equal to 21 tCO$_2$/tCH$_4$

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

The option is not used.

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[31] 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Chapter 4 (Subsection 4.2. "Fugitive emissions from oil and natural gas systems", adapted equations 4.2.4 page 4.45).

[32] 2006 IPCC Guidelines, volume 2, Energy, Chapter 4, Fugitive emissions,p.4.49

D.1.2.1. Data to be collected in order to monitor emission reductions from the <u>project</u>, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.2.2. Description of formulae used to calculate emission reductions from the <u>project</u> (for each gas, source etc.; emissions/emission reductions in units of CO₂ equivalent):

>>
The option is not used.

D.1.3. Treatment of <u>leakage</u> in the <u>monitoring plan</u>:

Leakages under the project activity are physical leaks resulted from:

1. Recovery and utilization of APG for gaslift at Urengoy oil-gas condensate field (so-called *technological losses*)
2. Transportation of commercial APG (including displaced valanzhin gas) through a gas pipeline system
3. Potential leakage from fugitive CH4 emissions associated with extraction, processing, transportation and distribution of fossil fuels (natural gas) used in the grid power plants

Nevertheless, these leaks are not considered due to the following reasons:
1. Technological losses are negligible. According to the norms of technological losses (shut-off valve, valves and linear part of gas pipeline)approved by Gazprom dobytcha Urengoy Company, these losses make 0.014% of recovered APG[33].

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[33] Approved norms of losses for OOO "Urengoygazprom", Annex 1, p.25, JSC "VNIIOENG",2007

2. Commercial APG will displace an equivalent quantity of the natural gas by end customers that would be otherwise used. As the equivalent amount of natural gas would be transported under the baseline, the leaks in the both scenarios are equal, which do not lead to additional emissions beyond the project boundary, i.e. to leakage.

3. Potential leakage from fugitive CH4 emissions associated with extraction, processing, transportation and distribution of fossil fuels (natural gas) used in the grid power plants in the project scenario are calculate and make less than 1 %, therefore aren't considered.[34]

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO$_2$ equivalent):

>>
Not applicable.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO$_2$ equivalent):

>>

(D.6) $$ER = BE - PE$$

ER – CO2 emission reductions for the project, tCO$_2$
BE – CO$_2$ baseline emissions, tCO$_2$
PE – CO$_2$ project emissions. tCO$_2$

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[34] Calculation potential leakage from fugitive CH4 emissions present in section E and excel

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

>>
Information on concerning the environmental impact will be presented according to Russian legislation[35].

According to the environmental legislation the company should control emissions of pollutants, waste water release, create and supply the wastes management system and should provide reports in authorized state bodies (Federal survey on ecological, technological and nuclear supervising). In "Gazprom dobycha Urengoy" LLC work on environmental protection is managed by technological progress and environmental protection department headed by Chief Engineer - first deputy general director. Annually environmental protection measures are developed that include ecological monitoring of industrial activity of the company.

Organizational structure of "Gazprom dobycha Urengoy" LLC includes engineering-technological center (ETC) accredited on making of instrumental control (certificate of accreditation №РОСС RU.0001.510998 from 17.12.2007 to 13.11.2011). Laboratories of ETC are carried out necessary chemical and analytical researches of environmental components.

"Gazprom dobycha Urengoy" LLC in stipulated dates provides official statistical reports and forms[36] to legal state bodies including:
- 2-TP (air)[37] – data on air protection including the information on number of captured and neutralized pollutants, detailed information on particular emissions of pollutants, number of emission sources, measures on emission reductions in atmosphere and emissions of separate groups of emission sources;
- 2-TP (water resources)[38] – data on water usage including the information on water consumption from natural sources, waste water releases and concentration of pollutants in water, water capacity etc. waste water treatment facilities;

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[35] THE FEDERAL LAW "ABOUT PROTECTION OF ATMOSPHERIC AIR" (ON MAY, 4TH 1999 Г N 96-FZ)

[36] The form of federal state statistical supervision (the report under the form) № 2-tp (air), (water), (waste) legal bodies should make, their isolated divisions (enterprise) having stationary sources of emissions of harmful (polluting) substances, carrying out water use, and also legal bodies (including being subjects of small business), including their isolated divisions in the course of which activity are formed (arrive), are used, neutralised and take places (including storage and burial place) production wastes and consumption, and also carrying out activity on gathering of waste, their transportation.

[37] The basic standard documents on realisation of federal state statistical supervision in the field of preservation of the environment under the form № 2-tp (air) "Data on protection of atmospheric air" are:

- The regulation of Goskomstat of the Russian Federation from July, 27th, 2001 N 53 "About the statement of statistical toolkit for the organisation of statistical supervision over environment and agriculture for 2002" (with changes from May, 23rd, on August, 8th, 2002, on June, 24th, 2003)

[38] The basic standard documents on realisation of federal state statistical supervision in the field of preservation of the environment under the form № 2-tp (water) "Data on water use are:

- The regulation of Goskomstat of the Russian Federation from November, 13th, 2000 N 110 "About the statement of statistical toolkit for organisation MPR of Russia of statistical supervision over stocks of minerals, prospecting jobs and their financing, use of water and the added payments for environmental contamination" (with changes from May, 23rd, on June, 25th, on September, 3rd, 2002)

- 2-TP (wastes)[39] – data on originating, usage, deactivation, transport and storage of wastes, including annual balance of wastes separated according their types and classes of danger.

On feasibility stage sources and kinds of impact were analyzed, evaluation of modern condition of pollution was carried out, preliminary forecast of condition was done and environmental protection measures were planned. In process of environmental impact evaluation the following components of environment were taken into account:

- earth;
- air;
- engineering and geological conditions;
- geomorphologic conditions;
- landscape complexes;
- surface and soil waters;
- soil;
- flora;
- fauna;
-social and economic conditions of life.

Results of environmental impact analysis show that in case of all standards and rules of environment protection honored satisfying environment condition for human living will be achieved. After the implementation of the construction in process of exploitation KS-1,2 analytical control for different types of Project's environmental impact will be performed according to the existing procedures on the plant.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary

[39] The basic standard documents on realisation of federal state statistical supervision in the field of preservation of the environment under form N 2-tp (waste) "Data on education, use, neutralisation, transportation and placing of production wastes and consumption" are:

- About the statement of the form of federal state statistical supervision № 2-TP (waste) "Data on education, use, neutralisation, transportation and placing of production wastes and consumption". The decision of Goskomstat of the Russian Federation from July, 25th, 2002 N 157.

- About the organisation of jobs on realisation of federal state statistical supervision under form N 2-TP (waste) "Data on education, use, neutralisation, transportation and placing of production wastes and consumption". Order МПР the Russian Federation from November, 5th, 2002 N 734.

- Entering of additions into the federal classification catalogue of waste confirmed by order МПР of Russia from 12/2/2002 N 786 "About the statement of the federal classification catalogue of waste". Order МПР the Russian Federation from July, 30th, 2003 N 663

M1, M3, M4, M5 *D.1.1.3*	low [16]	Quality control procedure are carried out once per two years by FGU "Tumen CSM". Permanent metrological supervision performs accredited metrological survey of "Gazprom dobycha Urengoy".[17]
M8 *D.1.1.1*	low	Quality control procedure are carried out once per two years by FGU "Tumen CSM". Permanent metrological supervision performs accredited metrological survey of "Gazprom dobycha Urengoy".
M9 *D.1.1.1*	low	Quality control procedure are carried out once per two years by FGU "Tumen CSM". Permanent metrological supervision performs accredited metrological survey of "Gazprom dobycha Urengoy".
M4 *D.1.1.3*	low	Quality control procedure are carried out once per two years by FGU "Tumen CSM". Permanent metrological supervision performs accredited metrological survey of "Gazprom dobycha Urengoy".
M7 *D.1.1.1*	low	Quality control is performed according to instruction of tool manufacturer.
M2,M6 *D.1.1.1 and D.1.1.3*	low	Chemical and analytical laboratory of physical and chemistry department of ETC fits the requirements of GOST R ISO//IEC 17025-2000[3].

