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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

CMM utilisation on the former Zory Coal Mine in Upper Silesian Basin, Poland

(Polish name of the mine is Żory. The English notation "Zory" is applied for this PDD).
Project acronym is Zory-lcmm.

Sectoral scopes	8, 10
Document Version:	03
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A.2. Description of the project:

The Upper Silesian Basin is the largest industrial region of Poland with coal, metallurgic and chemical industries. After the long term industrial use Upper Silesia is one of the most hazardous regions of Poland in terms of environmental pollution. The main contributor of methane emissions to the atmosphere is the coal industry.

Degassing of Coal Mine Gas (CMM) is an unavoidable occurrence of hard coal mining. CMM mainly consists of the harmful greenhouse gas methane (GWP 21), so that using of CMM becomes more important particularly with regard to the world-wide consensus of reducing green-house-gas emissions.

The coal mine Zory is abandoned since 1998. It was a gassy mine with a complicated geological structure. Its underground exploration area interfingered one of the bordering active coal mine Borynia. Furthermore its underground waters from Zory flow into the Borynia mine. There is a continuous methane migration noticed from the mine Zory to Borynia. Also another nearby mine, Jankowice detected methane flow from Zory to its underground exploration area. This migrating methane can only be moved outside the other mines together with the ventilation air. There is also a methane migration to the surface possible. The possible gas migration to the surface was proven for the Ruhr Basin, Ostrava-Karvina Basin and also Upper Silesia as a result of abandoning of the mines. Prior to the project operation methane deliberating from the abandoned mine Żory was released to the atmosphere without utilisation.

In this project CMM captured from the abandoned coal mine Zory in Poland should be first utilised for heat and power generation. The project developer (LNG Silesia, LNG) buys the CMM from its parent company Cetus Energetyka Gazowa sp.z o.o. and sells then the produced power to grid connected users. If the amounts of CMM able to be captured would increase, there is possible to install a liquefaction plant aiming utilisation of methane by means of using it as a substitute of natural gas or other fuels.

The combustion of methane in the CHP unit results in a significant emissions reduction. The conversion of the harmful greenhouse gas methane with a GWP of 21 into less harmful CO_2 with a GWP of 1 reduces the global warming potential of the emissions by 87%.

A.3. Project participants:

Table A- 1 – Project participants

Party involved (*)	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Poland (host)	▪ LNG Silesia sp.z o.o. (LNG)	No
Netherlands	▪ Carbon-TF B.V.	No
((host) indicates a host Party)		

- Carbon-TF B.V.
  Consultant and investor, buyer of the emission reduction certificates; Dutch company trading emissions reduction certificates. Authorised to participate in the project.
- LNG Silesia sp.z o.o. (LNG)
  The project developer (LNG Silesia, LNG) buys the CMM from its parent company Cetus Energetyka Gazowa sp.z o.o. and sells then the produced power to grid connected users. Owner of the plant.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project will have several locations. First of them is in Zory in south Poland (Silesian Voivodship). The second is now being developed in order to estimate the best location of the drilling. It is assumed to sink the drilling within the concession field near of the border to the active mine Borynia. Other locations will be developed later.

The first locations in the Upper Silesian are shown on the maps below.

A.4.1.1. Host Party(ies):

Host Party: Poland

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

Figure A- 1: Location of the Upper Silesian Basin in Poland

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

Location of project:

Location no. 1:

ul. Węglowa, 44-245 Żory.
Land parcel no. 1400/150 in Żory
Geographical coordinates of the Drilling M-1
N 50°02'01,21088" E 18°37'47,59752"

Location no. 2

The location of the new drilling is now in progress. The assumed location is nearby of the ul. Swierklanska or ul. Szerocka and in about 2,5km of the landmark with geographical coordinates 50° 1'0.51"N and 18°36'33.22"E. Because of the complicated geology of the area or other relevant reasons and risks associated with the project it is possible that a different location within the concession field will be needed to be developed instead of the now envisaged one. It is also possible that a further location will be enforced in order to ensure a sustainable CMM removal and use from the underground. The environmental effects of the proposed project will not be negative affected.

Figure A-3: Location of the Project Zory-lcmm

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

The project is located within the concession field Zory 1 Upper Silesia.

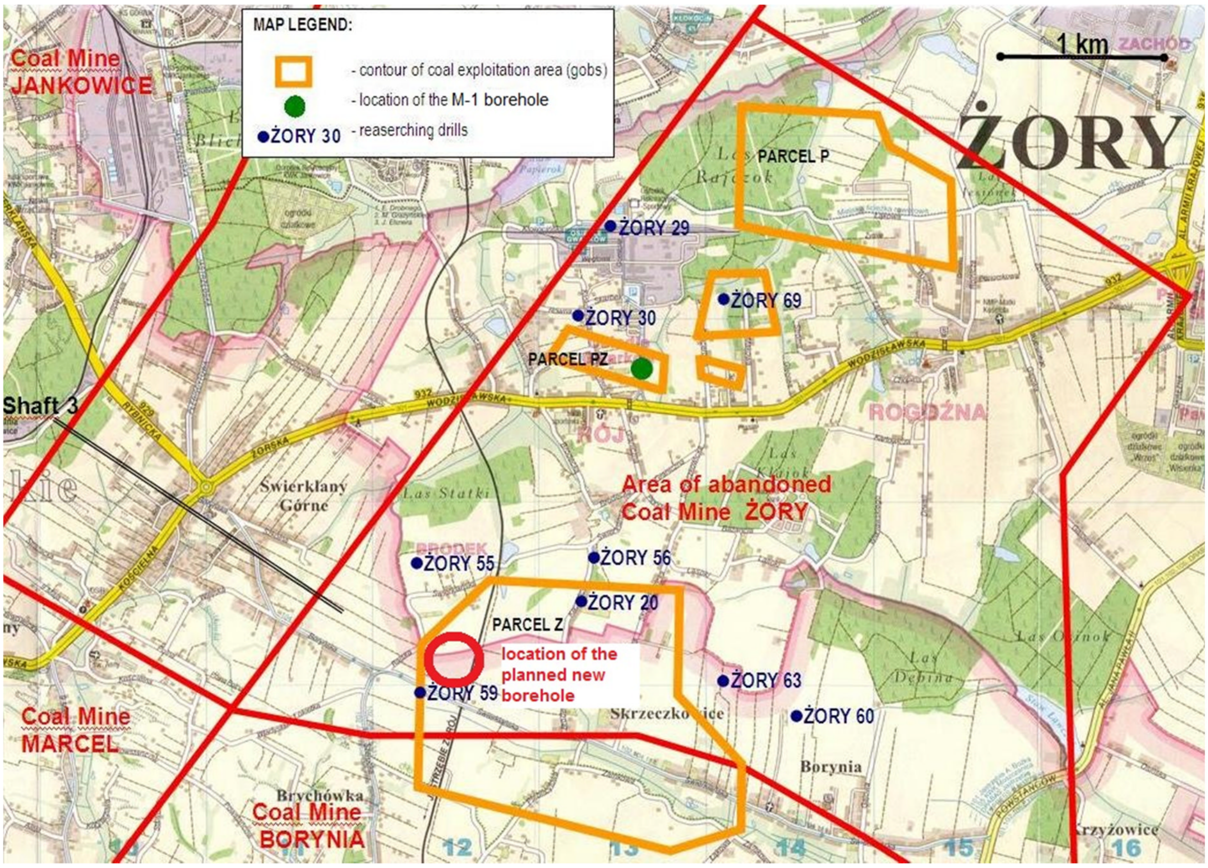

Figure A-4: location plan of the first two units within the project activity Zory-lcmm. A possible further drilling needed for a sustainable CMM removal and use from the underground would be located within the concession field

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

Degasification activities

The mine had an active degasification system, which is abandoned. In order to capture the methane from the underground a new drilling into the gob area was sank.

There are no national regulations or legal requirements for treatment and utilisation of the captured CMM whether from active or abandoned mines. The presented project is the first of its kind in Poland aiming the utilisation of CMM from an abandoned mine.

Project activities - Utilisation of CMM

In the case of this project a part of the CMM from the drilling is utilised for heat and power generation. This part of methane is destroyed by burning. In order to ensure the safety of the nearby mines Borynia and Jankowice there is a suction of minimum 10m³/min of pure methane recommended.

Utilisation of the methane captured (the project)

The utilisation of the CMM is provided through:

1. installation of a flare

   The methane flow from the capture system is about 200-750m³/h pure methane. The installed plant cannot use whole amount of the gas. It is supposed to use the gas in an engine while a remaining part of methane can be burned in the flare in order to reduce emission. The utilisation plan is shown in table A-2.

2. installation of one cogeneration unit for power and heat production.

   The methane flow from the capture system is about 200-750m³/h pure methane. The installed engine cannot use whole amount of the gas. A part of this gas can be flared in order to reduce emission. The utilisation plan is shown in table A-2.

3. installation of a flare

   The methane flow from the capture system is supposed to be about 250-750m³/h pure methane. The installed plant will be able to use whole amount of the gas. It is supposed to use the gas in an engine while a remaining part of methane can be burned in the flare in order to reduce emission. The utilisation plan is shown in table A-2.

4. installation of one cogeneration unit for power and heat production.

   The methane flow from the capture system is supposed to be about 200-1000m³/h pure methane. The installed engine cannot use whole amount of the gas. A part of this gas could be flared in order to reduce emission. The utilisation plan is shown in table A-2.

5. Installation of a liquefaction plant, if the amounts of captured CMM increase

Table A-2 – Installation plan of the project

unit	**installation date**	**firing capacity**	**product**	**efficiency**
1 Flare	December 2008	5,000 kWth	Methane destruction	99,9%
1 cogenera-tion unit	July 2010	2,014 kWel	power and heat	Electrical 42.8 % Thermal 43% Total 85.8%
1 Flare	Not earlier as 2013	5,000-10,000 kWth	Methane destruction	99.9%
1 cogenera-tion unit	Not earlier as 2013	2,000 kWel	power and heat	Electrical 42.8 % Thermal 43% Total 85.8%

CMM Supply

The utilisation unit is connected to the pipeline from the drilling. The pressure generated by the vacuum pumps is sufficient to supply the utilisation unit. The total amount of CMM sent to the utilisation unit is measured by flow meters. The unit is provided with a deflagration flame arrester which prevents backfiring from the utilisation unit into the underground building system of the coal mine.

Flare

A flare with a firing capacity of approx. 5,000 kWth was installed. The roots compressor was integrated in the same container unit.

Cogeneration unit

The cogeneration unit with a firing capacity of approx. 4,705 kW was installed. The cogeneration unit generates power with an output of approx. 2,014 kW per unit, and hot water for the displacement of an old coal boiler supplying a heating system with an output of max. 2,024 kW per unit.

The CMM is fed into the gas engine, where the methane will be burned completely with low exhaust emissions. The cogeneration unit is operated fully automatically and all essential measured data are gathered and recorded.

Cogeneration units like this have been tested at various sites in Western Europe and are now approved. Especially in the Ruhr District in Germany a large amount of units (approx. 150) is installed on active and abandoned coal mines.

Proved safety-related equipment is used to minimize the risks of the plant.

Technical data per unit	cogeneration unit for combined heat and power generation completely build in a container, including all necessary equipment, control and data collection system
Installed firing capacity	4,075 kWth *
Power output	max. 2,014 kWel *
Heat output	max. 2,024 kWth *
Efficiency (electricity)	max. 42.8 %
Maximum methane amount required	560 m³/h CH_4
Average annual operation time	7,500 h/a
Average heat generation	2,625 MWh/a
Average power generation	15,000 MWh/a
Average methane destruction	4,175,435 m3 CH4 per year = 2,993 t CH4 per year
Average power own consumption	525 MWh/a

*) firing capacity, efficiency and power and heat output depend on the gas quality, methane concentration and load.

Electricity utilisation

The electricity generated by the power generator of the CHP installed in the project is now fed into the Polish grid. In this way the power amount which is produced from fossil fuels is reduced.

The cogeneration unit is actually not economically viable. The installation of the cogeneration unit is based on an environmentally conscious management decision.

