



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

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**SECTION A. General description of the project****A.1. Title of the project:****Utilisation of CMM for liquefaction on the Krupinski Coal Mine in Upper Silesian Basin, Poland**

(Polish name of the mine is Krupiński. The English notation “Krupinski” is applied for this PDD)

Sectoral scopes 8, 10

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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.

In this project a part of CMM from the suction systems of the coal mine Krupinski should be utilised for production of LNG for use as substitute of natural gas and furthermore partially combusted in flares and a thermal oxidiser, which are part of the plant.

The owner of the mine Krupinski (JSW S.A.) has a big surplus on CMM which can only be emitted in the atmosphere. JSW sales the gas to the project owner (LNG Silesia), who will produce a liquid fuel at LNG quality by liquefaction in an innovative plant.

The coal mine Krupinski has 3 shafts, one of them is venting shaft. The degassing of the mine is operated by a specialised Polish company ZOK.

The combustion of methane within the purification steps of the liquefaction process and subsequently as a valuable fuel, which will be used as a substitute of natural gas in plants of external users, results in a significant emissions reduction. The conversion of the harmful greenhouse gas methane with a GWP of 21 into less harmful CO<sub>2</sub> with a GWP of 1 reduces the global warming potential of the emissions by 87%.

Due to avoid double counting, only the part of emission reduction generated through combustion of methane within flaring, the thermal oxidation or as the final product, will be claimed by the project. Therefore emission reductions from displacement of fossil fuels are not included in the project.

**A.3. Project participants:***Table A- 1 – Project participants*

<b>Party involved (*)</b>	<b>Legal entity <u>project participant</u> (as applicable)</b>	<b>Please indicate if the <u>Party involved</u> wishes to be considered as <u>project participant</u> (Yes/No)</b>
Poland (host)	<ul style="list-style-type: none"> <li>▪ LNG Silesia Sp. z o.o.</li> </ul>	No
Netherlands	<ul style="list-style-type: none"> <li>▪ Carbon-TF B.V.</li> </ul>	No
<b>((host) indicates a host Party)</b>		

- 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.  
Project developer, owner of the project and of the plant

**A.4. Technical description of the project:****A.4.1. Location of the project:**

The project is located at the coal mine Krupinski in Suszec in south Poland (Silesian Voivodship). The locations of the Upper Silesian basin as well as location of the coal mine 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.:**

The project is located in the Upper Silesia Basin, on the working coal mine Krupinski,  
ul. Piaskowa 35, PL - 43 - 267 Suszec  
boundary: Suszec,  
land parcels: 1786/78 and 329/18  
Geographical coordinates: 50°2'52"N  
18°46'29"E