Carrying out of control procedures mentioned above is based on the requirements of the following documents:
- Federal low from 26.06.2008 N 102-FL «On supplying of measurement unity»;
- GOST R ISO/IEC 17025-2000;
- "Requirements on calibration works making" app. by decree №17 Gosstandart of Russia from 21.09.1994;
- State register of SI system;
- PR 50.2.006-94

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

>>
The operational and management structure for the monitoring of emission reductions for the project will be adapted to the management system existing in Gazprom dobytcha Urengoy Company. Roles and responsibilities of persons, departments and organizations providing such a monitoring are presented in the following table:

№№	Organizations	Position/Department	Tasks	Comments
1.	JSC «Gazprom», Moscow	Head of Energy Saving and Environment Office of	Approval of Monitoring Reports (MR)	Submits aMR for verification

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[16] Total error of gas metering station makes 1,0-1,5%.
[17] Accreditation certificate № 012 dd. 01.02.2008. valid until 28.01.2012
[18] Accreditation certificate №POCC RU.0001.510998 dd. 17.12.2007 valid till 13.11.2011

		Department for Transportation, Underground Storage and Gas Utilization		Submits a verified MR in Gazprom dobytcha Urengoy
2.	NCSF	Project Development Department	Coordination and consulting on monitoring activities	Submits a MR in Gazprom dobytcha Urengoy Company Drafting a MR
3.	Gazprom VNIIGAZ, LLC Moscow	Laboratory of Environment Protection and Resource Saving of Center for Environmental Safety and Labour Protection	Processing of data for drafting MR	Calculates factual emission reductions in accordance with formulas presented in the section D.
4.	Gazprom dobytcha Urengoy, LLC, Urengoy	Technical progress and Environment Safety Department (TP&ES Dept)	Request of approved executive balance and report on electricity consumption.	Prepares and submits data to Laboratory of Environment Protection and Resource Saving of Center for Environmental Safety and Labour Protection
5.	Gazprom dobytcha Urengoy, LLC, Urengoy	Executives	Analysis of the company's performance data for the reporting period	Approves an executive balance and a report on electricity consumption. Data storage duration for paper copies is 3 years, for electronic copies is 5 years.
6.	Gazprom dobytcha Urengoy, LLC, Urengoy	Department for Production and Treatment of Oil and Condensate (PTOC Dept)	Preparation of monthly executive balances	Executive balance includes: • APG resources • APG recovery • APG flared • APG utilized (including losses)
7.	Gazprom dobytcha Urengoy, LLC, Urengoy	Chief Power Engineer Department (CPE Dept)	Preparation of monthly reports on electricity consumption	Submits data to the company's executives
8.	Gazprom dobytcha Urengoy, LLC, Urengoy	Chemical-analytical laboratory (CAL)of the technical center	Preparation of monthly gas test results on APG composition	Submits data to the company's executives
9.	Gazprom dobytcha Urengoy, LLC, Urengoy	Central Dispatching Office (CDO)	Collection of daily data on APG balance throughout the company	Submits data to the company's departments
10.	Gazprom dobytcha Urengoy, LLC, Urengoy	Production-dispatching office (PDO) of the oil and gas producing unit (OGPU)	Collection of daily data on APG balance throughout OGPU	Data is fixed in a log for gas accounting and is submitted to the central dispatching office
11.	Gazprom dobytcha Urengoy, LLC, Urengoy	Shift operators at CPF-1,2	Collection of daily data on APG balance at CPF-1,2	Data is fixed in a mode log and is submitted to the production-dispatching office of OGPU

| 12. | Gazprom dobytcha Urengoy, LLC, Urengoy | Shift operators at CS- 1,2 | Making daily reports on low-pressure APG balance and electricity consumption (by 11 a.m.) | Submit data to the shift operators of CPF-1,2 |

Schematically, the monitoring structure looks as follows:

Figure D.3. Operational and management structure of the monitoring
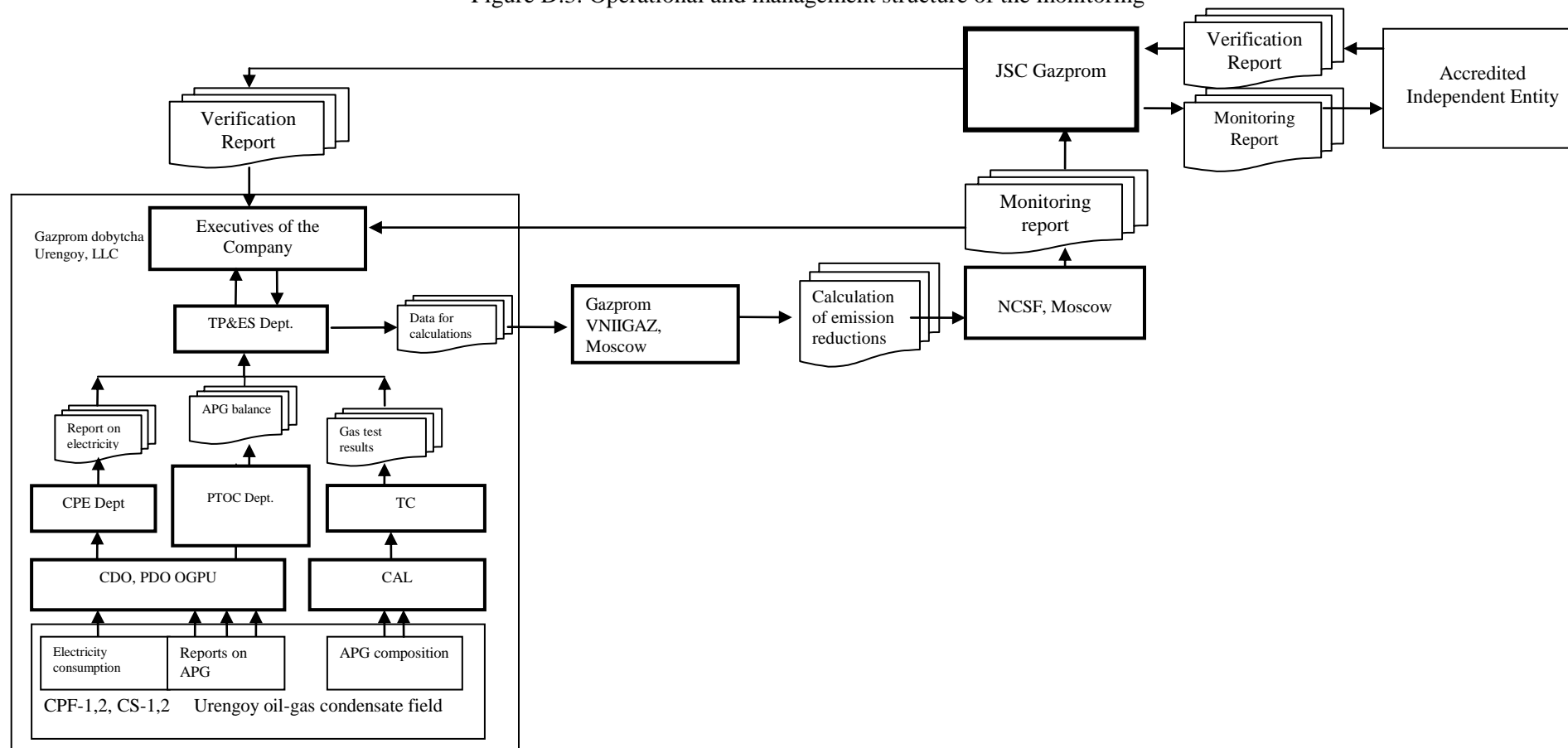
D.4.	**Name of person(s)/entity(ies) establishing the <u>monitoring plan:</u>**

\>>

The monitoring plan was established by National Carbon Sequestration Foundation – (NCSF, Moscow);

Contact persons:

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National Carbon Sequestration Foundation is not a participant of the Project.