Heat utilisation

The heat supply of the users in the area nearby of the unit locations is provided by coal boilers. It is possible to displace a part of this energy by the heat generation of the project. This amount of conventionally generated heat displaced by the project generates additional emissions reductions, will not be taken into account due to avoid of double counting.

Maintenance program

The maintenance and operation of the project equipment is provided by the personnel of the plant operator (LNG). The maintenance of the CHP modules has been carried out by the service division of the engine system provider.

Risks of the project

The following risk could be identified:

Table A- 3: Risk and mitigation to the project

Risk	**Mitigation**
Lower CMM utilisation than expected	The amount of CMM possible to extract is at the beginning higher than the demand of the project. It is very likely that the amount to extract at a particular drilling will be smaller. The further locations should ensure the biggest possible CMM extraction and utilisation in order to reduce the methane emission to the atmosphere.
Malfunctioning of the CHP plant.	Training of the staff and regular maintenance of equipment.
Lower concentration of methane in extracted gas	The supporting systems regulate automatically the amount of gas that is combusted in the CHP unit. Despite that a minimum concentration of 30% CH4 is required.

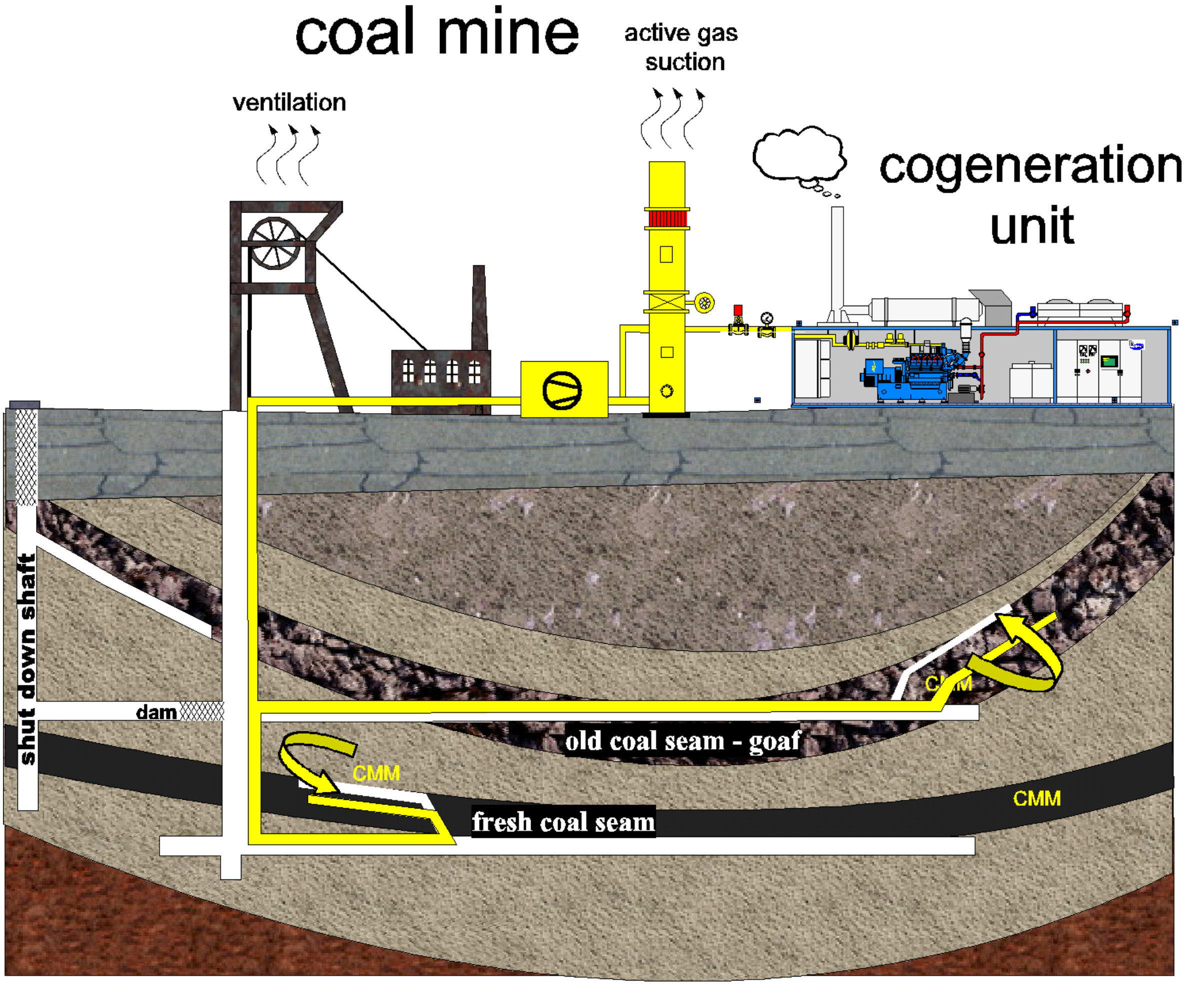

Figure A- 6: Scheme of the installation with main project components

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:

The emissions reduction is based on the conversion of CMM with its main component methane (GWP 21) into CO2 (GWP 1) in combustion processes. In absence of the project the whole CMM amount, which should be converted into CO2 in the heat and power generation unit would otherwise be released unused to the atmosphere as more harmful methane.

The power generated by the project displaces conventionally generated power and reduces the greenhouse gas emissions of the Polish grid. This amount emission reduction is not included in this PDD

The heat generated by the project displaces conventionally generated heat by coal combustion by a small local heat provider in the nearest area of the plant. This amount emission reduction is included in this PDD as far as it involves plants not considered by the EU-ETS.

The project is not "business-as-usual" and faces several barriers, both in terms of prevailing practice and the economic attractiveness of the project. In section B of this PDD, it is shown that the emission reductions would not occur in absence of the project.

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

Table A- 4 —*Emission reductions during the first and second crediting period (2008-2012, and 2013-2017)*

1st Crediting Period 2008- 2012	
	Years
Length of the crediting period	3
Start date of the project 01/01/2010	
2008	0
2009	0
2010	25,586
2011	45,320
2012	46,087
Total estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	116,993
Annual average of estimated emission reductions over the operational time within the crediting period (tonnes of CO2 equivalent)	38,998

There are no special conditions for small scale projects defined by the host party. The following information is given for the purpose of the project registration.

According to the data given above the project falls under:

Type III of JI SSC projects (Other projects that result in emission reductions of less than or equal to 60 kilotonnes (kt) of carbon dioxide (CO2) equivalent annually) as defined in “Provisions for joint implementation small-scale projects” developed by the JISC

The proposed JI SSC project is not a debundled component of a large project as there is no a JI (SSC) project with a publicly available determination in accordance with paragraph 34 of the JI guidelines:

(a) Which has the same project participants; and

(b) Which applies the same technology/measure and pertains to the same project category; and

(c) Whose determination has been made publicly available in accordance with paragraph 34 of the JI guidelines within the previous 2 years; and

(d) Whose project boundary is within 1 km of the project boundary of the proposed JI SSC project at the closest point.

Table A- 5 —*Prospected emission reductions during the second crediting period (2013-2017) considering the assumed project enhancement*

2013-2017	
	Year
Length of crediting Period	5
2013	74,451
2014	162,787
2015	162,787
2016	162,787
2017	162,787
Total estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	725,600
Annual average of estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	145,120
Total estimated emission reductions over the project lifetime 2010-2025 (tonnes of CO2 equivalent)	1,982,105

A.5. Project approval by the Parties involved:

The parties involved will support the project. The great impact for reduction of green house gas is one motivation to drive the system.

The Project Idea Note was submitted in June 2009 due to obtain the Letter of Endorsement before the project implementation. The Letter of Endorsement was issued in July 2010.

The PDD is a part of a request for the Letter of Approval by Poland within the first track according to the current Polish law.

The Letter of Approval of the Netherlands, as of the investor country, is issued July, 26th, 2012 (Reference: 2012JI33).

SECTION B. Baseline

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

The JI specific approach for baseline setting and monitoring has been used to identify the baseline scenario of the proposed JI project. According to the most recent guidelines for baseline setting and monitoring (JISC18) elements of approved CDM baseline and monitoring methodologies or approved CDM methodological tools can be used, as appropriate.

Systemic analysis

A project specific methodology determined by DMT will be applied. This methodology has been determined by the German Institute DMT (Deutsche Montan Technologie http://www.dmt.de) for two projects DE1000014 and DE1000015 utilising CMM out of abandoned coal mines.

In this methodology, which has been determined on behalf of a German Mining Authority "Bezirksregierung Arnsberg, Abteilung 8, Bergbau und Energie in NRW" (District Government Arnsberg, Dept. 8 - Mining and Energy - in North Rhine-Westphalia), DMT concludes, that CMM in the hard coal mining regions of Germany, is always finding a way through open shafts, cracks in the overburden and existing degassing wells directly or diffusely into the atmosphere.

DMT also declares that the total amount of burned CMM sucked out of abandoned coal mines has to be considered as avoided emissions. The conscious suction at a chosen spot doesn't induce an increased production of methane; in fact only the particular time of when the methane reaches the surface is been brought forward for a few weeks or months. However the suction is technically essential for the collection of the CMM at a chosen spot, because only with an external pressure gradient applied, the gas is flowing to the withdrawal point. Without the pressure gradient the CMM migrates diffusely to the surface and can possibly accumulate there to explosive mixtures. Such incidents already occurred in many coal mining areas (e.g. Germany, Poland, Czech Republic, Ukraine and Kazakhstan et al.).

Local analysis

The occurrence of CMM migration is ascertained also for the Polish Upper Silesian Basin.

The coal mine Zory is abandoned since 1998. It was a gassy mine with a complicated geological structure. Its underground exploration area interfingered one of the bordering active coal mine, which is proven by the official geological documentation for the mining area of the Zory mine. Furthermore the underground waters from Zory flow into the Borynia mine. There is a continuous methane migration noticed from the mine Zory to Borynia. Also another nearby mine, Jankowice, detected methane flow from Zory to its underground exploration area. This migrating methane can only be moved outside the other mines together with the ventilation air.

The additional matter is methane migration to the surface above the abandoned exploration area of the mine, which can occur similar as in the Ruhr Basin, the coal basins in the UK and Ostrava-Karvina region. It is verified through investigation of the Polish scientific institutions and authorities. A very efficient method of the surface endangerment verified in the Ruhr Basin is sucking of post mining methane from the gob area

The gas migration from abandoned mines to the surface was described in many scientific publications concerning coal mining regions in Poland, Germany and the Czech Republic or in the UK. It is also local proven for Upper Silesia through experiments and theoretical investigations.

Only in order to ensure the safety of the nearby mines Borynia and Jankowice there is a suction of minimum 10 m³/min of pure methane recommended. The mitigation of migration to the surface makes more extraction necessary. According to the abovementioned baseline the whole amount of extracted and utilised CMM is to consider as emission reduction.

The evidence for the systemic and local analysis was provided to the AIE.

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:

The additionality was proven by applying the "Tool for demonstration and assessment of additionality", (version 06), EB65.

The result is given below.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a Identification of technically feasible options for using CMM

Options for CMM treatment

Several approaches can be taken to treat the captured CMM of the project:

i. No treatment – venting through the nearby mines and the migration to the surface

ii. Flaring of CMM

iii. Use for additional grid power generation

iv. Use for additional captive power generation

v. Use for additional heat generation

vi. Feed into gas pipeline (to be used as fuel for vehicles or heat/power generation)

vii. Use for liquefaction of methane

viii. Possible combinations of options i to vii with the relative shares of gas treated under each option specified

All of these options are considered as possible alternatives for the baseline scenario. In step 3 of this section some of these options will be further developed into baseline scenario alternatives. The project activity is covered by the option viii. – the combination of option v. heat generation, and option iii. Additional grid power production.

Options for energy production

The options for energy production are included in the options iv. to viii. listed in step above.

The project activity is covered by the option viii. – the combination of option vi. heat generation, option iv Use for additional grid power generation and option v. captive power production.