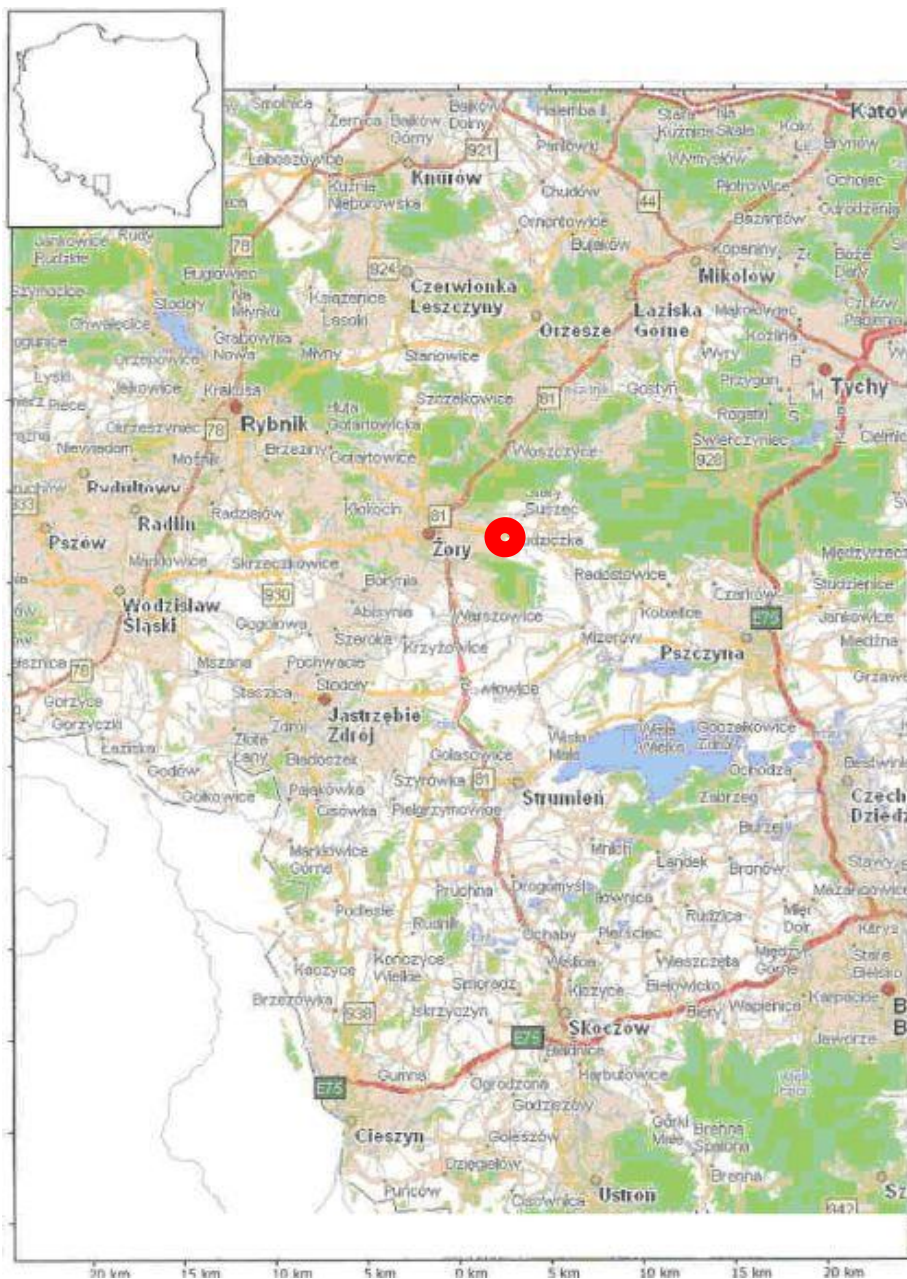
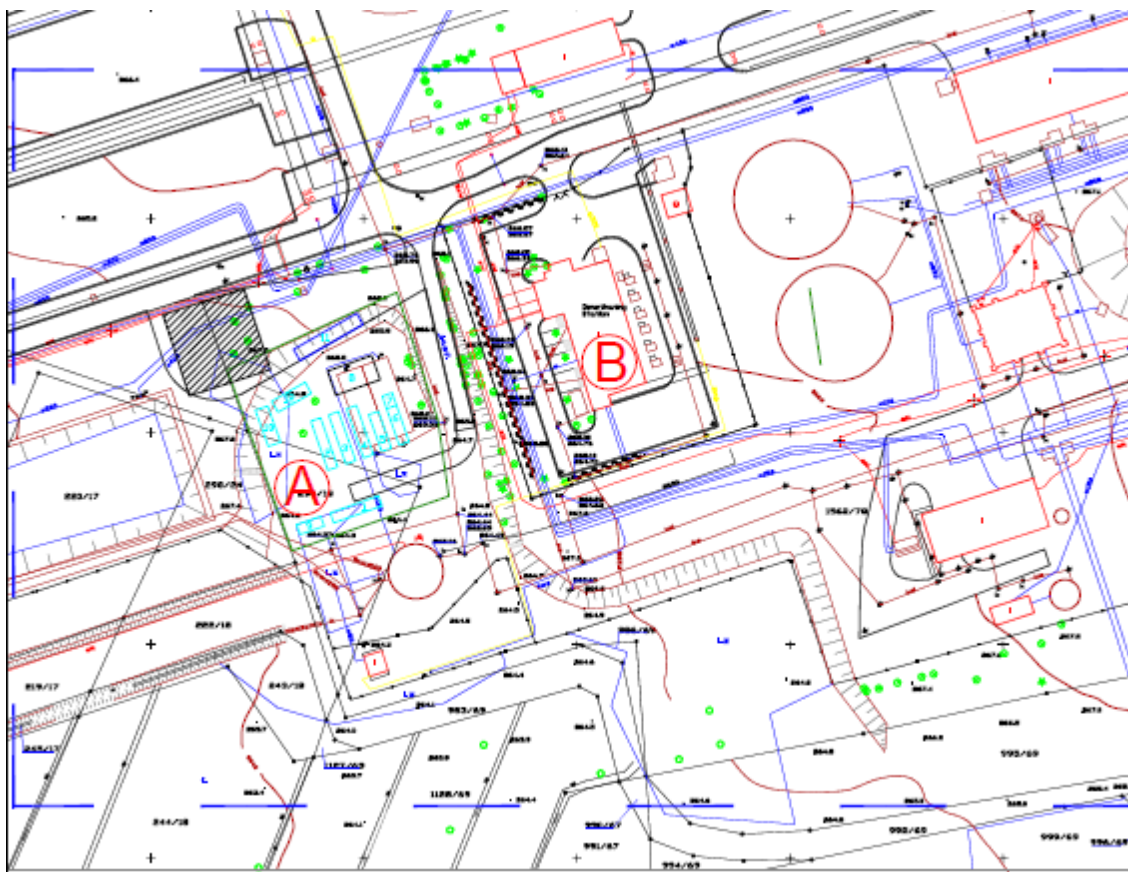


Figure A-2: Location of the Project in Upper Silesia

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

The project is located at the coal mine "Krupinski" in Upper Silesia.