SECTION E. Estimation of greenhouse gas emission reductions

For defining CO_2 and CH_4 emission factors of APG burned in flares, the approaches proposed in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Subchapter 4.2. Fugitive emissions from oil and natural gas systems) are applied. CO_2 and CH_4 emissions are defined as a product of APG amount to be utilized under the project and appropriate CO_2 or CH_4 emission factor.

The grid emissions are defined as a product of the electricity consumed for the project needs and a CO2 emission factor provided in Operational Guidelines for Project Design Documents of Joint Implementation Projects and proposed by Ministry of Economic Affairs of the Netherlands, May 2004.

We used emission factors from Netherlands study (table 2) in order to be conservative. As a matter of fact this study provides emission factors that are really bigger than the factor calculated for the exact energy system (Tyumenenergo):

Emission factors from Netherlands study (table 2)-**0,557**

Emission factor calculated for the exact energy system (Tyumenenergo)-**0,50**

Table with the characteristics of the main producers of electricity in Tyumenenergo

Item	Indication	Surgutskaya GRES-2	Surgutskaya GRES-1	Nizhnevartovsk GRES
Specific fuel consumption	g c.e./kWh	305[40]	325[41]	305[42]
Specific fuel consumption[43]	**MJ/kWh**	8,89	9,5	8,9
EFng[44]	tCO_2/TJ	56,1	56,1	56,1
Tyumenenergo energy system emission factor	tCO_2/MWh	0,50	0,53	0,50
Average Tyumenenergo energy system emission factor				0,50

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[40]

http://ru.wikipedia.org/wiki/%D0%A1%D1%83%D1%80%D0%B3%D1%83%D1%82%D1%81%D0%BA%D0%B0%D1%8F_%D0%93%D0%A0%D0%AD%D0%A1-2

[41] http://www.google.ru/url?sa=t&source=web&ct=res&cd=1&ved=0CAcQFjAA&url=http%3A%2F%2Fwww.finam.ru%2Ffiles%2Fdesk-note_2009-10-19_OGKB-desk-note(FINAM)rus.pdf&rct=j&q=%D0%BE%D1%82%D1%87%D0%B5%D1%82+%D0%9E%D0%93%D0%9A-2+%D1%83%D0%B4%D0%B5%D0%BB%D1%8C%D0%BD%D1%8B%D0%B9+%D1%80%D0%B0%D1%81%D1%85%D0%BE%D0%B4&ei=d516S5jHJdLM-Qad6PywCA&usg=AFQjCNHEkofzhWTqw1sEabLc20XueEApPA page 6 image 7

[42]

http://www.google.ru/url?sa=t&source=web&ct=res&cd=6&ved=0CBQQFjAF&url=http%3A%2F%2Fwww.ogk1.net%2Fppt%2Fpresentation19%2Fpresentation19.pdf&rct=j&q=%D1%82%D1%8E%D0%BC%D0%B5%D0%BD%D1%81%D0%BA%D0%B0%D0%B0%D1%8F+%D0%B3%D1%80%D1%8D%D1%81+%D1%83%D0%B4%D0%B5%D0%BB%D1%8C%D0%BD%D1%8B%D0%B9+%D1%80%D0%B0%D1%81%D1%85%D0%BE%D0%B4+%D1%82%D0%BE%D0%BF%D0%BB%D0%B8%D0%B2%D0%B0&ei=2Jp6S-zbCs7b-QbijKnsDw&usg=AFQjCNGsjGlqBV1TEvZLCHiv3mc3Frv3ig page 7

[43] The amount of fossil fuels are expressed in tonne of coal equivalent with net calorific value is equal to 7,000 kcal/kg c.e. or 29.33 GJ/t.c.e.

[44] Default value. Information source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, chapter 2, page 2.18, table 2.2

Table E.1. CO2 emission factor for calculating emissions in the grid, in 2009-2012

Parameter	Indication	Unit	2009	2010	2011	2012
CO_2 emission factor	EF_{CO2}	tCO_2/MWh	0.557	0.550	0.542	0.534

The estimation of emission factor for the period of 2013-2020 is based on a calculation of the average value of the factor over previous 3 years of 2010-2012.

(E. 1) $$EF_{CO2} = \sum_{2010-2012} EF_{CO2,}/3$$

Table E.2. CO2 emission factor for calculating emissions in the grid, in 2013-2020

Parameter	Indication	Unit	2013	2014	2015	2016	2017	2018	2019	2020
CO_2 emission factor	EF_{CO2}	tCO_2/MWh	0,525	0,525	0,525	0,525	0,525	0,525	0,525	0,525

As the project activity is carried out at CPF-1 and CPF-2 sites which have low-pressure APG of different composition , GHG emission factors are calculated for each CPF separately.

For own needs APG consumption as a fuel, emission factors are determined as follow:

(E. 2) $$EF_{CO2, APG, CPF-1,2} = (y_{CO2} + (Nc_{CH4}*y_{CH4} + Nc_{VOC}*y_{VOC}))*\rho_{CO2}*FE$$

y_{CO2}, y_{CH4} y_{VOC} − volumetric fractions of carbon, methane and volatile organic compounds VOC in APG used as a fuel .

$Nc_{CH4,}$ Nc_{VOC} − quantity of carbon moles in a mole of methane and VOC accordingly.

ρCO_2 − CO_2 density at 20°C is taken equal to 1.831 kg/m3.

FE –efficiency of APG combustion in a flare is taken equal to 0.98, for GTU it is equal to 1.

Table E.3 Calculation of CO2 emission factors for APG use in GTUs of CS-1 of CPF-1

Item	Volumetric fraction of component	Quantity of carbon moles in a mole of a component (fixed parameter)	Density of carbon dioxide	Efficiency combustion in stationary sources	CO2 emission factor for APG use
Index	yi	Nc	ρCO2	FE	$EF_{CO2,APG,CS-1}$
Unit	%		kg/m3	-	tCO2/thous. m3
Carbon dioxide, CO2	0,075%	1	1,831	1	0,001
methane, CH4	85,013%	1	1,831	1	1,557
ethane, C2H6	5,779%	2	1,831	1	0,212

propane, C3H8	3,308%	3	1,831	1	0,182
i-butane, C4H10	1,452%	4	1,831	1	0,106
n-butane, C4H10	1,422%	4	1,831	1	0,104
i-pentane, C5H12	0,615%	5	1,831	1	0,056
n-pentane, C5H12	0,605%	5	1,831	1	0,055
hexane, C6H14	0,727%	6	1,831	1	0,080
heptane, C7H16	0,276%	7	1,831	1	0,035
octane, C8H18	0,057%	8	1,831	1	0,008
hydrogen sulphur, H2S			1,831	1	0,000
nitrogen, N2	0,619%		1,831	1	0,000
oxigen, O2			1,831	1	0,000
100%					**2,397**