Formulation of the baseline scenario alternatives

The following alternatives can be considered for implementation at the project site and are in compliance with the options listed in step lb and step lc.

Alternative i. - Venting of CMM

Since there are no legal requirements for treatment and utilisation of the captured CMM, it is common practice at Polish coal mines to release the CMM into the atmosphere. The same situation is for abandoned coal mines. This alternative is the actual situation before project implementation – the CMM deliberating from the mine was released into the atmosphere.

The energy production in this scenario would continue in the following way:

- Electricity would be supplied by the national/regional grid
- Heat demand would be supplied by the coal fired boilers

Alternative ii. Flaring of CMM

The flaring of the captured methane is not required by any existing national regulations. The infrastructure for methane flaring does not exist at the project site, so that additional investment would be required. Without revenues from emissions trading this alternative would only generate costs and is economically not viable.

The energy needs of the mine would be supplied in the same way as described in alternative i. A flaring of CMM is a part of the project scenario.

Alternative iii. – use for additional grid power generation

The captured methane could be utilised in a power plant for power generation. Possible power plant alternatives are:

a) conventional steam power plant, CMM fired

b) combined gas-steam power plant, CMM fired

c) gas turbine, CMM fired

d) gas engine, CMM fired

e) fuel cell, CMM fired

Alternative iv. – use for additional captive power generation

The captured methane could be utilised for captive power generation. A combined heat and power generation is possible and eligible:

a) cogeneration unit, CMM fired

Alternative v. – use for additional heat generation

The captured methane could be utilised for additional heat generation. In this case a new heat generation plant should be constructed and connected to a heating system, e.g. a district heating system. Possible heat generation plant alternatives are:

a) conventional steam boiler, CMM fired
b) conventional hot water boiler, CMM fired or co-fired
c) heat generation in the cogeneration untit

The energy needs would be supplied in the same way as described in alternative i.

Alternative vi. – feed into a gas pipeline (to be used as fuel vehicles or heat /power generation)

There are three possible ways to utilise the captured methane:

a) feeding into a gas pipeline – in this case a new connection to an existing pipeline has to be made. Depending on the quality specification of the pipeline operator, most likely an additionally methane enrichment plant could be required
b) compression of the gas and usage as fuel for vehicles
c) liquefaction of the gas and transportation in tanks for utilisation by external users

The energy needs would be supplied in the same way as described in alternative i.

Alternative vii - Use for liquefaction of methane

The captured methane could be liquefied. In this case a new liquefaction plant should be constructed at the project site.

Alternative viii. – possible combinations of alternatives i. to vii.

There are numerous possible combinations of the alternatives i. to vii. described above, so that only the project scenario should be described in the following.

The CMM should be utilised for heat and additional power generation. Depending on the local heat demand the produced heat should be consummated by local facilities and the power should be fed in into the grid. The remaining amount of the CMM which cannot be utilised for heat and power generation should be vented in the first step. If the amounts of remaining CMM are big enough, they will be burned in a flare with a suitable firing capacity.

There is a CHP system for power production implemented as a project activity.

Power is produced by the cogeneration unit. The remaining available CMM amount, which cannot be utilised for heat and power production is to vent or to flare.

Sub-step 1b Eliminate baseline options that do not comply with legal or regulatory requirements

There are no particular regulations concerning the coal mine methane extraction after the coal mine abandoning. There is no regulation in place that would require any specific utilisation of the extracted methane. On the other hand, there is no national regulation in place that would prohibit the extraction or any use of CMM, e.g. for heat and/or electricity generation. Therefore, all the alternatives listed in step lb are in compliance with the existing regulations.

Outcome of Step 1

The proposed project activity is not the only alternative amongst the ones considered by the project participants that is in compliance with mandatory regulations with which there is general compliance.

Step 2. Investment analysis

In this step is to determine whether the proposed project activity is not

a) the most economically or financially attractive

or

b) economically or financially feasible, without the revenues from the sale of ERUs

Sub-step 2a. Determination of the analysis method

The proposed project activity generates also other revenues than only those from JI. Therefore, simple cost analysis (Option I) is not applicable.

Obtaining financial indicators for similar projects in Poland is problematic as each of existing projects has another constellation; therefore the investment comparison analysis (Option II) cannot be performed for the identified alternatives and the benchmark analysis (Option III) will be used to test the additionality of the proposed emission reduction project activity.

Sub-step 2b. Application of the benchmark analysis

The project operator (LNG Silesia) can sell the produced energy at wholesale prices similar as for energy from big power stations. There is only a limited possibility to sell heat. The project operator buys the CMM and sales the electricity and heat under that given conditions. The project operating company must evaluate a project, which is economically viable. As the benchmark of new projects used for evaluation is the IRR>12% and NPV(12%) at least be equal zero supposed, similar as for another Polish energy companies.

The Government bond rates for 2008, as the investment decision was considered, were variable depending on the inflation for ten years with 7% the first year. As the assumed rate for 10 years bonds were 7 % taken, which is conservative.

The NPV (7%) shows the comparison of the project activity with the financial investments by means of government bonds. If its value is positive, the project activity would be economical more attractive than the bond investment.

Sub-step 2c. Calculation and comparison of the indicators

The economic indicators for the proposed project without JI revenue has been calculated under the following assumptions:

Supposed prices for electricity and heat were taken as of 2008, after the decision to implement the project was considered.

The project has the following economic indicators:

Table B-1: Economic indicators of the project, without revenues from emissions trading

Economic Parameters without ERUs		
IRR	-	%
NPV (0 %)	-1,515,395	EUR
NPV (7 %)	-1,243,553	EUR

Sub-step 2d. Sensitivity analysis

A sensitivity analysis of the proposed project was made based on the market data available at the moment of making the financial analysis of the proposed project. According to the "Tool for the demonstration and assessment of additionality", the revenues from electricity and heat sale in 2010 was supposed changed 10% downwards and 10% upwards as they are the source of revenue. The operational costs are those for CMM purchase and maintenance, which are nearly stable, so a variation for the sensitive analysis is not realistic.

Table B-2: Sensitivity analysis of economic indicators of the project, without ERU

Economic Parameters without ERUs	power+heat up 10%	power+heat down 10%	
IRR	-13.89	-	%
NPV (0 %)	-693,617	-2,356,835	EUR
NPV (7 %)	-731,873	-1,763,718	EUR

Thus, even in the case of a significant change in the power and heat revenues, the IRR of the proposed project would be lower as the benchmark of 12%, as for projects of Polish energy providers and NPV(7%) has not became positive, which makes a bond investment more attractive.

With expected revenues from emission trading the project becomes financially attractive. Detailed information about the finance indicators and structure of the project finance is given in the Annex 6

Outcome of the step 2 :

Even in the case of a significant change in the power and heat revenues, the IRR of the proposed project would be lower as the benchmark of 12% and NPV(7%) has not became positive. The proposed project is unlikely to be financially attractive.

Step 3. Barrier analysis

Preliminary step: Elimination of baseline scenario alternatives that face prohibitive barriers

If this Step is used, determine whether the proposed project activity faces barriers that:

(a) Prevent the implementation of this type of proposed project activity; and

(b) Do not prevent the implementation of at least one of the alternatives.

The identified barriers are only sufficient grounds for demonstration of additionality, if they would prevent potential project proponents from carrying.

In this section the possible alternatives formulated above will be checked against the existing economic and other barriers for their implementation. Non-realistic alternatives will be eliminated.

Alternative i. Venting

There are no legal requirements that prohibit venting or require stakeholders to utilise post mining CMM . This alternative represents the current situation in the absence of the proposed project activity. There are no barriers or external factors that prevent this alternative to be continued. Therefore, this scenario can be considered to be a realistic alternative.

Alternative ii. Flaring of CMM

Flaring of CMM is not required by the existing national regulation. Additional investment has to be made by the project owners to install the flare. The operation would generate additional costs. Without revenues from emissions trading no income but only costs are generated, this alternative is therefore economically not viable.

So this scenario is facing a strong prohibitive barrier, because the investment will not generate any revenues.

Alternative iii. Use for additional grid power generation

Generally CMM can be used for electricity generation that is delivered to the grid.

a) conventional steam power plant, CMM fired

There cannot be a stable minimum amount of CMM needed for a conventional steam power plant guaranteed. Usually power generation in conventional steam power plants is economically viable for middle and large scale plants (more than 20 MWel), so in case of the project the alternatives b) to e), which are listed below, could be economically more attractive.

Therefore this alternative faces a prohibitive barrier and is eliminated.

b) combined gas-steam power plant, CMM fired

A combined gas-steam power plant is a rather new technology. At present the technology is only available for natural gas, so that the CMM, which has an appreciable lower methane concentration and lower calorific value, should be first conditioned to an adequate quality. The additionally required conditioning plant makes this alternative economically not viable.

Also a stable minimum amount of CMM needed for combined gas-steam power plant cannot be guaranteed. There is also no appropriate need for an additional heat amount produced by the plant.

Therefore this alternative faces multiple prohibitive barriers and is eliminated.

c) gas turbine, CMM fired

At present this technology is only available for gases with high caloric values, so that the CMM, which has a low calorific value, should be first conditioned to an adequate quality. The additionally required conditioning plant makes this alternative economically not viable. There is also no experience in Poland with such technologies for CMM utilisation, it would be therefore a solution first in its kind, which is a clear barrier.

Therefore this alternative faces prohibitive barriers and is eliminated.

d) gas engine, CMM fired

The additional grid power generation by means of gas engines is part of the project scenario.

This alternative is the most suitable technology for power generation in the prospected range of performance. In this alternative only power generation for the grid and no heat generation is regarded.

This alternative is not economically viable, because the required revenues for the power feed-in into the grid are not marketable due to the business competition of the grid owners. The actually realisable sale price of power is too low. There are no privileges for power produced from CMM according to the Polish Energy Law valid at the time of investment decision and the sale price realisable at the beginning was too low. There is since autumn 2010 a possibility to get tradable certificates for power generated in cogeneration which could be also taken into account for the project activity. The additional income is only possible in case of a suitable use of produced heat which is unlikely because there are only a very limited possibilities for the heat use in the near of the plant.

Therefore this alternative faces a prohibitive barrier and is eliminated.

e) fuel cell, CMM fired

At present this technology is only available for gases with high caloric values, so that the CMM, which has a low calorific value due to low methane concentration, should be first conditioned to an adequate quality. The additionally required conditioning plant makes this alternative economically not viable. Further on this would be the first fuel cell fired with CMM in Poland and there are no skilled and properly trained personnel for the operation and maintenance of this kind of technology.

Therefore this alternative faces multiple prohibitive barriers and is eliminated.

Alternative iv. Use for additional captive power generation

There are no users for which the captive power could be produced.

The alternative faces prohibitive barriers and is eliminated as a baseline scenario.

Alternative v. Use for additional heat generation

There are no bigger users in the near of the project location for whom the additional heat could be produced. There exists a small coal fired heating plant which meet the demand of the residential area. A conventional hot water boiler produces hot water, which is supposed for the feed-in in a heating grid, e.g. a district heating system. As the district heating is not the common solution for the sparsely populated region where the project is located and the next really available district heating system is too far away, the connection would cause very too high investment costs to make this alternative economically viable.

A conventional steam boiler produces steam, so that a steam grid is required for the transportation of the generated heat to the users. Because no such a grid is available and the investment and maintenance cost for such a grid are too high the alternative is not implementable.

The alternatives face prohibitive barriers and are eliminated.

Alternative vi. feed into a gas pipeline (to be used as fuel vehicles or heat /power generation)

There are three possible ways to utilise the captured methane:

a) feeding into a gas pipeline

In this case a new pipeline connection with compressor station has to be made. Also an additionally methane enrichment plant is required to fulfil the quality specification of the pipeline operator. The costs of the enrichment plant and the lacking piping infrastructure make this alternative economically not viable. Further on the alternative faces a barrier due to the absence of prevailing practises to feeding into a gas pipeline of natural gas.

Therefore this alternative faces a prohibitive barrier and is eliminated.

b) compression of the gas and usage as fuel for vehicles

This alternative requires a suitable large fleet of vehicles, which are upgraded with CMM compatible engines. But there are not enough such consumers available. Further on the alternative faces a barrier due to the absence of prevailing practises to utilise CMM as vehicle fuel.