A liquefaction plant

B degassing station of the coal mine Krupinski

*Figure A-3: Location plan of the liquefaction plant at the coal mine Krupinski*

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

The mine has an active degasification system. A part of the CMM is captured out of underground boreholes in the longwall and the mining area and is collected in a central suction system, which ends on the surface of the venting shaft.

The suction system was primarily designed for operational safety in the underground and not for CMM utilisation and there are no national regulations or legal requirements for treatment and utilisation of the captured CMM. However it is common practice at Polish coal mines to release the CMM into the atmosphere, the coal mine Krupinski used a part of the captured CMM in CHP-Units, in boiler systems for heat generation and for coal drying. These facilities are operated by the mine and one of its subsidiaries and are neither connected to the presented project nor can be influenced by the project operator.

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**Project activities - Utilisation of CMM**

In the case of this additional project a part of the CMM from the capturing system is utilised for production of liquefied methane, which will be used as a natural gas substitute. Furthermore some of the gas will be combusted in the thermal oxidiser and in a flare, which are both parts of the plant. The power supply of the plant will be from the public grid. An enhancement of the project by a CHP is still in discussion.

**Utilisation of the methane captured (the project)**

The utilisation of the CMM is provided through:

1. installation of a liquefaction plant producing a LNG substitute

The yearly methane amount envisaged for use in the LNG production plant is at least 7,000,000 m<sup>3</sup>. The methane flow from the suction system is about 816-1250 m<sup>3</sup>/h. pure methane. The utilisation plan is shown in table A-2.

*Table A-2 – Installation plan of the project*

<b>unit</b>	<b>installation date</b>	<b>Production capacity</b>	<b>product</b>
1 liquefaction plant	07.2011	Up to 5,600,000 m <sup>3</sup> yearly	Liquid methane

**CMM Supply**

The utilisation unit is connected to the central suction system. The pressure generated by the vacuum pumps of the coal mine is sufficient to supply the utilisation unit, so that no further compression for transport is needed.

The total amount of CMM sent to the utilisation unit is measured by flow meters. The units are provided with a deflagration flame arrester which prevents backfiring from the utilisation unit into the suction system.

**Liquefaction plant**

The CMM from the central CMM capture station is delivered to the liquefaction plant. The plant consists of three main production modules, which are relevant for the estimation of the environmental effect of the plant: oxygen removal from the feed in the thermal oxidiser through combustion with a part of methane, flaring of methane containing waste gas streams from the production and the delivery of the product aiming the later combustion in decentralised plants.

**Maintenance program**

The maintenance and operation of the project equipment is provided by the personnel of the plant operator (LNG-Silesia) and specialised service personnel of the module producers.

**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 extracted CMM is normally higher than the amount of utilised CMM. The amount of CMM is expected to increase in the future, due to the extension of the coal mining activities.
Malfunctioning of the liquefaction plant.	Training of the staff and regular maintenance of equipment.
Lower concentration of methane in extracted gas	A lower concentration of methane in the feed gas lowers the efficiency of LNG production, by increasing the amount of waste gas to flare. In case of higher oxygen concentration more methane has to be burned in the thermal oxidiser. Thus the environmental effect of the plant will not be affected in that extend. Despite that a minimum concentration of 30% CH <sub>4</sub> in the captured gas is required for safety reasons.

**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 CO<sub>2</sub> (GWP 1) in combustion processes. In absence of the project the whole CMM amount, which should be converted into CO<sub>2</sub> through combustion within the purification steps within the liquefaction process and subsequently then of the final product, would otherwise be released unused to the atmosphere as more harmful methane.

The LNG produced in the plant is to use as a substitute of other fuels in plants of external users. In order to avoid double counting any effects of displacement of fossil fuels measured in emission reductions in that plant are not claimed and not included in this PDD.

The project is a first of its kind as so not "business-as-usual" and faces several barriers, both in terms of prevailing practice and the economic attractiveness of the project. There is presented in section B of this PDD, 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 period (2008-2012)*

1st Crediting Period 2008- 2012	
	Years
Length of the crediting period	1.5
Start date of the project 01/07/2011	
2008	0
2009	0
2010	0
2011	13,115
2012	50,671
Total estimated emission reductions over the <u>crediting period</u> (tonnes of CO2 equivalent)	63,785
Annual average of estimated emission reductions over the <u>crediting period</u> (tonnes of CO2 equivalent)	42,524

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)*

2nd Crediting Period 2013 2017	
	Year
Length of crediting Period	5
2013	70,939
2014	70,031
2015	70,031
2016	70,031
2017	70,031
Total estimated emission reductions over the <u>crediting period</u> (tonnes of CO2 equivalent)	351,064
Annual average of estimated emission reductions over the <u>crediting period</u> (tonnes of CO2 equivalent)	70,213
Total estimated emission reductions over the <u>project lifetime 2011-2019</u> (tonnes of CO2 equivalent)	554,911

**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 Letter of Approval of Netherlands as of the investing country (reference 2012JI46) was issued 18 October 2012.