Table E.4 Calculation of CO2 emission factors for APG use in GTUs of CS-2 of CPF-2

Item	Volumetric fraction of component	Quantity of carbon moles in a mole of a component (fixed parameter)	Density of carbon dioxide	Efficiency combustion in stationary sources	CO2 emission factor for APG use
Index	y_i	N_c	ρCO_2	FE	$EF_{CO2,APG,CS-2}$
Unit	%		kg/m3	-	tCO2/thous. m3
Carbon dioxide, CO2	0,07%	1	1,831	1	0,001
methane, CH4	89,13%	1	1,831	1	1,632
ethane, C2H6	5,54%	2	1,831	1	0,203
propane, C3H8	2,60%	3	1,831	1	0,143
i-butane, C4H10	0,77%	4	1,831	1	0,056
n-butane, C4H10	0,70%	4	1,831	1	0,051
i-pentane, C5H12	0,20%	5	1,831	1	0,018
n-pentane, C5H12	0,16%	5	1,831	1	0,014
hexane, C6H14	0,13%	6	1,831	1	0,014
heptane, C7H16	0,05%	7	1,831	1	0,007
octane, C8H18	0,01%	8	1,831	1	0,002
hydrogen sulphur, H2S	0,63%		1,831	1	0,000
nitrogen, N2			1,831	1	0,000
100%					**2,142**

CO2 emission factor for low-pressure APG flaring at CPF-1,2 is determined as follows:

(E.3) $$EF_{CO2, APG, CPF-1,2} = (y_{CO2} + (Nc_{CH4} * y_{CH4} + Nc_{VOC} * y_{VOC})) * \rho_{CO2} * FE$$

$y_{CO2}, y_{CH4}, y_{VOC}$ – volumetric fractions of carbon, methane and volatile organic compounds VOC in low-pressure APG to be flared at CPF-1,2

$Nc_{CH4},\ Nc_{VOC}$ − quantity of carbon moles in a mole of methane and VOC accordingly.

ρCO_2 −CO_2 density at 20°C is taken equal to 1.831 kg/m3.

FE −efficiency of APG combustion in a flare is taken equal to 0.98, for GTU it is equal to 0.98

Table E 5. Calculation of CO_2emission factor for APG flaring at CPF-1

Item	Volumetric fraction of component	Quantity of carbon moles in a mole of a component (fixed parameter)	Density of carbon dioxide	Flaring efficiency	CO2 emission factor for APG flaring at CPF-1
Index	yi	Nc	ρCO2	FE	$EF_{CO2,APG,CPF-1}$
Unit	%		kg/m3	-	tCO2/ths. m3
Carbon dioxide, CO2	0,076%	1	1,831	0,98	0,001
methane, CH4	89,274%	1	1,831	0,98	1,602
ethane, C2H6	5,480%	2	1,831	0,98	0,197
propane, C3H8	2,483%	3	1,831	0,98	0,134
i-butane, C4H10	0,655%	4	1,831	0,98	0,047
n-butane, C4H10	0,660%	4	1,831	0,98	0,047
i-pentane, C5H12	0,196%	5	1,831	0,98	0,018
n-pentane, C5H12	0,172%	5	1,831	0,98	0,015
hexane, C6H14	0,196%	6	1,831	0,98	0,021
heptane, C7H16	0,101%	7	1,831	0,98	0,013
octane, C8H18	0,029%	8	1,831	0,98	0,004
hydrogen sulphur, H2S			1,831	0,98	0,000
nitrogen, N2	0,668%		1,831	0,98	0,000
oxigen, O2			1,831	0,98	0,000
100%					**2,099**

CH_4 emissions (in terms of CO2) by incomplete burning of APG flared at CPF-1

(E.4) $$EF_{CH4,F,CPF-1} = y_{CH4,CPF-1} * \rho CH_4 * (1-FE) * GWP_{CH4}$$

Table E 6. Calculation of CH4 emission factor for APG flared at CPF-1

Item	Volumetric fraction of methane in APG	Density of methane	Correction for incomplete combustion	Global Warming Potential	CH4 emission factor (in terms of CO2)
Index	yCH4	ρCH4	(1-FE)	GWPCH4	$EF_{CH4,f,CPF-1}$

Unit	%	kg/m3	-	tCO_2/tCH_4	tCO_2
Value	89,27%	0,667	0,020	21	**0,250**

Table E 7. Calculation of CO_2 emission factor for APG flaring at CPF-2

Item	Volumetric fraction of component	Quantity of carbon moles in a mole of a component (fixed parameter)	Density of carbon dioxide	Flaring efficiency	CO2 emission factor for APG flaring at CPF-2
Index	y_i	N_c	ρCO_2	FE	$EF_{CO2,APG,CPF-2}$
Unit	%		kg/m3	-	tCO2/ths. m3
Carbon dioxide, CO2	0,07%	1	1,831	0,98	0,001
methane, CH4	88,70%	1	1,831	0,98	1,592
ethane, C2H6	5,54%	2	1,831	0,98	0,199
propane, C3H8	2,67%	3	1,831	0,98	0,144
i-butane, C4H10	0,93%	4	1,831	0,98	0,067
n-butane, C4H10	0,77%	4	1,831	0,98	0,055
i-pentane, C5H12	0,24%	5	1,831	0,98	0,021
n-pentane, C5H12	0,19%	5	1,831	0,98	0,017
hexane, C6H14	0,17%	6	1,831	0,98	0,019
geptane, C7H16	0,07%	7	1,831	0,98	0,009
octane, C8H18	0,02%	8	1,831	0,98	0,002
nitrogen, N2	0,63%		1,831	0,98	0,000
oxigen, O2			1,831	0,98	0,000
	100%				**2,125**

Table E 8. Calculation of CH4 emission factor for APG flared at CPF-2

Item	Volumetric fraction of methane in APG	Density of methane	Correction for incomplete combustion	Global Warming Potential	CH_4 emission factor (in terms of CO_2)
Index	y_{CH4}	$\rho CH4$	(1-FE)	GWP_{CH4}	$EF_{CH4,f,CPF-2}$
Unit	%	kg/m3	-	tCO_2/tCH_4	tCO_2
Value	88,70%	0,667	0,020	21	**0,248**

| E.1. | **Estimated project emissions:** |

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GHG emissions from APG consumption at CS- 1 and CPF-1

(E.1.1) $\qquad PE_{EN, GTU, CS-1} = \cdot EF_{CO2, APG, CSp-1} \; FC_{APG, GTUi, CS-1}$

Table E1.1. CO_2 emissions from APG consumption for own use

in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
APG for own use	$FC_{APG, GTU, CS-1}$	ths m^3	5 610	22 440	22 440	22 440
CO_2 emission factor	$EF_{CO2, APG, CSp-1}$	tCO$_2$/ths. m^3	2,40	2,40	2,40	2,40
CO2 emissions	$PE_{EN, GTU, CS-1}$	tCO$_2$	13448	53790	53790	53790

Table E1.2. CO_2 emissions from APG consumption for own use

in 2013-2020

Item	2013	2014	2015	2016	2017	2018	2019	2020
APG for own use	44 290	44 290	44 290	44 290	44 290	44 290	44 290	44 290
CO_2 emission factor	2,40	2,40	2,40	2,40	2,40	2,40	2,40	2,40
CO2 emissions	106166	106166	106166	106166	106166	106166	106166	106166

GHG emissions from APG consumption at CS- 2 and CPF-2

(E.1.2) $\qquad PE_{EN, GTU, CS-2} = \cdot EF_{CO2, APG, CSp-2} \; FC_{APG, GTUi, CS-2}$