Therefore this alternative faces prohibitive barriers and is eliminated.

Alternative vii. liquefaction of the gas and transportation in tanks for utilisation by external users

This alternative requires a liquefaction plant. The required investment for the plant is high. There is significant uncertainty in Poland on the domestic price of natural gas, and as a consequence, on the economic feasibility of such a project. Even as this alternative was seriously taken as an option for the project activity the stable high amount of the extracted CMM cannot be ensured at the present project location. This was proven by the production test of the drilling. Further on the alternative faces a barrier due to the absence of prevailing practises to utilise CMM for liquefaction purposes.

Therefore this alternative faces prohibitive barriers and is eliminated.

Alternative viii. *Possible combinations of options i to vii with the relative shares of gas treated under each option specified.*
This alternative describes the project scenario not registered as JI-Project

A combination of the alternatives described above faces similar barriers as the alternatives as standalone solutions.

According to the methodological tool the project scenario without being registered as JI is to consider as an alternative, where 100% of treated methane would be used for.

The project scenario alternative as described requires a high investment, the operating and the maintenance costs of the technology are relatively high. The electricity price in Poland is at the time too low for economically justifiable power generation in cogeneration units. As shown in the calculation of profitability, the project scenario is financially not attractive. This is proven in section B.2 of this PDD.

Incentives from the selling of emission reduction were seriously considered in the decision to proceed with the project activity. Before the start of project works an analysis was made, if the project can be approved by the host party. The positive opinion as a Letter of Endorsement was issued in July 2010.

In addition there is significant uncertainty in Poland on the domestic price of natural gas, and as a consequence, on the economic feasibility of such a project.

Thus this alternative is a realistic alternative but faces economic barriers and is eliminated.

Conclusion

There is only one realistic option for the baseline scenario, which is the continuation of the current situation: venting of the CMM into the atmosphere.

The heat demand in the area will be met by production from the existing coal fired boilers, the electricity will be purchased from the grid.

Without additional income from emission trading, the project is economically not viable and faces prohibitive barriers.

Sub-step 3a. Barrier identification for the presented activity

The proposed JI activity faces the following barriers:

Barriers to prevailing practices

According to publicly available information from Polish Ministry of Environment and Polish State Institute of Geology about 442 million cubic meters of CMM were 2005 extracted through degasification systems by Polish coal mines. Confidential statistics are not available.

The incentive from the selling of emission reduction was seriously considered in the decision to proceed with the project activity.

The CMM deliberating at the Coal Mine Zory was vented in the atmosphere through the ventilation of the nearby mines and the migration to the surface. Existing legislation is primary orientated on increasing safety of active coal mine operations thus facilitating and enforcing development of degasification and ventilation systems at coal mines. There are also no requirements for post mining CMM. Therefore current practices and economic conditions prevent the project from being implemented and clearly prevent the development of CMM utilisation activities. This is the first project in Poland which uses post mining CMM as a feed stock.

The project is a first of its kind activity according to the "Tool for the demonstration and assessment of additionality" (Version 06.0.0) EB 65 as there are no other examples within the applicable geographical area (Poland) delivering the same output within the calculated output range between 1,007 and 3,201 kWel which the same

(a) Energy source/fuel;

(b) Feed stock;

(c) Size of installation (power capacity):

(i) Micro (as defined in paragraph 24 of Decision 2/CMP.5 and paragraph 39 of Decision 3/CMP.6);

(ii) Small (as defined in paragraph 28 of Decision 1/CMP.2);

(iii) Large

Furthermore as concluded after the barrier analysis there is an alternative remaining and it is not the proposed activity without JI, which proofs the barrier due to prevailing practice

This project is the "first of its kind" in Poland using CMM from an abandoned coal mine.

Technology barrier

The project is the first CMM utilisation project by means of CHP units from an abandoned mine in Poland. CMM has varying quality and its combustion is not that simple as this of natural gas, which is reflected in the high service demand of the engines. The gas quality and amount are not possible to be forecasted for other as only short terms. It depends not only on the amounts of the gas in the underground, but also on the geology and hydraulic circumstances caused through the mine water flow and venting of the bordering mines. According to the experience from other European countries sometimes it is not possible to proceed with the extraction at the primarily chosen location but only to continue or enhance the activity at new ones. Also the experiences done in another European countries show, that the maintenance of this technology is very cost intensive. Therefore there is a clear technology barrier for the realisation of the proposed project.

Financial barrier

See step 2.

Sub-step 3b. Influence of the barriers identified on the alternative baseline scenario

The only viable alternative to the proposed activity was the continuation of the former situation. Since this scenario does not require any additional investment or changes in the technology, it is not affected by the barriers described above.

Step 4. Common practice analysis

Venting the captured CMM into the atmosphere is the common practice in the coal sector of Poland. There were other major examples of using even the CMM from active mines for heat or power generation that have been implemented only with a precognition of additional emission trade revenues. There are some additional technology problems, if it is CMM from abandoned mine. The project is an activity first of its kind according to “Tool for the demonstration and assessment of additionality” (Version 06.0.0) EB 65 and so **not a common practice**.

The proposed activity is not a common practice and a first of its kind.

Conclusion

The impact of approval of the proposed project activity will allow the crossing of the financial hurdles and other barriers that otherwise would prevent the project from being implemented. The project is additional.

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

Baseline

The baseline shall be established in accordance with the appendix B of the Guidance on criteria for baseline setting and monitoring.

Table B-4: Overview on emissions sources included in or excluded from the project boundary

Source	**Gas**		**Justification / Explanation**
Emissions of methane as a result of venting	CH4	Included	The main emission source. The amount of methane to be released depends on the amount of coal produced. The baseline scenario for the project activity not implemented as a JI project is taken into account.
Emissions from destruction of methane in the baseline	CO_2	Excluded	There are no systems for heat and power in the applicable baseline scenario.
	CH_4	Excluded	There are no systems for heat and power in the applicable baseline scenario.
	N_2O	Excluded	There are no systems for heat and power in the applicable baseline scenario.
Grid electricity generation (electricity provided to the grid)	CO_2	Excluded	CO_2 emissions associated to the same quantity of electricity than electricity generated, as a result of the use of methane are excluded.
	CH_4	Excluded	Excluded for simplification. This is conservative
	N_2O	Excluded	Excluded for simplification. This is conservative
Captive power and/or heat, and vehicle fuel use	CO_2	Included	In the baseline scenario heat would be generated by the coal boilers. CO_2 emissions associated to the same quantity of heat than heat generated, as a result of the use of methane are included only for displacement of heat in units not considered by EU-ETS
	CH_4	Excluded	Excluded for simplification. This is conservative
	N_2O	Excluded	Excluded for simplification. This is conservative

Table B-5: Overview on emissions sources included in or excluded from the project boundary

Project activity

Source	**Gas**		**Justification / Explanation**
Emissions of methane as a result of continued venting	CH_4	Excluded	Only the change in CMM emissions release will be taken into account, by monitoring the methane used or destroyed by the project activity.
On-site fuel consumption due to the project activity, including transport of the gas	CO_2	Included	The own electricity consumption of the cogeneration units (cooling fans) is included.
	CO_2	Excluded	The electricity consumption of the vacuum pumps is not included in the project boundary. There is assumed, that the efforts for venting and capturing of the methane by the bordering mines against the present extraction are comparable or higher. Thus the extraction is performed both in the baseline and project scenario.
	CO_2	Excluded	The electricity consumption of the CHP unit during the down time is not included in the project boundary as it is not significant.[1]
	CH_4	Excluded	Excluded for simplification. This is conservative. This emission source is assumed to be very small.
	N_2O	Excluded	Excluded for simplification. This is conservative. This emission source is assumed to be very small.
Emissions from methane destruction	CO_2	Included	From the combustion of methane in the heat and power generation.
Emissions from NMHC destruction	CO_2	Included	Actually NMHC accounts less than 1% by volume of the extracted coal mine gas, so NMHC has been excluded for estimating the emission reductions. However the NMHC amount will be monitored on a regular basis and the emissions will be included if the NMHC concentration will exceed 1%.
Fugitive emissions of unburned methane	CH_4	Included	A small amount of uncombusted methane, 0.5% for each unit, will be accounted to keep conservative.
Fugitive methane	CH_4	Excluded	Excluded for simplification. This emission source is

[1] The average per year over the crediting period is less than 1% of the annual average and does not exceed the amount of 2,000 t CO_{2eq}. Reference JISC "Guidance on Criteria for Baseline Setting and Monitoring".

emissions from on-site equipment			assumed to be very small.
Fugitive methane emissions from gas supply pipeline or in relation to use in vehicles	CH_4	Excluded	Not applicable to the project
Accidental methane release	CH_4	Excluded	This emission source is assumed to be very small.

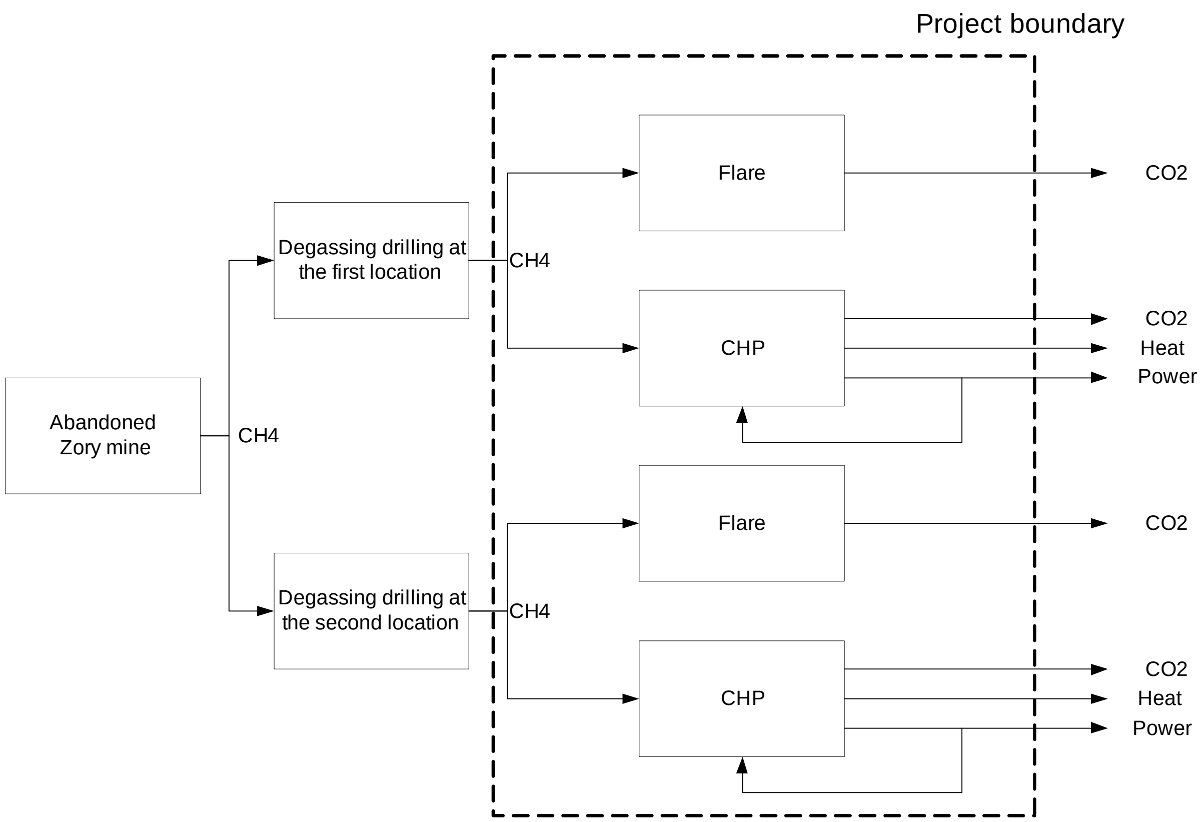

Figure B-3: Project boundary

Overlap of the project activity and the baseline

As there was no use of methane in the baseline, an overlap of the project activity is not possible.