The Project Idea Note was submitted June 2006 due to obtain the Letter of Endorsement. The Letter of Endorsement was issued in August 2009.

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.

**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 elements of approved CDM baseline and monitoring methodologies or approved CDM methodological tools can be used, as appropriate.

**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 06.1.0), EB69.

The result is given below.

**Step 1. Alternatives****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 vii. use for liquefaction of methane and option ii. flaring of CMM.

**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 vii. Use for liquefaction of methane and option ii. flaring of CMM.

### **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 1b and step 1c.

#### *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. Even if the CMM from the coal mine Krupinski was used in several facilities for power and heat production, there are big amounts of methane still released unused into the atmosphere.

#### *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

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

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 liquefaction and flaring. The remaining amount of the CMM which cannot be utilised for the project or in other activities at the location should be vented.

### **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 utilisation during the operation of a mine or 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 or for use as a fuel. Therefore, all the alternatives listed in step 1b 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 not possible as this project is the first in its kind, 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 operating company must evaluate a project, which is economically viable. As the benchmark used for evaluation is the investment in governmental bonds. The Government bond rates for 2008, as the investment process was about to start, were variable depending on the inflation for ten years with 6.75% the first year. As the assumed rate for 10 years bonds were 6.75 % taken, which is conservative.

The NPV (6.75%) 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 project has the following economic indicators:

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

<b>Economic Parameters without ERUs</b>		
<b>IRR</b>	<b>2.79</b>	<b>%</b>
<b>NPV (0 %)</b>	<b>807,689</b>	<b>EUR</b>
<b>NPV (6.75%)</b>	<b>-796,162</b>	<b>EUR</b>

**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. The price for the LNG was evaluated by the project developer and is based on the negotiations with the potential customers. According to the "Tool for the demonstration and assessment of additionality", the relevant elements of the project finance revenues were supposed changed 10% downwards and 10% upwards. Variables evaluated as reasonable to the project are the revenues from the sales of the product, as they are the main source of revenues, the expenses for CMM and power purchase. CMM price is directly connected to the prices at the gas market, so it is supposed to be variable in the same extend, as LNG. The high power demand of the plant results in high costs for power purchase, which contributes to more than 50% of project costs, should be also considered as connected to price changes at the energy market. A variation of the revenues and expenses in opposite directions within the same energy market environment is very unlikely and therefore not taken under account. The remaining operational costs are those for maintenance, which are supposed to be nearly stable so a variation for the sensitive analysis is not realistic.

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Tab. A6-1: Sensitivity analysis of economic indicators of the project as planned in 2008, without ERU

Economic Parameters without ERUs	Energy resources and products up 10%	Energy resources and products down 10%	
IRR	4.46	0.94	%
NPV (0 %)	1,357,724	257,653	EUR
NPV (6.75 %)	-482,875	-1,109,448	EUR

Thus, even in the case of a significant change in the price levels within the energy markets, the IRR of the proposed project would stay very low and NPV(6.75%) has not become positive, which makes a bond investment more 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 price levels within the energy markets revenues, the IRR of the proposed project would stay very low and NPV(6.75%) has not become positive, which makes a bond investment more attractive. The project is not supposed to be financially attractive without revenues from emission trading.

### 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:

- Prevent the implementation of this type of proposed project activity; and
- 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.

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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

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.

The 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 were 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.

Therefore this alternative faces a prohibitive barrier and is eliminated.

e) fuel cell, CMM fired

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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*

The mine operator and its subsidiary operate several CMM fired engines, which meet the power demand of the mine. There are no other 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*

The heat demand of the coal mine is already met by CMM and coal fired boilers. There is also one CMM fired coal drying plant and no need for an enhancement. A conventional hot water boiler could produce 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 is a part of the project scenario.

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There is a liquefaction plant required. 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, which is a financial barrier proven within the financial analysis. There is also no experience in Poland with this technology for CMM utilisation, which makes it the first in its kind, which is a clear barrier. This is proven by the following analysis of prevailing practise.

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. As shown in the calculation of profitability, the project scenario is financially not attractive. This is proven in section B.2 of this PDD. Furthermore it is proven as a project first of its kind.

Incentives from the selling of emission reduction were seriously considered in the decision to proceed with the project activity. Furthermore the delay in the issuance of the Letter of Endorsement caused the withdrawal of the main investor in the year 2008 and a serious delay of the start-up of the project, due to lacking finance. Before the start of project works an analysis was made, if the project can be approved by the host party. The letter of Endorsement was requested in September 2006. Letter of Endorsement was issued in September 2008.