Table E1.3. CO_2 emissions from APG consumption for own use

in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
APG for own use	$FC_{APG, GTU, CS-2}$	ths m^3	11 073	44 290	44 290	44 290
CO_2 emission factor	$EF_{CO2, APG, CSp-2}$	tCO$_2$/ths. m^3	2,14	2,14	2,14	2,14
CO2 emissions	$PE_{EN, GTU, CS-2}$	tCO$_2$	23715	94861	94861	94861

Table E1.4. CO_2 emissions from APG consumption for own use
in 2013-2020

Item	2013	2014	2015	2016	2017	2018	2019	2020
APG for own use	22 440	22440	22440	22440	22 440	22 440	22 440	22 440

CO$_2$ emission factor	2,14	2,14	2,14	2,14	2,14	2,14	2,14	2,14
CO2 emissions	48062	48062	48062	48062	48062	48062	48062	48062

GHG emissions from consumption of the grid electricity at CS-1

(E.1.3) $PE_{EC, CS-1} = EC_{CS-1} \cdot EF_{CO2}$

Table E.1.4. CO2 emissions from consumption of the grid electricity at CS-1
in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
Electricity consumption at CS-1[45]	EC_{CS-1}	MWh	2 517,7	10 070,6	10 070,6	10 070,6
CO2 emission factor	EF_{CO2}	tCO2/MWh	0,557	0,550	0,542	0,534
CO2 emissions	$PE_{EC, CS-1}$	tCO2	1402	5539	5458	5378

Table E.1.5. CO2 emissions from consumption of the grid electricity at CS-1,
in 2013-2020

Item	2013	2014	2015	2016	2017	2018	2019	2020
Electricity consumption at CS-1	10 070,6	10 070,6	10 070,6	10 070,6	10 070,6	10 070,6	10 070,6	10 070,6
CO2 emission factor	0,525	0,525	0,525	0,525	0,525	0,525	0,525	0,525
CO2 emissions	5287	5287	5287	5287	5287	5287	5287	5287

GHG emissions from consumption of the grid electricity at CS-2

(E.1.4) $PE_{EC, CS-1} = EC_{CS-2} \cdot EF_{CO2}$

Table E 1.6.CO2 emissions from consumption of the grid electricity at CS-2
in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
Electricity consumption at CS-2[46]	EC_{CS-2}	MWh	2 540,1	10 160,3	10 160,3	10 160,3

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[45] Explanatory note «Compression station for APG utilization at CPF-1 of Urengoy OGCF.TyumenNIIgiprogaz, 2007. Section «Electrical solutions», table. 8.3.2.
[46] Explanatory note «Compression station for APG utilization at CPF-1 of Urengoy OGCF.TyumenNIIgiprogaz, 2007. Section «Electrical solutions», table. 8.3.2.

CO2 emission factor	EF_{CO_2}	tCO2/MWh	0,557	0,550	0,542	0,534
CO2 emissions	$PE_{EC,\,CS-2}$	tCO2	1415	5588	5507	5426

Table E.1.7. CO2 emissions from consumption of the grid electricity at CS-2, in 2013-2020

Item	2013	2014	2015	2016	2017	2018	2019	2020
Electricity consumption at CS-2	10 160,3	10 160,3	10 160,3	10 160,3	10 160,3	10 160,3	10 160,3	10 160,3
CO2 emission factor	0,525	0,525	0,525	0,525	0,525	0,525	0,525	0,525
CO2 emissions	5334	5334	5334	5334	5334	5334	5334	5334

Total project emissions

(E.1.5) $PE = (PE_{EN,\,CS-1} + PE_{EC,\,CS-1}) + (PE_{EN,\,CS-2} + PE_{EC,\,CS-2})$

Table E 1.8. Total project emissions in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
Emissions from APG combustion for own use at CS-1	$PE_{EN,\,CS-1}$	tCO$_2$	13448	53790	53790	53790
Emission from consumption of the grid electricity at CS-1	$PE_{EC,CS-1}$	tCO$_2$	1402	5539	5458	5378
Emissions from APG combustion for own use at CS-2	$PE_{EN,\,CS-2}$	tCO$_2$	23715	94861	94861	94861
Emission from consumption of the grid electricity at CS-2	$PE_{EC,\,cp-2}$	tCO2	1415	5588	5507	5426
Total project emissions	**PE**	tCO$_2$	39980	159778	159616	159454

Table E 1.9. Total project emissions in 2013-2016

Item	Index	Unit	2013	2014	2015	2016
Emissions from APG combustion for own use at CS-1	$PE_{EN, CS-1}$	tCO_2	106166	106166	106166	106166
Emission from consumption of the grid electricity at CS-1	$PE_{EC,CS-1}$	tCO_2	5287	5287	5287	5287
Emissions from APG combustion for own use at CS-2	$PE_{EN, CS-2}$	tCO_2	48062	48062	48062	48062
Emission from consumption of the grid electricity at CS-2	$PE_{EC, cp-2}$	tCO2	5334	5334	5334	5334
Total project emissions	**PE**	tCO_2	164850	164850	164850	164850

Table E 1.9. Total project emissions in 2017-2020

Item	Index	Unit	2017	2018	2019	2020
Emissions from APG combustion for own use at CS-1	$PE_{EN, CS-1}$	tCO_2	106166	106166	106166	106166
Emission from consumption of the grid electricity at CS-1	$PE_{EC,CS-1}$	tCO_2	5287	5287	5287	5287
Emissions from APG combustion for own use at CS-2	$PE_{EN, CS-2}$	tCO_2	48062	48062	48062	48062
Emission from consumption of the grid electricity at CS-2	$PE_{EC, cp-2}$	tCO2	5334	5334	5334	5334
Total project emissions	**PE**	tCO_2	164850	164850	164850	164850

E.2.   Estimated leakage:

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Leakages from the electricity consumption at CS-1,2:

Potential leakage from fugitive CH4 emissions associated with extraction, processing, transportation and distribution of fossil fuels (natural gas) used in the grid power plants in the project scenario:

E 2.1 $$L = ECef_* (E_{extr} + E_{proc} + E_{trans+} E_{dist}/1000)* GWP_{CH4}$$

L – leakage from fugitive CH4 emissions associated with extraction, processing, transportation and distribution of natural gas used in the grid power plants in the project scenario, tCO2

ECef – sum of total electricity consumption at CS-1,2 in ths.m3, with efficiency 37%

E_{extr}– CH4 emissions from extraction of natural gas, equal 2,3E-03 $GgCH_4$/ mln. m^3

E_{proc}– CH4 emissions from processing of natural gas, equal 10,3E-04 Gg CH_4/ mln. m^3

E_{trans}– CH4 emissions from transportation of natural gas, equal 4,8E-04 $GgCH_4$ / mln. m^3

E_{dist}– CH4 emissions from distribution of natural gas, equal 1,1E-03 $GgCH_4$ / mln. m^3

GWP – global warming potential for methane, equal to 21 tCO_2/tCH_4

Table E 2. CH4 emissions from extraction, processing, transportation and distribution of natural gas used in the grid power plants in 2009-2012 [47]

Item	Index	Unit	2009	2010	2011	2012
CH4 emissions from extraction of natural gas	E_{extr}	GgCH4/ mln. m^3	0,0023	0,0023	0,0023	0,0023
CH4 emissions from processing of natural gas	E_{proc}	GgCH4/ mln. m^3	0,000103	0,000103	0,000103	0,000103
CH4 emissions from transportation of natural gas	$E_{trans\ l}$	GgCH4/ mln. m^3	0,00048	0,00048	0,00048	0,00048
CH4 emissions from distribution of natural gas	E_{dist}	GgCH4/ mln. m^3	0,0011	0,0011	0,0011	0,0011
Total CH4 emissions from extraction, processing, transportation and distribution of natural gas	E	GgCH4/ mln. m3	0,003983	0,003983	0,003983	0,003983