Baseline Emissions

Baseline emissions are given by the following equation

$BE_y = BE_{MDy} + BE_{MRy} + BE_{Use,y}$ (1)

where

BE_y = baseline emissions in year y (t_{CO2e})
BE_{MDy} = Baseline emissions from destruction of methane in the baseline in year y (t_{CO2e})
BE_{MRy} = Baseline emissions from release of methane into atmosphere in year y (t_{CO2e}) that is avoided by the project activity
$BE_{Use,y}$ = Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity in year y (t_{CO2e})

Methane destruction in the baseline

The project activity uses methane which otherwise would be exhausted into the atmosphere. There is no use of this part of methane in the baseline.

$BE_{MDy} = 0$ (2)

Methane released in the atmosphere

The baseline emissions from release of methane into the atmosphere in the year y ($BE_{MR,y}$) is obtained by the following equation:

$BE_{MR,y} = (CMM_{PJ,y}) x\ GWP_{CH4}$ (3)

$CMM_{PJ,} = MM_{Flare\ i} + MM_{Elec\ i}$ (4)

$MM_{ELEC\ Eng1} = EG_{Eng1} / \eta_{power} / NCV_M\ x\ \rho_{CH4}$ (5)

where

$CMM_{PJ,}$ = CMM captured, sent to and destroyed by use *i* in the project activity in year *y* (expressed in tCH_4)
GWP_{CH4} = Global warming potential of methane (21 tCO_2e/tCH_4)
$MM_{Flare\ i}$ = Methane destroyed in the flare i
$MM_{ELEC\ Eng1}$ = Methane destroyed in the power plant i
EG_{Eng1} = Electricity generation (MWh)
η_{power} = Efficiency of the power plant
NCV_M = Net calorific value of methane
ρ_{CH4} = Density of methane

The emissions reductions from displacement of heat generation are described as follows:

$BE_{Use,y} = HG_{Engi}\ x\ EF_{Heat\text{-}gen}$ (6)

where

HG_{Engi} = Heat generation
$EF_{Heat\text{-}gen}$= CO_2 emission factor of coal fired heating

Leakage

The formula for leakage is given as follows:
$LE_y = LE_{d,y} + LE_{o,y}$ (7)

Where:
LE_y = Leakage emissions in year *y* (tCO_2e)
$LE_{d,y}$ = Leakage emissions due to displacement of other baseline thermal energy uses of methane in year *y* (tCO_2e)
$LE_{o,y}$ = Leakage emissions due to other uncertainties in year *y* (tCO_2e)

Displacement of baseline thermal energy uses

There is no use of methane in the baseline which could be displaced by the project activity.

Emission Reduction

ERy = BEy - PEy -LEy (8)

where

ERy = Emission reductions of the project activity during the year y(t CO2)
BEy = Baseline emissions during the year y (t CO2)
PEy = Project emissions during the year y (t CO2)
LEy = leakage emissions in year y (t CO2) =0

Data / Parameter:	BEy
Data unit:	t CO_{2Eq}
Description:	baseline emissions in year y (t_{CO2e})
Time of determination/ monitoring	During the project implementation,
Source of data:	Monitored data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	Monthly recorded
Any comment:	Calculated using formulae in section B3

Data / Parameter:	$BE_{MR}y$
Data unit:	t CO_{2Eq}
Description:	Baseline emissions from release of methane into atmosphere in year y (t_{CO2e}) that is avoided by the project activity
Time of determination/ monitoring	During the project implementation.
Source of data:	Monitored data
Value of data applied	
Justification of the choice of	The amount of methane will be calculated from in dependence from the load of

data or description of measurement methods and procedures (to be) applied	the CHP installed in the project activity and the efficiency of the power production. The load is determined from the measurement of the operating time of the system and staff reporting. The operating hours are a part of the monthly reporting of the project activity. The GWP for methane is determined after the IPCCC
QA/QC procedures:	Monthly recorded
Any comment:	Calculated using formulae in section B3 $BE_{MR,y}$ = ($CMM_{PJ,y}$)x GWP_{CH4}

Data / Parameter:	BE_{MDy}
Data unit:	t CO_{2Eq}
Description:	Baseline emissions from destruction of methane in the baseline in year y (t_{CO2e})
Time of determination/ monitoring	Ex ante
Source of data:	
Value of data applied	0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are no systems for heat and power in the applicable baseline scenario.
QA/QC procedures:	
Any comment:	

Data / Parameter:	PC_{NMHC}
Data unit:	%
Description:	Concentration (in mass) of NMHC in extracted gas (%), to be measured on wet basis
Time of determination/ monitoring	yearly
Source of data:	Monitored data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Actually NMHC accounts less than 1% by volume of the extracted coal mine gas, so NMHC has been excluded for estimating the emission reductions. However the NMHC amount will be monitored on a regular basis and the emissions will be included if the NMHC concentration will exceed 1%.
QA/QC procedures:	The determination will be provided by an appropriate analysis.
Any comment:	

Data / Parameter:	$BE_{Use,y}$
Data unit:	t CO_{2Eq}
Description:	Baseline emissions from the production of power, heat or gas supply to grid replaced by the project activity in year y (tCO2e) in units not considered by EU-ETS
Time of determination/ monitoring	Ex ante
Source of data:	Monitored data
Value of data applied	

Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	In order to avoid of double counting of emissions only emission reduction , as a result of the use of methane for heat displacement in units not considered by EU-ETS will be claimed. Calculated using formulae in section B3: $BE_{Use,y} = BE_{heat,y}$

Data / Parameter:	$CMM_{PJ,}$
Data unit:	tCH_4
Description:	CMM captured, sent to and destroyed by use *i* in the project activity in year *y*
Time of determination/ monitoring	During the project implementation, monthly
Source of data:	Monitored data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of methane destroyed in flares and engines will be measured by measuring equipment consisting of flow and power meters, methane detectors, thermometers and pressure gauges. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements.
QA/QC procedures:	See Section D.2
Any comment:	$CMM_{PJ,} = MM_{Flare\ i} + MM_{Elec\ i}$

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_{2Eq} /tCH_4
Description:	Global warming potential of methane
Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	21 tCO_2e/tCH_4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

Data / Parameter:	CEF_{CH4}
Data unit:	tCO_{2Eq} /tCH_4
Description:	Carbon emission factor for combusted methane
Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	2.75 tCO_2e/tCH_4
Justification of the choice of data or description of	

measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

Data / Parameter:	CMM $_{BL,y}$
Data unit:	t CH4
Description:	CMM that would have been captured , sent to and destroyed by use *i* in the baseline scenario in year *y*
Time of determination/ monitoring	Ex ante at the start of the project
Source of data:	Project site
Value of data applied	0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There are no systems for heat and power in the applicable baseline scenario.
QA/QC procedures:	
Any comment:	

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 completion of the baseline study: 21 August 2012

Name of person / entity setting the baseline: Alina Mroz, / Carbon-TF B.V.

See Annex 1 for detailed contact information.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The first test extraction and experiments on the CMM potential were made in spring 2009. The project activity started its operation in January 2010.

C.2. Expected operational lifetime of the project:

At least 15 years, equal to 180 months, if the CMM amounts will be appropriate

C.3. Length of the crediting period:

3 years (2010 – 2012), equal 36 months, within the Kyoto-period 2008-2012.

The crediting period can extend beyond 2012 subject to the approval by the host party. The crediting period will not extend beyond the operational lifetime of the project.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

A monitoring plan according to the JI approach after JISC and the Guidance on criteria for baseline setting and monitoring is applied for the project.

General remarks to the Monitoring Plan:

- Social indicators such as number of people employed, safety record, training records, etc, will be available to the verifier;
- Environmental indicators such as dust emissions, NO_x, or SO_x will be available to the verifier. These indicators are being reported to the Regional Supervisory Authority on an annual basis;
- IPCC default factors have been taken from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. [IPCC-2]

Figure D-1: Data collected for the monitoring

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

Data / Parameter:	$CONS_{ELEC,PJ}$
Data unit:	MWh
Description:	Additional electricity consumption for use or destruction of methane, if any
Time of determination/ monitoring	Ex post
Source of data:	Research, measurements
Value of data applied	0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The additional electricity consumption lowers the amount of electricity fed in into the grid. As the net electricity production is monitored during the monitoring of the own consumption is obsolete for the already installed location.
QA/QC procedures:	
Any comment:	

Data / Parameter:	$MM_{ELEC\ Eng1}$
Data unit:	tCH_4
Time of determination/ monitoring	monthly
Description:	Methane destroyed in the power plant
Source of data:	calculated
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of methane will be estimated in dependence from the energy generation of the CHP installed in the project activity and the efficiency of the power production.
QA/QC procedures:	
Any comment:	$MM_{ELEC\ Eng1} = EG_{Eng1} / \eta_{power} / NCV_M \times \rho_{CH4}$

Data / Parameter:	η_{power}
Data unit:	%
Time of determination/ monitoring	in dependence from load of the plant and according to the manufacturer data of the plant
Description:	Energy efficiency of the plant
Source of data:	Calculated
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The efficiency in dependence from load of the plant is provided by the manufacturer
QA/QC procedures:	
Any comment:	The energy efficiency of the plant depends on the achieved load of the plant and will be calculated for the given operational case as monthly average. The calculation of achieved efficiency in dependence of the load

	will be interpolated and based on the values given by the manufacturer

Data / Parameter:	NCV_M
Data unit:	TJ/Gg
Time of determination/ monitoring	Ex ante
Description:	Net calorific value of methane
Source of data:	Polish legal source: 2008/Dz.Ust 183/1142
Value of data applied	50
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	With 1MJ=0.2778 kWh and ρ_{CH4}=0.717 kg/m^3 NCV_M=9.96 kWh/m^3

Data / Parameter:	Ti
Data unit:	hours
Time of determination/ monitoring	During the project implementation
Description:	Operating hours of the plant
Source of data:	measured
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of the operating hours is necessary for the determination of the load factor of the plants
QA/QC procedures:	Operating hours are daily and monthly reported by the staff
Any comment:	

Data / Parameter:	LF_{Engi}
Data unit:	%
Time of determination/ monitoring	During the project implementation
Description:	The load factor of the plant
Source of data:	calculated
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The achieved capacity is to calculate as a monthly average from of the operating hours and generated power versus the theoretical capacity of the plant. The load factor is necessary for the final efficiency of power production in the plant. The calculation of achieved efficiency in dependence of the load will be interpolated and based on the values given by the manufacturer.
QA/QC procedures:	Operating hours are daily and monthly reported by the staff.
Any comment:	$LF_{Engi}= EG_{Eng1}/Ti/P_i$

Data / Parameter:	P_i
Data unit:	kWel
Time of determination/ monitoring	Ex ante/ex post
Description:	Theoretical electrical capacity of the plant
Source of data:	Manufacturer´s data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	The theoretical capacity is individual for each engine installed within the project capacity. The theoretical capacity can change subject to technical improvement and innovation made in cooperation with the engine manufacturer.