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: use in the available facilities of the mine and venting of the remaining CMM into the atmosphere.

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.

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

This is the first project in Poland which uses CMM for liquefaction.

The project is a first of its kind activity according to the “Tool for the demonstration and assessment of additionality” (Version 06.1.0) EB 69 as there are no other examples within the applicable geographical area (Poland) delivering the same product as output , with 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 proves the barrier due to prevailing practice

This project is the “first of its kind” in Poland using CMM for liquefaction.

#### *Technology barrier*

The project is the first CMM utilisation by means of liquefaction in Poland. CMM has varying quality and its use for liquefaction is not comparable with this of natural gas. The only information on the process available results from simulations. The experience after the operation of the plant can be first used for further optimisation of the process. 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**

The project is an activity first of its kind according to “Tool for the demonstration and assessment of additionality” (Version 06.1.0) EB 69 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:***Table B-4: Overview on emissions sources included in or excluded from the project boundary***Baseline**

Source	Gas		Justification / Explanation
Emissions of methane as a result of venting	CH <sub>4</sub>	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 is taken into account.
Emissions from destruction of methane in the baseline	CO <sub>2</sub>	Excluded	There are no systems in the applicable baseline scenario which can be influenced by the project operator. Furthermore the dedicated amount of methane for use in the project was evaluated by the coal mine under consideration of its demand which is to meet before other users.
	CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative.
	N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative.
Grid electricity generation (electricity provided to the grid)	CO <sub>2</sub>	Excluded	There is no electricity generated in the project. Thus not applicable to the project
	CH <sub>4</sub>	Excluded	There is no electricity generated in the project. Thus not applicable to the project
	N <sub>2</sub> O	Excluded	There is no electricity generated in the project. Thus not applicable to the project
Captive power and/or heat, and vehicle fuel use	CO <sub>2</sub>	Excluded	There are no systems in the applicable baseline scenario which can be influenced by the project operator.
	CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative.
	N <sub>2</sub> O	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 <sub>4</sub>	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 <sub>2</sub>	Included	The own electricity consumption of the liquefaction plant is included.
	CO <sub>2</sub>	Excluded	The electricity consumption of the vacuum pumps is not included in the project boundary as they are necessary for the extraction itself and is performed both in the baseline and project scenario.
	CO <sub>2</sub>	Excluded	The electricity consumption of the plant during the down time is not included in the project boundary as it is not significant. <sup>1</sup>
	CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative. This emission source is assumed to be very small.
	N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative. This emission source is assumed to be very small.
Emissions from methane destruction	CO <sub>2</sub>	Included	From the combustion of the liquefied methane, flared methane and methane burned within the thermal oxidiser unit for oxygen removal.
Emissions from NMHC destruction	CO <sub>2</sub>	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 <sub>4</sub>	Included	A small amount of uncombusted methane, 0.5% for the plant, will be accounted to keep conservative.
Fugitive methane	CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative. This

<sup>1</sup> 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<sub>2eq</sub>. Reference JISC "Guidance on Criteria for Baseline Setting and Monitoring". This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

emissions from on-site equipment			emission source is assumed to be very small.
Fugitive methane emissions from gas supply pipeline or in relation to use in vehicles	CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative. This emission source is assumed to be very small. (Besides it is not applicable to the project.)
Accidental methane release	CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative. This emission source is assumed to be very small.