E 2.2 $$EC = (((E_{EC,CS-1} + E_{EC,CS-2}))/1000)*NCV_{NG}/\ efficiency)$$

EC_{CS-1} – total electricity consumption at CS-1, kWh
EC_{CS-2} – total electricity consumption at CS-2, kWh

NCV_{NG} – net calorific value of natural gas, fixed parameter, 9,3 MWh/thousand m^3 [48]

efficiency – thermal efficiency big gas fired power plants, fixed parameter -37%

Table E 2.1 CO2 emissions from extraction, processing, transportation and distribution of natural gas used in the grid power plants in 2009-2012 [49]

Item	Index	Unit	2009	2010	2011	2012

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[47] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Energy, Ch4 Fugitive Emissions, table 4.2.4. Gas extraction, processing, transportation and distribution

[48] 2006 IPCCGuidelines for National Greenhaus Gas Inventories, Volume 2, Energy, table 1.2 page1.18 (net calorific value of natural gas, 48TJ/Ktonne equal 33,7TJ/thousand m^3 and take into 1 J = 0,278*10{-6} kWh

[49] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Energy, Ch4 Fugitive Emissions, table 4.2.4. Gas extraction, processing, transportation and distribution

Electricity consumption at CS-1[50]	EC_{CS-1}	MWh	2 517,7	10 070,6	10 070,6	10 070,6
Electricity consumption at CS-2[51]	EC_{CS-2}	MWh	2 540,1	10 160,3	10 160,3	10 160,3
Net calorific value of natural gas	NCV_{NG}	MWh/thousand m^3	9,3	9,3	9,3	9,3
Efficiency power plant	-	%	0,37	0,37	0,37	0,37
Total CH4 emissions from extraction, processing, transportation and distribution of natural gas	E	GgCH4/ mln. m3	0,003983	0,003983	0,003983	0,003983
Global warming potential for methane	GWP	tCO_2/tCH_4	21	21	21	21
Leakage CO2 emissions	L	tCO_2	**123**	**492**	**492**	**492**
Total project emissions	PE	tCO2	**164850**	**164850**	**164850**	**164850**

Potential leakage from fugitive CH4 emissions associated with extraction, processing, transportation and distribution of fossil fuels (natural gas) used in the grid power plants in the project scenario are calculate and make less than 1 % (at project emissions), therefore aren't considered.

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

>>
Due to the absence of leakage E1 remains the same.

E.4.	**Estimated <u>baseline</u> emissions:**

>>
Low-pressure APG flaring at CPF-1

(E.4.1) $BE_{CO2,F,CPF-1} = FC_{APG,CPF-1} * EF_{CO2, APG, CPF-1}$

Table E 4.1. CO_2 emissions from low-pressure APG flaring at CPF-1
in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
APG used in the project at CS-1	$FC_{APG,CS-1}$	ths.$м^3$	91 000	367 000	379 000	400 000
CO_2 emission factor	$EF_{CO2,APG,CPF-1}$	tCO_2/ths.m^3	2,10	2,10	2,10	2,10
CO2 emissions	$BE_{CO2,F,CPG-1}$	tCO_2	191 005	770318	795505	839583

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[50] Explanatory note «Compression station for APG utilization at CPF-1 of Urengoy OGCF.TyumenNIIgiprogaz, 2007. Section «Electrical solutions», table. 8.3.2.
[51] Explanatory note «Compression station for APG utilization at CPF-1 of Urengoy OGCF.TyumenNIIgiprogaz, 2007. Section «Electrical solutions», table. 8.3.2.

Table E 4.2. CO_2 emissions from low-pressure APG flaring at CPF-1
in 2013-2020

Item	2013	2014	2015	2016	2017	2018	2019	2020
APG used in the project at CS-1	468000	563000	649 000	706 000	761 000	737 000	724 000	706 000
CO_2 emission factor,	2,10	2,10	2,10	2,10	2,10	2,10	2,10	2,10
CO2 emissions	982312	1118173	1362224	1481864	1597307	1546932	1519646	1481864

CH4 emissions by incomplete combustion of APG flared at CPF-1

(E.4.2) $$BE_{CH4,F,CS\text{-}1} = FC_{APG,CS\text{-}1} * EF_{CH4,F,CS\text{-}1}$$

Table E 4.3. CH_4 emissions (in terms of CO_2) by incomplete combustion
of APG flared at CPF-1 in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
APG used in the project at CS-1	$FC_{APG,CPF\text{-}1}$	ths m^3	91 000	367 000	379 000	400 000
CH_4 emission factor (in terms of CO_2)	$EF_{CH4,F,CPF\text{-}1}$	tCO$_2$e/ths m^3	0,250	0,250	0,250	0,250
CO2e emissions	$BE_{CH4,F,CPF1}$	tCO$_{2}$e	22 758	91784	94785	100037

Table E 4.4. CH_4 emissions (in terms of CO_2) by incomplete combustion
of APG flared at CPF-1 in 2013-2020

Item	2013	2014	2015	2016	2017	2018	2019	2020
APG used in the project at CS-1	468000	563000	649 000	706 000	761 000	737 000	724 000	706000
CH_4 emission factor (in terms of CO_2)	0,250	0,250	0,250	0,250	0,250	0,250	0,250	0,250
CO2 emissions	117043	140802	162310	176565	190320	184318	181067	176565

Low-pressure APG flaring at CPF-2

(E.4.3) $BE_{CO2,F,CPF-2} = FC_{APG,CPF-2} * EF_{CO2, APG, CPF-2}$

Table E 4.5. CO_2 emissions from low-pressure APG flaring at CPF-2
in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
APG used in the project at CS-2	$FC_{APG,CS-2}$	ths.м^3	130 000	514 000	490 000	455 000
CO_2 emission factor	$EF_{CO2,APG,CPF-2}$	tCO_2/ths.m^3	2,13	2,13	2,13	2,13
CO2 emissions	$BE_{CO2,F,CPG-2}$	tCO_2	276 319	1092524	1041511	967117

Table E 4.6. CO_2 emissions from low-pressure APG flaring at CPF-2
in 2013-2020 .

Item	2013	2014	2015	2016	2017	2018	2019	2020
APG used in the project at CS-2	420 000	387000	355 000	319000	288 000	253 000	225 000	192 000
CO_2 emission factor	2,13	2,13	2,13	2,13	2,13	2,13	2,13	2,13
CO2 emissions	892724	822581	754564	678045	612153	537760	478245	408102

CH4 emissions by incomplete combustion of APG flared at CPF-2

(E.4.4) $BE_{CH4,F,CS-2} = FC_{APG,CS-2} * EF_{CH4,F,CS-2}$

Таблица E 4.7. CH_4 emissions (in terms of CO_2) by incomplete combustion
of APG flared at CPF-2 in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
APG used in the project at CS-2	$FC_{APG,CPF-2}$	ths. m^3	130 000	514 000	490 000	455 000
CH_4 emission factor(in terms of CO_2)	$EF_{CH4,F,CPF2}$	tCO_2e/ths m^3	0,248	0,248	0,248	0,248
CO_2 e emissions	$BE_{CH4,F,CPF2}$	tCO_2	32301	127715	121752	113055

Table E 4.8. CH_4 emissions (in terms of CO_2) by incomplete combustion
of APG flared at CPF-1 in 2013-2020