Data / Parameter:	MM_{Flare}
Data unit:	tCH_4
Description:	Methane destroyed in the flare i
Time of determination/ monitoring	Continuous, recorded at least every 20 minutes
Source of data:	Measured / calculated
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of methane will be measured by measuring equipment consisting of flow and power meters, methane detectors, thermometers and pressure gauges. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements.
QA/QC procedures:	
Any comment:	

Data / Parameter:	T_{FL}
Data unit:	K
Description:	Temperature of exhaust gas
Time of determination/ monitoring	Continuous, recorded at least every 20 minutes
Source of data:	Measurement
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	The efficiency is set to 99.5%. This will be verified by a yearly evaluation. See Annex 3 for justification. The run time of the flare is monitored by continuous measurement of the exhaust gas temperature

Data / Parameter:	Eff_{Flare}
Data unit:	%
Description:	Efficiency of methane destruction/oxidation in the flare
Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	99.5%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	In difference to the flaring tool a combustion efficiency of 99.5%, according to the IPCC guidelines (see also ACM0008 Version 1 and Version 2), has been taken into account instead of the default value of 90% as given in the flaring tool. See Annex 3 The approach is already approved in the final determined project 0077

Data / Parameter:	EG_{Engi}
Data unit:	MWh
Description:	Electricity generation
Time of determination/ monitoring	continuous
Source of data:	measured
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Continuous measurement with summation, recorded hourly in the Vattenfall´s control system
QA/QC procedures:	Calibration according to the producer instructions, legal and operation requirements. The power meters fulfil the requirements for billing. They allow an automatic reading from the Vattenfall´s control room.
Any comment:	

Data / Parameter:	EG_{HEATy}
Data unit:	MWh
Description:	Heat generation by project
Time of determination/ monitoring	monthly
Source of data:	Measurements
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	Calibration according to the producer instructions, legal and operation requirements.
Any comment:	

Data / Parameter:	NCV_M
Data unit:	TJ/Gg
Description:	Ex ante
Time of determination/ monitoring	Net calorific value of methane
Source of data:	Polish legal source: 2008/Dz.Ust 183/1142
Value of data applied	50
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	With 1MJ=0.2778 kWh and ρ_{CH4}=0.717 kg/m^3 NCV_M=9.96 kWh/m^3

Data / Parameter:	Eff_{ELEC}
Data unit:	%
Description:	Efficiency of methane destruction/oxidation in power plant
Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	99.5%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	Set at 99.5%(IPCC)

Data / Parameter:	CEF_{NMHC}
Data unit:	
Description:	Carbon emission factor for combusted non methane hydrocarbons (various)
Time of determination/ monitoring	Once a year
Source of data:	measured
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	The determination will be provided by an independent laboratory or appropriate measurement
Any comment:	To be obtained through periodical analysis of the fractional composition of captured

Data / Parameter:	PC_{NMHC}
Data unit:	%
Description:	NMHC concentration (in mass) in extracted gas
Time of determination/ monitoring	Annually
Source of data:	Concentration meters, optical and calorific
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	To be obtained through periodical analysis of the fractional composition of captured

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/ tCH_4
Description:	Global warming potential of methane
Time of determination/ monitoring	*Ex ante*
Source of data:	
Value of data applied	21 tCO_2e/tCH_4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EF_{elec-gen}$
Data unit:	t CO_2 / MWh
Description:	CO_2 emission factor of the grid
Time of determination/ monitoring	Ex ante
Source of data:	KOBiZE/Poland
Value of data applied	0.812 t_{CO2}/MWh
Justification of the choice of data or description of measurement methods and procedures (to be) applied	A standardised carbon emission factor for the Polish Grid as determined by KOBiZE: http://www.kobize.pl/materialy/jicdm/JI-wskaznik_referencyjny_26sie2011_publik.pdf
QA/QC procedures:	
Any comment:	

Data / Parameter:	CEF_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Carbon emission factor for combusted methane
Time of determination/ monitoring	*Ex ante*
Source of data:	
Value of data applied	44/16 = 2.75 tCO_2e/tCH_4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EF_{Heat\text{-}gen}$
Data unit:	t_{CO2} /GJ $_{Heat}$
Description:	CO_2 emission factor of coal fired heating
Time of determination/ monitoring	Ex ante
Source of data:	IPCC 2006 / Polish legal source: 2008/Dz.Ust 183/1142
Value of data applied	0.118t_{CO2} /GJ $_{Heat}$
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The standard carbon emission factor from the IPCC guidelines together with a combustion efficiency of 80% has been taken as a conservative approach. The value for “Coking Coal” / “Other Bit. Coal” of 94.5 t_{CO2} /TJ has been chosen. This is the value with the lowest carbon emissions, thus this is conservative for coal displacement.
QA/QC procedures:	
Any comment:	$EF_{Heat\text{-}gen}$= 0.0945 / 0.8 = 0.118 t_{CO2} /GJ $_{Heat}$

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 emissions are defined by the following equation

$PE_y = PE_{ME} + PE_{MD} + PE_{UM}$ (9)

Project emissions from energy use to capture and use methane (PE_{ME}), is obtained by the equation:

$PE_{ME} = CONS_{ELEC,PJ} \times EF_{elec}$ (10)

where $CONS_{ELEC,PJ} = 0$
as the resulting net energy produced (energy produced lowered by the own consumption) is monitored.

All utilisation units are supplied with CMM from the CMM suction system of the coal mine. The CMM pressure provided by the suction system is sufficient for the operation of all utilisation units and no further compression is needed. The CMM suction system is always in operation for safety reasons in the underground of the coal mine, in the case of the project through the venting systems of the neighbouring mines. The CMM suction system would be also in operation in the absence of the project; in this case the part of methane would be simply blown into the atmosphere. Thus the energy use for capture of the methane is outside the project boundaries and only the part for use methane is regarded.

The power generator and the cogeneration unit need additional power especially for the cooling fans. The power amount consumed by the power generation units lowers the amount of energy fed in into the grid.

Project emissions from methane destroyed (PE_{MD}) can be obtained by the equation

$PE_{MD}= (MM_{Fl}+MM_{ELEC}) \times (CEF_{CH4} + r \times CEF_{NMHC})$ (11)
with:

$r = PC_{NMHC} / PC_{CH4}$ (12)

where:

PE_{MD}	Project emissions from CMM destroyed (t CO_2eq)
CEF_{CH4}	Carbon emission factor for combusted methane (2.75 t CO_2eq/t CH4)
CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (various) (t CO_2eq/tNMHC)
r	Relative proportion of NMHC compared to methane
Pc_{CH4}	Concentration (in mass) of methane in extracted gas (%)
PC_{NMHC}	NMHC concentration (in mass) in extracted gas (%)

Uncombusted methane from flaring and end uses (PE_{UM}) can be obtained through the equation:

$PE_{UM} = GWP_{CH4} \times [MM_{Fl} \times (1-EffFl) + MM_{ELEC} \times (1 - Eff_{ELEC})]$ (13)

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

Data / Parameter:	BE_y
Data unit:	t CO_{2eq}
Description:	Baseline emissions in year y
Time of determination/ monitoring	Monthly monitored
Source of data:	monitored data
Value of data applied	Calculated
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	calculated using formulae in Section D.1.1.4, see below

Data / Parameter:	$BE_{MR,y}$
Data unit:	t CO_{2eq}
Description:	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity
Time of determination/ monitoring	monthly
Source of data:	
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of methane will be measured by measuring equipment consisting of flow and power meters, methane detectors, thermometers and pressure gauges. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements.
QA/QC procedures:	Monthly recorded
Any comment:	Calculated using formulae in section B3 $BE_{MR,y} = (CMM_{PJ,y}) x \; GWP_{CH4}$

Data / Parameter:	$BE_{Use,y}$
Data unit:	t CO2Eq
Description:	Baseline emissions from the production of power, heat or gas supply to grid replaced by the project activity in year y (tCO2e) in units not considered by EU-ETS
Time of determination/ monitoring	During the project duration
Source of data:	Monitored data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	In order to avoid of double counting of emissions only emission reduction , as a result of the use of methane for heat displacement in units not considered by EU-ETS will be claimed. Calculated using formulae in section B3: $BE_{Use,y} = BE_{heat,y}$

Data / Parameter:	BEheat,y
Data unit:	t CO_{2Eq}
Description:	Baseline emissions from the production of heat by the project activity in year y (tCO2e)
Time of determination/ monitoring	During the project duration
Source of data:	Monitored data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The total emissions reductions from displacement of the same quantity of heat as heat generated, that otherwise would be produced in boilers by use of fossil fuels.
QA/QC procedures:	
Any comment:	$BE_{heat,y} = EG_{HEATy}$ x $EF_{Heat-gen}$

Data / Parameter:	$CMM_{PJ,}$
Data unit:	t_{CH4}
Description:	CMM captured, sent to and destroyed by use *i* in the project activity in year *y*
Time of determination/monitoring	During the project implementation, monthly
Source of data:	Monitored data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of methane destroyed in flares and engines will be measured by measuring equipment consisting of flow and power meters, methane detectors, thermometers and pressure gauges. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements.
QA/QC procedures:	See Section D.2

Any comment:	$CMM_{PJ,} = MM_{Flare\ i} + MM_{Elec\ i}$

Data / Parameter:	GWP_{CH4}
Data unit:	t_{CO2eq} / t_{CH4}
Description:	Global warming potential of methane
Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

Data / Parameter:	CEF_{CH4}
Data unit:	t_{CO2eq} / t CH_4
Description:	Carbon emission factor for combusted methane
Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	2.75
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

Data / Parameter:	EG_{HEATy}
Data unit:	MWh
Description:	Heat generation by project
Time of determination/ monitoring	monthly
Source of data:	Measurements
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	Calibration according to the producer instructions, legal and operation requirements.
Any comment:	

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

$BE_y = BE_{MR,y} + BE_{Use,y}$ (14)

The baseline emissions from release of methane into the atmosphere in the year y (BEMR,y) is obtained by the following equation:

$BE_{MR,y} = CMM_{PJ,y} \times GWP_{CH4}$ (15)

$BE_{Use,y} = BE_{heat,y} = EG_{HEATy} \times EF_{Heat\text{-}gen}$ (16)

The emissions reductions from displacement of power generation are not taken under account.

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

Data / Parameter:	
Data unit:	
Description:	
Time of determination/ monitoring	
Source of data:	
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

not applicable

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

not applicable

D.1.3. Treatment of leakage in the monitoring plan:

In accordance with methodological tools the following leakages should be considered:

1. Displacement of baseline thermal energy uses
2. CBM drainage from outside the de-stressed zone
3. Impact of the emission reducing project on coal production
4. Impact of the emission reducing project on coal prices

Leakage in the project is very unlikely as:

1. there is no use of methane in the baseline
2. There is no CBM involved hence no leakage occurs from CBM drainage from outside the de-stressed zone
3. There is no impact of the emission reducing project on coal production as the project is independent from any present coal production
4. There is no impact of the emission reducing project on coal prices as the project is independent from any present coal production.

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:

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):

The greenhouse gas emission reduction gained by the project over a period is the difference between the total baseline emissions over the period and the total project emissions over the period. This is given by the equation:

$$ER_y = BE_y - PE_y \qquad (17)$$

where:
ER_y Emissions reductions of the project activity during the year y (t CO_{2eq})
BE_y Baseline emissions during the year y (t CO_{2eq})
PE_y Project emissions during the year y (t CO_{2eq})

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

To maintain a consistent and reliable performance of the automatic controlling and monitoring system an adequate quality control and assurance procedures will be implemented that is regulated by the calibration standards and quality norms of the national legislation. Under these requirements of quality control system, regular maintenance and testing regime to ensure accuracy of flow meters, gas-analysers, electricity and heat measuring instruments will be provided. All measuring instruments will be calibrated periodically, according to the technical and legal requirements. The calibration protocols will be archived and provided for the purposes of project verification to the independent entity. A consistency check for all measurement data and the calculation of the emission reductions will be carried out and reported monthly.

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

Data	**Uncertainty level of data (high/medium/low)**	**Explain QA/QC procedures planned for these data, or why such procedures are not necessary.**
NMHC Concentration	low	The determination will be provided by an appropriate measurement.
Power production	low	The indication of the measurement instrument should be controlled one-time during the final inspection by the manufacturer. The gauge has usually hardly any fluctuations and no recalibration is needed. The indication of the measurement instrument should be controlled during the regular inspections while the operation time and a gauge which is obviously out of order should be substituted.
Methane amount	low	The indication of the measurement instrument should be controlled one-time during the final inspection by the manufacturer. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration is according to the producer instructions, legal and operation requirements.

Irrespective the monitoring plan all installed aggregates and gauges should be controlled during the regular inspections, at least weakly, to assure a proper operation of the facility. Beside the monitored values any other values which are needed for the supervision of the plant should be logged.

Any gauge or apparatus which is detected as obviously out of order should be substituted.

Furthermore emissions measurement for dust, CO, NO_x etc. for all combustion units will be carried out and archived as required by the legal requirements of the Polish Authorities.

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

The plants installed in the project are designed to run fully automatic, so that the operating personnel have only to supervise the correct operation of the plant and the plausibility of the collected and monitored data. In case of disturbances the plant will be shut down automatically and no unintended emissions are caused.