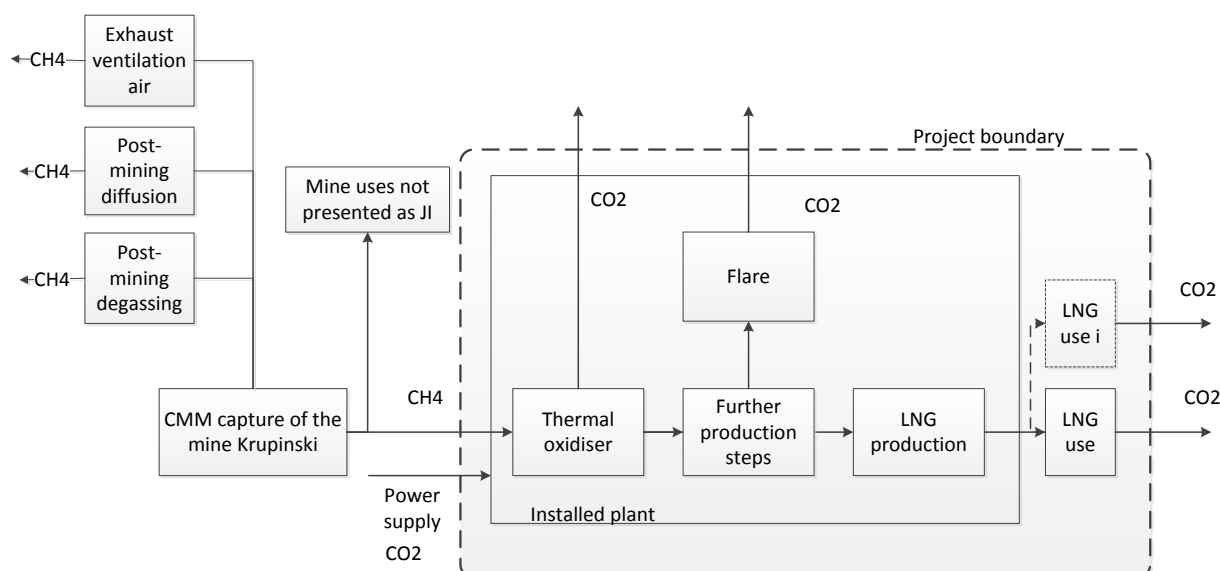


Figure B-3: Project boundary

**Overlap of the project activity and the baseline**

Overlaps between the project activity and the baseline should be concerned as a leakage. In the case of the proposed project activity leakage is not likely as analysed in the next steps of the baseline section and D.1.3. and can be ignored.

**Baseline Emissions**

Baseline emissions are given by the following equation

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

where

- BE<sub>y</sub> = baseline emissions in year y (tCO<sub>2e</sub>)
- BE<sub>MDy</sub> = Baseline emissions from destruction of methane in the baseline in year y (tCO<sub>2e</sub>)
- BE<sub>MRy</sub> = Baseline emissions from release of methane into atmosphere in year y (tCO<sub>2e</sub>) that is avoided by the project activity

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$BE_{Use,y}$  = Baseline emissions from the production of power, heat or supply to gas grid or other fuels replaced by the project activity in year y ( $t_{CO_2e}$ )

$$BE_{Use,y} = 0$$

### 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.

There is CMM utilisation at the coal mine, but there is no impact on the project activity.

The coal mine operator is responsible for the mine operation. The heat demand of the mine is to be met before the external uses, as it is essential for the mine processes. The heat demand is being met by the mine itself and a subsidiary company responsible for the energy supply. The project operator receives a dedicated amount of methane which ensures that all vital demand of the mine was met before.

$$BE_{MDy} = 0 \quad (2)$$

### 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:

$$BE_{MR,y} = \sum(CMM_{PJ,y}) \times GWP_{CH_4} \quad (3)$$

$$CMM_{PJ,y} = MM_{Fl} + MM_{LNG} + MM_{oxi} \quad (4)$$

where

$CMM_{PJ,y}$  = CMM captured, sent to and destroyed by use  $i$  in the project activity in year y (expressed in  $tCH_4$ )

$GWP_{CH_4}$  = Global warming potential of methane (21  $tCO_2e/tCH_4$ )

$MM_{LNG}$  = Methane destroyed through combustion of LNG

$MM_{oxi}$  = Methane destroyed in the thermal oxidiser

$MM_{Fl}$  = Methane destroyed in the flare

### Leakage

The formula for leakage is given as follows:

$$LE_y = LE_{d,y} + LE_{o,y} \quad (5)$$

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

Leakage may occur if the project activity prevents CMM/CBM from being used to meet baseline thermal energy demand, whether as a result of physical constraints on delivery, or price changes. Where

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regulations require that local thermal demand is to be met before all other uses, which is common in many jurisdictions, then this leakage could be ignored.

The boilers fired with CMM, coal drying are the main heat supply for the regarding mine. The coal mine operator is responsible for the mine operation and it is not likely that the company would sell CMM which ensures the energy demand of the mine. The heat demand has to be met before other uses, as it is essential for the mine operation. The heat demand is changing and depends on the mine operation. Furthermore, there were still big amounts of CMM exhausted before the start-up of the project.

In addition, the price of heat produced in boilers depends on the kind of fuel and is lower if the boilers use more gas. The situation where CMM would be sent to the project activity instead to the boilers is very unlikely because of increasing operational heat prices.

The gas engines installed by the mine and its subsidiary ensure energy delivery at prices lower than that from the grid. The situation where CMM would be sent to the project activity instead to the engines is very unlikely because of increasing operational power prices.

The project activity produces LNG which is not related to the mine operations.