Item	2013	2014	2015	2016	2017	2018	2019	2020
APG used in the project at CS-2	420 000	387000	355000	319000	288 000	253 000	225 000	192 000
CH_4 emission factor(in terms of CO_2)	0,248	0,248	0,248	0,248	0,248	0,248	0,248	0,248
CO_2 e emissions	104359	96159	88208	79263	71560	62864	55906	47707

Total baseline emissions

(E.4.5) $$BE = (BE_{CO2,F,CPF-1} + BE_{CH4,F,CPF-1}) + (BE_{CO2,F,CPF-2} + BE_{CH4,F,CPF-2})$$

Table E 4.9. Total baseline emissions in 2009-2012

Item	Index	Unit	2009	2010	2011	2012
CO_2 emissions from APG flaring at CPF-1	$BE_{CO2,F,CPF-1}$	tCO_2	191 005	770318	795505	839583
CH_4 emissions (in terms of CO_2) due to incomplete combustion	$BE_{CH4,F,CPF-1}$	tCO_2	22 758	91784	94785	100037
CO_2 emissions from APG flaring at CPF-2	$BE_{CO2,F,CPF-2}$	tCO_2	276 319	1092524	1041511	967117
CH_4 emissions (in terms of CO_2) due to incomplete combustion	$BE_{CH4,F,CPF-2}$	tCO_2	32 301	127715	121752	113055
Total baseline emissions	BE	tCO_2	522 384	2082340	2053553	2019793

Table E 4.10. Total baseline emissions in 2013-2016

Item	Index	Unit	2013	2014	2015	2016
CO_2 emissions from APG flaring at CPF-1	$BE_{CO2,F,CPF-1}$	tCO_2	982312	1181713	1362224	1481864
CH_4 emissions (in terms of CO_2) due to incomplete combustion	$BE_{CH4,F,CPF-1}$	tCO_2	117043	140802	162310	176565
CO_2 emissions from APG flaring at CPF-2	$BE_{CO2,F,CPF-2}$	tCO_2	892724	822581	754564	678045
CH_4 emissions (in terms of CO_2) due to incomplete	$BE_{CH4,F,CPF-2}$	tCO_2	104359	96159	88208	79263

combustion						
Total baseline emissions	BE	tCO$_2$	2096438	2241256	2367306	2415737

Table E 4.11. Total baseline emissions in 2016-2020

Item	Index	Unit	2017	2018	2019	2020
CO$_2$ emissions from APG flaring at CPF-1	BE $_{CO2,F,CPF-1}$	tCO$_2$	1597307	1546932	1519646	1481864
CH$_4$ emissions (in terms of CO$_2$) due to incomplete combustion	BE $_{CH4,F,CPF-1}$	tCO$_2$	190320	184318	181067	176565
CO$_2$ emissions from APG flaring at CPF-2	BE $_{CO2,F,CPF-2}$	tCO$_2$	612153	537760	478245	408102
CH$_4$ emissions (in terms of CO$_2$) due to incomplete combustion	BE $_{CH4,F,CPF-2}$	tCO$_2$	71560	62864	55906	47707
Total baseline emissions	BE	tCO$_2$	2471341	2331873	2234864	2114239

E.5.   Difference between E.4. and E.3. representing the emission reductions of the <u>project</u>:

\>>

(E.5. 1) $$ER = BE - PE$$

where:

ER – emission reduction, tonnes of CO$_2$

BE – baseline emissions, tonnes CO$_2$

PE – project emissions, tonnes of CO$_2$

Numeric values are given in section E.6.

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

\>>

Year	Estimated <u>project</u> emissions (tonnes of CO$_2$ equivalent)	Estimated <u>leakage</u> (tonnes of CO$_2$ equivalent)	Estimated <u>baseline</u> emissions (tonnes of CO$_2$ equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
2009	39 980	-	522 384	482404

2010	159778	-	2082340	1922562
2011	159616	-	2053553	1893937
2012	159454	-	2019793	1860338
Total (tonnes of CO_2 equivalent)	518829	-	6678070	6159242

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
2013	164850	-	2096438	1931588
2014	164850	-	2241256	2076406
2015	164850	-	2367306	2202456
2016	164850	-	2415737	2250888
2017	164850	-	2471341	2306491
2018	164850	-	2331873	2167024
2019	164850	-	2234864	2070014
2020	164850	-	2114239	1949389
Total (tonnes of CO2 equivalent)	1318798	-	18273053	16954255

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:

>>

The project has obtained the positive opinions issued by the Federal State Entity "GlavGosExpertiza Rossii":

   –   № 614-07/SPE-68 (in Registry 00-1-4-1529-08)
   –   № 029-08/SPE-0279/02 (in Registry 00-1-4-1544-08)

Project has permission on emissions:

-Permission №46 at 15.05.2009 (for a period 01.07.2009 – 31.12.2010) for air pollutant emissions from the stationary sources for the period of object expluatation CS-1,2 at CPF-1,2 Urengoy oil-gas condensate field site given by federal survey of ecological, technological and nuclear control «Rostekhnadzor»

According to the State Committee for Ecology and Natural Resources of the Russian Federation Decree dated 15.04.2000, number 372 "On compliance with regulations regarding the planned economic (and other) actions and their ecological impact", developers must include environmental issues into the project documentation.

The section "Environment Protection" (EP) is integrated into the design. The design documentation was expanded in 2007 (section №8 in the technical documentation "CS for APG utilization at CPF 1,2 of Urengoy NGCF", TyumenNIIgiprogaz, ТЗ 1520К-П3 ,Volume 1).

While evaluation of environmental impact sources and kinds of impact were analyzed, evaluation of modern situation of pollution was carried out, preliminary forecast of condition was done and environmental protection measures were planned. In process of environmental impact evaluation the following components of environment were taken into account:
– earth;
– air;
– engineering and geological conditions;
– geomorphologic conditions;
– landscape complexes;
– surface and soil waters;
– soil;
– flora;
– fauna;
– social and economic conditions of life.

Recultivation of damaged soils is an inherent part of construction process. The project proposes measures on recultivation of soils used for the open pit location, temporal drive-up road and place for the temporal buildings and constructions. Recultivation of soils used for the off-site line constructions is not required or inappropriate as recovery works can damage additional soils.

Flora of the object territory is typical for subzone of forest tundra in Western Siberia. Bog and tundra ecosystems not consider the damaged areas are located on the most part of the territory. Most part of the flora has been changed by human. On the researched territory species of plants that must be protected were not found.

The construction place of the projected object is characterized by specific fauna. Hunting fauna of the place is purified considerably and presented mainly by white ptarmigan, arctic hare, polar fox, capercaillie, reindeer, fox and ermine. Habitat of the animals on the territory has changed tremendously due to the human activity.

Existed technology of waste water treatment satisfies the requirements for the water quality pumping into the absorb well. Purifying of dispersed substances and oil products leads parameter 15 g/m^3. Standard parameters of pumping waste waters quality don't exceed 40000 g/m^3. This type of utilization allows to exclude contamination by surface and soil waters almost entirely.

For the evaluation of object's impact on the air was made calculation of the near the ground spread of pollutants concentration considering the background level of contamination. Calculation results show that there are no exceeding of the pollutant levels on the borders of sanitary protection zone due to the exploitation of equipment.

Noise impact was considered from different sources. Calculations of noise pressure level were made in computational points. The calculations show that due to the work of correct equipment levels of noise won't exceed the standard value. Measures of individual protection of workers, methods and tools for noise level control, medical and preventive measures against noise were suggested.

Project stipulates measures on collecting, temporal storage and carrying away of wastes separately according to their types and classes of danger. These measures will fit all the standards and rules for collecting, storage and carrying away of wastes.