The operator of the capturing station is responsible for the measurement of the whole amount of captured methane, the amount of methane sent to the operator of proposed project. The measured amounts are relevant for invoices for the CMM used by the project operator.

The operator of the plant is responsible for the operation and maintenance of all measurement equipment. Calibration procedures are in accordance to the producer instructions, legal and operation requirements. The power meters fulfil the requirements for billing. They allow an automatic reading from the Vattenfall´s control room.

The protocols should be stored as a part of balance of the operating company.

All stored data will be kept during the whole operation period of the plant and furthermore for at least 5 years. All printed and validated reports and invoices are to be stored for at least two years after the last transfer of ERUs for the project. Storage of scanned reports is allowed, due to the internal quality guidelines of the project operator.

The relevant process data collected by the project operator are: methane input, methane concentration, CHP-worked hours, power and heat production, exhaust gas temperature of the flare. The power plant and all relevant process data are to be observed daily by the staff. The process data are to be collected and archived monthly.

The power production is measured by measuring devices maintained by the grid operator, as they are relevant for invoicing. The readout of the measurement is automatically. The quality of the measurement is thereafter high.

All measuring equipment is to calibrate according to the producer instructions, legal and operation requirements.

The plant manager is responsible for the preparation of the standardised monthly report. He is also in charge for the preparation of the summarised monthly and yearly reports, which should be revised by the project manager.

The plant manager is keeping an operational journal which includes the following information:

- compilation and description of all data recorded, required for the calculation of the emission reductions
- description of all records to be kept during the regular inspections, including all corrective action undertaken
- manually logged data collected during the regular inspections
- particular events
- all calibrations carried out, incl. all calibration protocols

All data should be continuously checked for consistency, completeness and integrity by project developer. A detailed plausibility check should be carried out at least monthly.

Based on the procedure described above a detailed annual report should be prepared by LNG Silesia and confirmed by the verifier.

The responsible staff members of the project operator LNG Silesia have been trained on the handling with CMM-utilisation units and the applied monitoring systems by the plant producer. Those trained personnel of the operator is the basis and responsible for operating and monitoring of this project.

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

Date of completion of the monitoring plan: 21 August 2012

Name of person / entity setting the monitoring plan: Alina Mroz / Carbon-TF B.V.

See Annex 1 for detailed contact information.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

The following calculations are based on the baseline determined in section B. All CMM which is burned in the cogeneration unit is concurrently avoided CMM, which would otherwise escape to the atmosphere in absence of the project.

The project emissions PE are calculated presuming that NMHC has not to be regarded (r = 0).

Table E-1 – Estimated project emissions

Estimated project emissions [t CO_{2Eq}]						
Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013-2017**
Methane destruction						
flaring			413	0	0	44,738
heat generation	0	0	0	0	0	0
power generation	0	0	3,595	7,131	7,131	64,783
additional power consumption	0	0	0	0	0	1,692
sum	**0**	**0**	**4,008**	**7,131**	**7,131**	**111,213**

E.2. Estimated leakage:

There is no leakage estimated in this project.

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

Table E-3 – Estimated project emissions and leakage

Estimated project emissions and leakage [t CO_{2Eq}]						
Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013-2017**
Methane destruction						
flaring	0	0	3,153	0	0	341,635
heat generation	0	0	0	0	0	0
power generation	0	0	26,441	52,451	52,451	476,510
additional power consumption			0	0	767	18,668
sum	**0**	**0**	**29,594**	**52,451**	**53,218**	**836,813**

E.4. Estimated baseline emissions:

Table E-4 – Estimated baseline emissions

Estimated baseline emissions [t CO_{2Eq}]						
Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013-2017**
Methane destruction						
flaring	0	0	3,153	0	0	341,635
heat generation	0	0	0	0	0	0
power generation	0	0	26,441	52,451	52,451	476,510
production of heat that is displaced by the project			0	0	767	18,668
Sum	**0**	**0**	**29,594**	**52,451**	**53,218**	**836,813**

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

See table E-6 in section E.6.

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

Table E-6 – Project emissions and emission reductions during the lifetime of the project (2008-2012)

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emissions reductions (tonnes of CO2 equivalent)
2008	0	-	0	0
2009	0	-	0	0
2010	4,008	-	29,594	25,586
2011	7,131	-	52,451	45,320
2012	7,131	-	53,218	46,087
Total t $_{CO2\ equiv.}$	**18,269**	**-**	**135,262**	**116,993**

prospected emissions for the years 2013-2017				
Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emissions reductions (tonnes of CO2 equivalent)
2013	11,222	-	85,672	74,451
2014	24,998	-	187,785	162,787
2015	24,998	-	187,785	162,787
2016	24,998	-	187,785	162,787
2017	24,998	-	187,785	162,787
Total t $_{CO2\ equiv}$	**111,213**	**-**	**836,813**	**725,600**

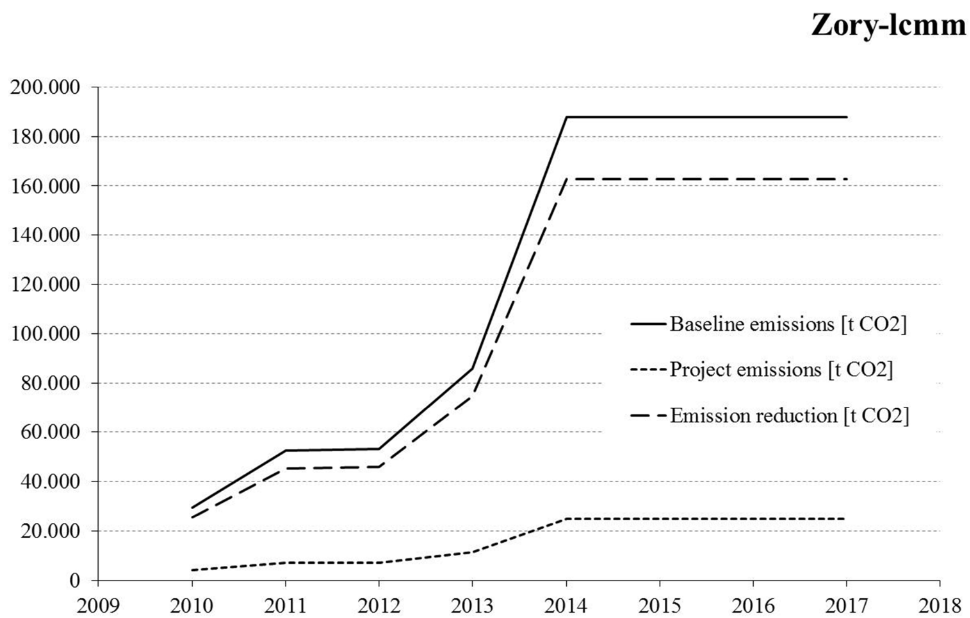

Figure E-1 - Baseline emissions, project emissions and emissions reduction; total project

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including trans-boundary impacts, in accordance with procedures as determined by the host Party:

The CHP-unit does not use the natural resources: water, ground and landscape, so that no impairment on nature or landscape is given. The facility does not produce any waste, sewage or condensate. Due to the very high operational safety standards supplied a very low accident hazard is given.

The plant requires an approval by the Polish Environmental Authorities. The combustion processes are designed to comply for the Polish emissions limits.

The facility causes no harmful environmental impacts. In fact the utilisation of otherwise unused CMM reduces in an active manner the amount of CMM which is released to the atmosphere and provides significant benefits for the global climate production by converting the harmful methane into the less harmful carbon dioxide.

Furthermore the operation of the plant creates additional jobs.

Beside the positive effect on the global climate protection, no trans-boundary impacts occur.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

There are no significant environmental impacts expected. No environmental impact assessment is needed. The plant has to fulfil the requirements of the Polish regulations.

SECTION G. Stakeholders' comments

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

A local stakeholder consultation is required during the authorisation procedure, by the building law, the law of city and regional planning, environmental law. The stakeholder rights are described in the administrative law. The stakeholders were consulted according to the regulations.

The project operator LNG Silesia has applied for the building permit in accordance with the current legislation. Parties involved in the procedure were: Municipality Zory, District Building Supervision in Pszczyna, District Mining Authority. As the necessary preliminary administrative step was the achieving of a decision about the conditions for the building development plan. This decision was given by the Municipality Zory after examination of the ownership right and other stakeholder´s rights and interests. According to the Polish legislation every stakeholder can raise objection, if his rights and interests are put at risk.

During the plant building the stakeholders had to be informed about the character of the plant and all risks that could occur.

No objection was raised during the administrative procedure or during the construction and operational time of the plant.

Furthermore, a Project Idea Note was presented to the Polish Ministry of Environment and a state Environmental Funding Institution (NFOSiGW) due to obtain a Letter of Endorsement for the project. The opinion of NFOSiGW in August 2009 was positive. The Letter of Endorsement was issued in July 2010.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Proposer and project operator

Organization:	LNG Silesia
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Represented by:	Artur Kostka
Title:	CEO
Salutation:	Mr.
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Middle Name:	
First Name:	Artur
Department:	
Phone(direct):	
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Personal e-mail:	akostka@lngsilesia.pl

Consultant and investor, buyer of the emission reduction certificates

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E-mail:	info@carbon-tf.com
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Represented by:	Clemens Backhaus
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Salutation:	
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Contact person for the purpose of the project:

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Annex 2

BASELINE INFORMATION

Justification of the methane amount taken for the baseline estimation

Evaluation of the geological documentation and the results of production tests were taken for the estimation of the size of the utilisation units. Furthermore there was the recommendation of the involved authority to capture the minimum amount of 10 m³/min of pure methane. The first operational results of the installed equipment proved the correctness of the assumed amounts of methane to treat. The supporting documents regarding the assumption were provided to the AIE.

Power own consumption of the cogeneration units

The power own consumption of the power generation units is estimated ex ante as of 3.5% of the generated power. This ratio is based on the experience made with over 100 CMM CHP modules in Germany.

Project emission

The project emissions during the down times of the plant are not considered in the calculation. As they are very small and not significant, they are not necessary to be encompassed by the project boundaries. This is in accordance with the JISC`s Guidance on criteria for baseline setting and monitoring.

Efficiency of the cogeneration units

The firing capacity, efficiency, power and heat output of the cogeneration units depend mainly on the gas quality, especially the methane concentration. Average values, based on the experience made on comparable units in Germany have been taken into account.