The leakage could be ignored as:

- as the heat demand of the mine is met before the extern uses, as it is essential for the mine processes
- the other technological and economic circumstances at the project location makes leakage emissions due to displacement of other baseline thermal energy uses of methane very unlikely

### Emission Reduction

$$ER_y = BE_y - PE_y - LE_y \quad (6)$$

where

ER <sub>y</sub>	=	Emission reductions of the project activity during the year y (t CO <sub>2</sub> )
BE <sub>y</sub>	=	Baseline emissions during the year y (t CO <sub>2</sub> )
PE <sub>y</sub>	=	Project emissions during the year y (t CO <sub>2</sub> )
LE <sub>y</sub>	=	leakage emissions in year y (t CO <sub>2</sub> ) = 0

<b>Data / Parameter:</b>	BE <sub>y</sub>
Data unit:	t CO <sub>2Eq</sub>
Description:	baseline emissions in year y (tCO <sub>2e</sub> )
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:	BE <sub>y</sub> =BE <sub>MDy</sub> +BE <sub>MRy</sub> +BE <sub>Use,y</sub>

<b>Data / Parameter:</b>	BE <sub>MRy</sub>
Data unit:	t CO <sub>2Eq</sub>
Description:	Baseline emissions from release of methane into atmosphere in year y

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	(t <sub>CO2e</sub> ) 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 data or description of measurement methods and procedures (to be) applied	The GWP for methane is determined after the IPCC
QA/QC procedures:	Monthly recorded
Any comment:	Calculated using formulae in section B3 $BE_{MR,y} = (CMM_{PJ,y}) \times GWP_{CH_4}$

<b>Data / Parameter:</b>	$BE_{MDy}$
Data unit:	t CO <sub>2Eq</sub>
Description:	Baseline emissions from destruction of methane in the baseline in year y (t <sub>CO2e</sub> )
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:	

<b>Data / Parameter:</b>	$PC_{NMHC}$
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:	

<b>Data / Parameter:</b>	$CMM_{PJiv}$
Data unit:	tCH <sub>4</sub>
Description:	CMM captured, sent to and destroyed by use <i>i</i> in the project activity in year <i>y</i>
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 the thermal oxidiser, flare and as LNG will be measured by measuring equipment consisting of flow meters, methane detectors, oxygen detectors, thermometers, pressure gauges, weighting instruments. 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:	$CMM_{PJ} = MM_{FI} + MM_{LNG} + MM_{oxi}$

<b>Data / Parameter:</b>	$GWP_{CH_4}$
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:	

<b>Data / Parameter:</b>	$CEF_{CH_4}$
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:	

<b>Data / Parameter:</b>	$CMM_{BLi,y}$
Data unit:	$t CH_4$
Description:	CMM that would have been captured , sent to and destroyed by use <i>i</i> in the baseline scenario in year <i>y</i>
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. The existing systems use methane for heat generation which is to meet before other uses. The amounts of methane used in these systems cannot be used for the project activity and are so not reasonably significant for the project.
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: 30 October 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 managerial evaluation was made in March 2006. The final decision to start with the project was made after the issuance of the LoE. The first operation of the project was July 2011.

**C.2. Expected operational lifetime of the project:**

At least 10 years from the start of construction. Effectively at least 8.5 years in regards of emission reduction, equal to 102 months, as a result of the delay within the construction stage of the project. An enlargement of the project lifetime is subject to agreement with the gas concession owner.

**C.3. Length of the crediting period:**

1.5 years (2011-2012), which is equal to 18 months.

The crediting period can extend beyond 2012 subject to the approval by the host party.

**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;
- IPCC default factors have been taken from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. [IPCC-2]
- Only methane that is being destroyed by the project should be measured.