Results of the environmental impact analysis from projected object show that in case of all standards and rules of environment protection honored satisfying conditions for human living will be achieved.

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:

>>
Not applicable

SECTION G. Stakeholders' comments

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

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This project has not been controversial since Urengoy oil-gas condensate field site has long been used for oil development and the emissions from the CS-1,2 will be less significant than those from the flare at CPF-1,2. No comments were received during the state expertise.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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NCSF is not the project participant

Annex 2

BASELINE INFORMATION

The key information and data used to establish the baseline.

Data/Parameter	Amount of low-pressure APG supplied to the CS-1				
Data unit	ths.m 3 (at standard condition)				
Description	Low-pressure APG is produced as a result of oil separation at the Urengoyskoye CPC-1. The total amount of low-pressure APG (at standard condition) produced in the Urengoy oil -gas field is flared according to the baseline				
Time of determination/monitoring	Constant				
Source of data (to be) used	Flow meter				
Value of data applied (for exante calculations/determinations)	**2009**	**2010**	**2011**	**2012**	
	91 000	367 000	379 000	400 000	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The entire amount of the low-pressure APG burned in flares is one of the major emission sources. For this reason, the amount of the produced low-pressure APG is the main parameter that allows the calculation of basic emissions. Low-pressure APG metering will be performed by accurate and regularly checked instruments.				
QC/QA procedures (to be) applied	The instruments are calibrated 1 times in 2 years of FGU «Tyumen SMC center»; The metrological control is carried out by metrological service «Urengoygazprom».				
Any comment	-				

Data/Parameter	Amount of low-pressure APG supplied to the CS-2				
Data unit	ths.m 3 (at standard condition)				
Description	Low-pressure APG is produced as a result of oil separation at the Urengoyskoye CPC-2. The total amount of low-pressure APG (at standard condition) produced in the Urengoy oil -gas field is flared according to the baseline				
Time of determination/monitoring	Constant				
Source of data (to be) used	Flow meter				
Value of data applied (for exante calculations/determinations)	**2009**	**2010**	**2011**	**2012**	
	130 000	514 000	490 000	455 000	

Justification of the choice of data or description of measurement methods and procedures (to be) applied	The entire amount of the low-pressure APG burned in flares is one of the major emission sources. For this reason, the amount of the produced low-pressure APG is the main parameter that allows the calculation of basic emissions. Low-pressure APG metering will be performed by accurate and regularly checked instruments.
QC/QA procedures (to be) applied	The instruments are calibrated 1 times in 2 years of FGU «Tyumen SMC center»; The metrological control is carried out by metrological service «Urengoygazprom».
Any comment	-

Data/Parameter	Chemical composition of low-pressure APG at CPFs № 1
Data unit	%
Description	Chemical composition (at standard condition) of low-pressure APG required for the calculation of emissions factor from flaring at CPFs № 1
Time of determination/monitoring	1 times in month
Source of data (to be) used	chemical-analysis laboratory TC (technical center) (Lab analysis gas chromatograph)
Value of data applied (for exante calculations/determinations)	-
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The chemical composition is needed to identify the volume fraction of carbon, methane and VOC and calculate the GHG emission rates due to the combustion of the given gas.
QC/QA procedures (to be) applied	TC accredited with state standard R ISO/IEC 17025-2000
Any comment	-

Data/Parameter	Chemical composition of low-pressure APG at CPFs № 2
Data unit	%
Description	Chemical composition (at standard condition) of low-pressure APG required for the calculation of emissions factor from flaring at CPFs № 2
Time of determination/monitoring	1 times in month
Source of data (to be) used	chemical-analysis laboratory TC (technical center) (Lab analysis gas chromatograph)
Value of data applied (for exante calculations/determinations)	-
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The chemical composition is needed to identify the volume fraction of carbon, methane and VOC and calculate the GHG emission rates due to the combustion of the given gas.
QC/QA procedures (to be) applied	TC accredited with state standard R ISO/IEC 17025-2000

Any comment	-

Data/Parameter	ρ_{CO2}
Data unit	kg/m3
Description	Carbon dioxide (CO_2) density under the standard condition
Time of determination/monitoring	Fixed parameter
Source of data (to be) used	Methodology of the calculation of the pollution emissions into the atmosphere during the associated petroleum gas flaring, Research institute "Atmosphere", 1998.
Value of data applied (for exante calculations/determinations)	1,831
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Density of CO2 required for the calculation of emissions factor from flaring at CPFs № 2
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	ρ_{CH4}
Data unit	kg/m3
Description	Metane (CH4) density under the standard condition
Time of determination/monitoring	Fixed parameter
Source of data (to be) used	Methodology of the calculation of the pollution emissions into the atmosphere during the associated petroleum gas flaring, Research institute "Atmosphere", 1998.
Value of data applied (for exante calculations/determinations)	0,667
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Density of CH4 required for the calculation of CH4 emissions factor from flaring at CPFs № 2
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	APG flaring efficiency
Data unit	%
Description	APG flaring efficiency required for the calculation of emissions factor from flaring the low-pressure apg at CPFs № 1,2
Time of determination/monitoring	Fixed parameter

Source of data (to be) used	2006 IPCC guidance (2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Chapter 4 (Subsection 4.2. "Fugitive emissions from oil and natural gas systems", adapted equations 4.2.4 page 4.45).
Value of data applied (for exante calculations/determinations)	98
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The flaring efficiency is needed to calculate the GHG emission rates due to the combustion of the low-pressure gas.
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	Global Warming Potential of methane
Data unit	$t\ CO_2/t\ CH_4$
Description	Global Warming Potential of methane required for the calculation of CH4 emissions factor from flaring the low-pressure apg at CPFs № 1,2
Time of determination/monitoring	Fixed parameter
Source of data (to be) used	**Decision 2/CP.3** **http://unfccc.int/resource/docs/cop3/07a01.pdf#page=31** Climate Change 1995, The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group I Report, page 22. http://unfccc.int/ghg_data/items/3825.php
Value of data applied (for exante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Global Warming Potential of methane is needed to calculate the CH4 emission rates due to the combustion of the low-pressure gas.
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	Methane emission factor by APG flaring at CPF-1
Data unit	$tCO2e/ths.\ m^3$
Description	Methane emission factor is needed to calculate the GHG emission rates due to the combustion of the given low-pressure gas at CPF-1.
Time of determination/monitoring	monthly
Source of data (to be) used	2006 IPCC guidance

	(2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Chapter 4 (Subsection 4.2. "Fugitive emissions from oil and natural gas systems", adapted equations 4.2.4 page 4.44).
Value of data applied (for exante calculations/determinations)	-
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methane emission factor is needed to calculate the GHG emission rates due to the combustion of the low-pressure gas.
QC/QA procedures (to be) applied	-
Any comment	-

Data/Parameter	Methane emission factor by APG flaring at CPF-2
Data unit	tCO2e/ths. m^3
Description	Methane emission factor is needed to calculate the GHG emission rates due to the combustion of the given low-pressure gas at CPF-2
Time of determination/monitoring	monthly
Source of data (to be) used	2006 IPCC guidance (2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, Chapter 4 (Subsection 4.2. "Fugitive emissions from oil and natural gas systems", adapted equations 4.2.4 page 4.44).
Value of data applied (for exante calculations/determinations)	-
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The flaring efficiency is needed to calculate the GHG emission rates due to the combustion of the low-pressure gas.
QC/QA procedures (to be) applied	-
Any comment	-

<u>Annex 3</u>

MONITORING PLAN

Please see section D

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