Baseline Carbon Emission Factor for the Polish power grid

A standardised carbon emission factor for the Polish Grid as determined by KOBiZE
http://www.kobize.pl/materialy/jicdm/JI-wskaznik_referencyjny_26sie2011_publik.pdf

Key elements of the baseline

Data / Parameter:	BE_y
Data unit:	t CO_{2eq}
Description:	Baseline emissions in year y
Time of determination/ monitoring	Monthly monitored
Source of data:	monitored data
Value of data applied	Calculated
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	calculated using formulae in Section D.1.1.4, see below

Data / Parameter:	$BE_{MR,y}$
Data unit:	t CO_{2eq}
Description:	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity
Time of determination/ monitoring	monthly
Source of data:	
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of methane will be measured by measuring equipment consisting of flow meters, methane detectors, thermometers and pressure gauges. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements.
QA/QC procedures:	Monthly recorded
Any comment:	Calculated using formulae in section B3 $BE_{MR,y} = (CMM_{PJ,y})x\ \ GWP_{CH4}$

Data / Parameter:	$BE_{Use,y}$
Data unit:	t CO2Eq
Description:	Baseline emissions from the production of power, heat or gas supply to grid replaced by the project activity in year y (tCO2e)
Time of determination/ monitoring	During the project duration
Source of data:	Monitored data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	In order to avoid of double counting of emissions the emission reduction caused by the project activity is to proceed from the appropriate set-aside in the national allocation plan. Calculated using formulae in section B3

	$BE_{Use,y}$ = BEheat,y

Data / Parameter:	BEheat,y
Data unit:	t CO2Eq
Description:	Baseline emissions from the production of heat by the project activity in year y (tCO2e)
Time of determination/ monitoring	During the project duration
Source of data:	Monitored data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The total emissions reductions from displacement of the same quantity of heat as heat generated, that otherwise would be produced in boilers by use of fossil fuels.
QA/QC procedures:	
Any comment:	BEheat,y = EG_{HEATy} x $EF_{Heat-gen}$

Data / Parameter:	$MM_{ELEC\ Eng1}$
Data unit:	tCH_4
Time of determination/ monitoring	monthly
Description:	Methane destroyed in the power plant
Source of data:	calculated
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of methane will be estimated in dependence from the energy generation of the CHP installed in the project activity and the efficiency of the power production.
QA/QC procedures:	
Any comment:	$MM_{ELEC\ Eng1} = EG_{Eng1} / \eta_{power} / NCV_M \times \rho_{CH4}$

Data / Parameter:	η_{power}
Data unit:	%
Time of determination/ monitoring	in dependence from load of the plant and according to the manufacturer data of the plant
Description:	Energy efficiency of the plant
Source of data:	Calculated
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The efficiency in dependence from load of the plant is provided by the manufacturer
QA/QC procedures:	
Any comment:	The energy efficiency of the plant depends on the achieved load of the plant and will be calculated for the given operational case as monthly average. The calculation of achieved efficiency in dependence of the load will be interpolated and based on the values given by the manufacturer

Data / Parameter:	NCV_M
Data unit:	TJ/Gg
Time of determination/ monitoring	Ex ante
Description:	Net calorific value of methane
Source of data:	Polish legal source: 2008/Dz.Ust 183/1142
Value of data applied	50
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	With 1MJ=0.2778 kWh and ρ_{CH4}=0.717 kg/m^3 NCV_M=9.96 kWh/m^3

Data / Parameter:	Ti
Data unit:	hours
Time of determination/ monitoring	During the project implementation
Description:	Operating hours of the plant
Source of data:	measured
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of the operating hours is necessary for the determination of the load factor of the plants
QA/QC procedures:	Operating hours are daily and monthly reported by the staff
Any comment:	

Data / Parameter:	LF_{Engi}
Data unit:	%
Time of determination/ monitoring	During the project implementation
Description:	The load factor of the plant
Source of data:	calculated
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The achieved capacity is to calculate as a monthly average from of the operating hours and generated power versus the theoretical capacity of the plant. The load factor is necessary for the final efficiency of power production in the plant. The calculation of achieved efficiency in dependence of the load will be interpolated and based on the values given by the manufacturer.
QA/QC procedures:	Operating hours are daily and monthly reported by the staff.
Any comment:	$LF_{Engi}= EG_{Eng1}/Ti/P_i$
Data / Parameter:	P_i
Data unit:	kWel
Time of determination/ monitoring	Ex ante/ex post

Description:	Theoretical electrical capacity of the plant
Source of data:	Manufacturer´s data
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	The theoretical capacity is individual for each engine installed within the project capacity. The theoretical capacity can change subject to technical improvement and innovation made in cooperation with the engine manufacturer.

Data / Parameter:	MM_{Flare}
Data unit:	tCH_4
Description:	Methane destroyed in the flare i
Time of determination/ monitoring	Continuous, recorded at least every 20 minutes
Source of data:	Measured / calculated
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The amount of methane will be measured by measuring equipment consisting of flow and power meters, methane detectors, thermometers and pressure gauges. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements.
QA/QC procedures:	
Any comment:	

Data / Parameter:	T_{FL}
Data unit:	K
Description:	Temperature of exhaust gas
Time of determination/ monitoring	Continuous, recorded at least every 20 minutes
Source of data:	Measurement
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	The efficiency is set to 99.5%. This will be verified by a yearly evaluation. See Annex 3 for justification. The run time of the flare is monitored by continuous measurement of the exhaust gas temperature

Data / Parameter:	Eff_{Flare}
Data unit:	%
Description:	Efficiency of methane destruction/oxidation in the flare

Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	99.5%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	In difference to the flaring tool a combustion efficiency of 99.5%, according to the IPCC guidelines (see also ACM0008 Version 1 and Version 2), has been taken into account instead of the default value of 90% as given in the flaring tool. See Annex 3 The approach is already approved in the final determined project 0077

Data / Parameter:	EG_{Engi}
Data unit:	MWh
Description:	Electricity generation
Time of determination/ monitoring	continuous
Source of data:	measured
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Continuous measurement with summation, recorded hourly in the Vattenfall´s control system
QA/QC procedures:	Calibration according to the producer instructions, legal and operation requirements. The power meters fulfil the requirements for billing. They allow an automatic reading from the Vattenfall´s control room.
Any comment:	

Data / Parameter:	EG_{HEATy}
Data unit:	MWh
Description:	Heat generation by project
Time of determination/ monitoring	monthly
Source of data:	Measurements
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	Calibration according to the producer instructions, legal and operation requirements.
Any comment:	

Data / Parameter:	NCV_M
Data unit:	TJ/Gg

Description:	Ex ante
Time of determination/ monitoring	Net calorific value of methane
Source of data:	Polish legal source: 2008/Dz.Ust 183/1142
Value of data applied	50
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	With 1MJ=0.2778 kWh and ρ_{CH4}=0.717 kg/m^3 NCV_M=9.96 kWh/m³

Data / Parameter:	Eff_{ELEC}
Data unit:	%
Description:	Efficiency of methane destruction/oxidation in power plant
Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	99.5%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	Set at 99.5%(IPCC)

Data / Parameter:	CEF_{NMHC}
Data unit:	
Description:	Carbon emission factor for combusted non methane hydrocarbons (various)
Time of determination/ monitoring	Once a year
Source of data:	measured
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	The determination will be provided by an independent laboratory or appropriate measurement
Any comment:	To be obtained through periodical analysis of the fractional composition of captured

Data / Parameter:	PC_{NMHC}
Data unit:	%
Description:	NMHC concentration (in mass) in extracted gas
Time of determination/ monitoring	Annually

Source of data:	Concentration meters, optical and calorific
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	To be obtained through periodical analysis of the fractional composition of captured

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/ tCH_4
Description:	Global warming potential of methane
Time of determination/ monitoring	*Ex ante*
Source of data:	
Value of data applied	21 tCO_2e/tCH_4
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EF_{elec\text{-}gen}$
Data unit:	t CO_2 / MWh
Description:	CO_2 emission factor of the grid
Time of determination/ monitoring	Ex ante
Source of data:	KOBiZE/Poland
Value of data applied	0.812 t_{CO2}/MWh
Justification of the choice of data or description of measurement methods and procedures (to be) applied	A standardised carbon emission factor for the Polish Grid as determined by KOBiZE: http://www.kobize.pl/materialy/jicdm/JI-wskaznik_referencyjny_26sie2011_publik.pdf
QA/QC procedures:	
Any comment:	

Data / Parameter:	CEF_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Carbon emission factor for combusted methane
Time of determination/ monitoring	*Ex ante*
Source of data:	
Value of data applied	44/16 = 2.75 tCO_2e/tCH_4
Justification of the choice of data or description of measurement methods and	

procedures (to be) applied	
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EF_{Heat-gen}$
Data unit:	t_{CO2} /GJ $_{Heat}$
Description:	CO_2 emission factor of coal fired heating
Time of determination/ monitoring	Ex ante
Source of data:	IPCC 2006 / Polish legal source: 2008/Dz.Ust 183/1142
Value of data applied	0.118t_{CO2} /GJ $_{Heat}$
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The standard carbon emission factor from the IPCC guidelines together with a combustion efficiency of 80% has been taken as a conservative approach. The value for “Coking Coal” / “Other Bit. Coal” of 94.5 t_{CO2} /TJ has been chosen. This is the value with the lowest carbon emissions, thus this is conservative for coal displacement.
QA/QC procedures:	
Any comment:	$EF_{Heat-gen}$= 0.0945 / 0.8 = 0.118 t_{CO2} /GJ $_{Heat}$

Annex 3

MONITORING PLAN

The monitoring plan is listed in section D. In this section additional information concerning the flaring technology used is given.

Justification of the combustion efficiency of the chosen flare

The methodological "Tool to determine project emissions from flaring gases containing methane", EB 28 Meeting report, Annex 13, has been taken for the determination of the project emissions from flaring. In difference to the flaring tool a combustion efficiency of 99.5%, according to the IPCC guidelines (see also ACM0008 Version 1 and Version 2), has been taken into account instead of the default value of 90% as given in the flaring tool.

This approach was already approved in the registered 2 track project "CMM utilisation on the coal mine Shcheglovskaya-Glubokaya of the State Holding Joint-Stock", unfccc ID 0077.

German regulations

The chosen flare is designed in Germany to fulfil the German regulations for flaring of landfill gas. In these regulations a minimum efficiency of 99.9 % is required. This efficiency is proved by a continuous measurement of the combustion temperature, which has to be above 1,000°C, whereas a minimum retention time of at least 0.3 s is required [TA-Luft]. Additionally the emissions of the flare have to be verified every three years by a measurement.

In case of flaring of landfill gas the German Authorities started with a required combustion temperature of 1,200°C. The temperature has been dropped to 1,000°C after first good experience in flaring of landfill gas has been made. This minimum temperature of 1,000°C is claimed for landfill gas or gas from waste utilisation plants only; in case of other gases e.g. CMM a temperature of 850°C is sufficient (there are no polycyclic aromatic hydrocarbons contained in CMM).

A combustion temperature of more than 850°C assures the complete conversion of hydro carbons contained in the fuel gas into carbon dioxide with minimum proportion of carbon monoxide and marginal, negligible fraction of other components containing carbon, so that an efficiency of minimum 99.9 % is reached. This is state of the art and has been proven in numerous combustion plants in Germany and throughout the world. There are no legal obligatory regulations about the monitoring of flares in Germany. According to the German [TA-Luft], these regulations have to be examined in every individual case by the Authorising Authority. Normally a periodical emissions measurement of the main components CO, NOx and total carbon, which indicates the combustion efficiency of the flare, has to be carried out every three years by an approved expert laboratory, institute etc. At this the value of 20 mg/m³ total carbon in flue gas [TALuft] is taken.

Description of the flare equipment

The flare, which is supposed to be used in this project, is an enclosed flare with a controlled combustion process. The flare is designed for a combustion temperature of more than 850°C and a retention time of about 0.3 sec. The flare is a further development of flares for landfill gas, which has been installed on numerous landfill sites in Germany, France, Belgium, Spain, Portugal, Hungary and Croatia. Characteristic for landfill gas flares is the continuous operation of the flaring process and the controlled combustion process. The German Regulations require a minimum temperature of 1,000°C for landfill gas flares and 850°C for CMM flares. To fulfil this legal requirement a special design of the burning system and an adequate controlling system is applied. The main difference to other flaring systems is the controlled combustion process – the combustion temperature and combustion output are controlled and regulated.

The fuel gas is fed in via a distribution system into the combustion chamber. The main pipe is split up in several distribution pipes fitted with nozzles, which are evenly distributed over the whole cross section of the combustion chamber. The uniform distribution of the fuel gas provides a smooth combustion over the whole cross section of the combustion chamber; generation of possible schlieren of uncombusted gas is minimised in that way.

The combustion air is sucked in into the combustion chamber by the natural drought of the chimney effect of the combustion pipe. The amount of the combustion air is regulated by lamellar lids in the supply air inlet, whereas the lid position is controlled by the temperature in the combustion chamber. In that way the desired value for the combustion temperature in the flare is kept constant. The retention time of 0.3 s is achieved by the height of the flare pipe. The amount of the fuel gas is regulated by a throttle in the main fuel gas conduit. Hereby the combustion output of the flare is controlled.

The given combustion output is automatically controlled by the control system. The flare has a minimum combustion output, at which the minimum combustion temperature of 850°C can be reached and a maximum combustion output, at which the minimum retention time can be reached. Both limiting values are monitored by the control system. If the combustion temperature falls under the minimal value or the combustion output exceeds the maximal value, the system is automatically shut down. The flare is provided with an automatic firing device and a flame detector. Both devices are standards from heating boilers section. All process and operation data, especially the combustion temperature and the CMM amount is monitored, stored and archived.