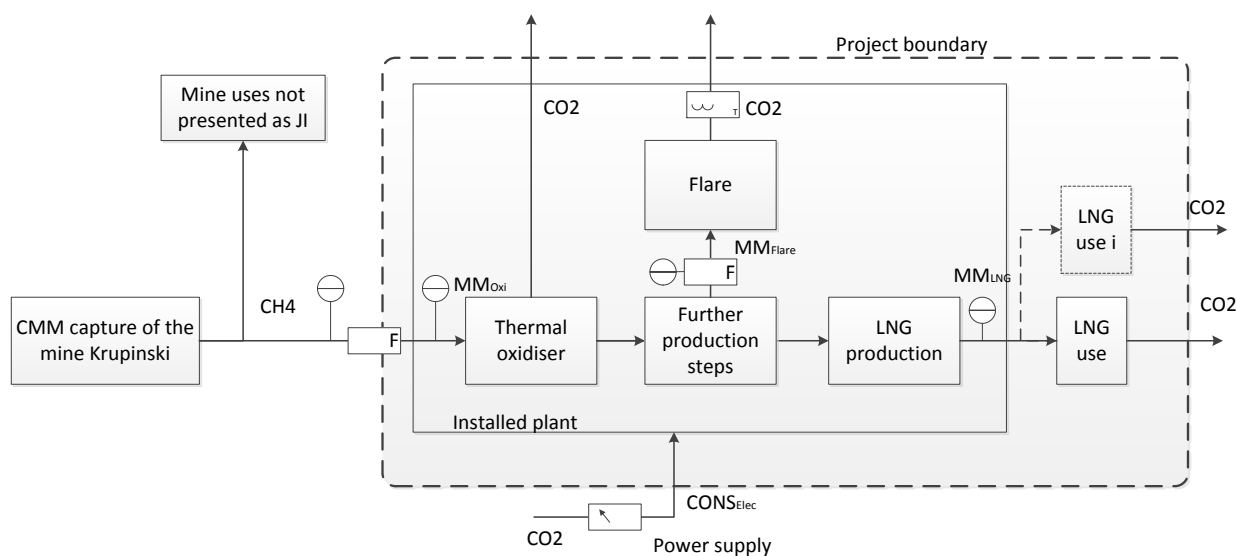


Figure D-1: Data collected for the monitoring

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

<b>Data / Parameter:</b>	CON <sub>ELEC,PJ</sub>
Data unit:	MWh
Time of determination/ monitoring	Ex post
Description:	Additional electricity consumption for use or destruction of methane
Source of data:	Measurements
Value of data applied	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The additional electricity consumption will be determined in dependence from the purchased power
QA/QC procedures:	Calibration according to the producer instructions, legal and operation requirements.
Any comment:	

<b>Data / Parameter:</b>	EF <sub>elec</sub>
Data unit:	t CO <sub>2</sub> / MWh
Description:	CO <sub>2</sub> emission factor of the grid
Time of determination/ monitoring	
Source of data:	KOBiZE/Poland
Value of data applied	0.812 t <sub>CO2</sub> /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: <a href="http://www.kobize.pl/materialy/jicdm/JI-wskaznik_referencyjny_26sie2011_publik.pdf">http://www.kobize.pl/materialy/jicdm/JI-wskaznik_referencyjny_26sie2011_publik.pdf</a>
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	MM <sub>Oxi</sub>
Data unit:	tCH <sub>4</sub>
Time of determination/ monitoring	Monthly
Description:	Methane destroyed in the thermal oxidiser
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 oxygen destroyed in the thermal oxidiser. For safety reasons all oxygen has to be removed. The calculation formula obtained from the chemical equation for combustion.
QA/QC procedures:	The data are recorded at least each 30 minutes. Additional information see annex 3
Any comment:	$MM_{Oxi} = f(M_{O2}) = 16/64 \times M_{O2} = 0.25 \times M_{O2}$

<b>Data / Parameter:</b>	MM <sub>Flare</sub>
Data unit:	tCH <sub>4</sub>
Description:	Methane destroyed in the flare i
Time of determination/ monitoring	Continuous, recorded at least every 20 minutes

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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 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:	

<b>Data / Parameter:</b>	MM <sub>LNG</sub>
Data unit:	tCH <sub>4</sub>
Description:	Methane sent to destruction as LNG
Time of determination/monitoring	Weighted on demand for every dispatch
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 an appropriate truck weighting measuring equipment. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements. The composition of the LNG is to analyse for each truck load. The resulting methane amount will be calculated according to the given fractional analysis of the product and using parameters provided by IPCC or other reliable sources.
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	T <sub>FL</sub>
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 run time of the flare is monitored by continuous measurement of the exhaust gas temperature. See Annex 3

<b>Data / Parameter:</b>	Eff <sub>Flare</sub>
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:	The amount of methane destroyed in the flare will be calculated under consideration of the evaluated flare efficiency as 99.5% of the estimated entire methane amount sent to the flare

<b>Data / Parameter:</b>	$CEF_{NMHC}$
Data unit:	$t\ CO_{2eq} / t_{NMHC}$
Time of determination/ monitoring	Once a year
Description:	Carbon emission factor for combusted non methane hydrocarbons (various)
Source of data:	Estimated
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 of the gas composition will be provided by an accredited laboratory. The emission factors will be estimated for the particular gas component from appropriate sources
Any comment:	To be obtained through periodical analysis of the fractional composition of gas captured.

<b>Data / Parameter:</b>	$PC_{NMHC}$
Data unit:	%
Time of determination/ monitoring	Annually
Description:	NMHC concentration (in mass) in extracted gas
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:	Measured by an accredited laboratory
Any comment:	

<b>Data / Parameter:</b>	$GWP_{CH4}$
Data unit:	$tCO_{2e} / tCH_4$
Time of determination/ monitoring	<i>Ex ante</i>
Description:	Global warming potential of methane
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:	



<b>Data / Parameter:</b>	CEF <sub>CH4</sub>
Data unit:	tCO <sub>2e</sub> /tCH <sub>4</sub>
Time of determination/ monitoring	<i>Ex ante</i>
Description:	Carbon emission factor for combusted methane
Source of data:	
Value of data applied	44/16 = 2.75 tCO <sub>2e</sub> /tCH <sub>4</sub>
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

**D.1.1.2. Description of formulae used to estimate project emissions  
(for each gas, source etc.; emissions in units of CO<sub>2</sub> equivalent):**

Project emissions are defined by the following equation

$$PE_y = PE_{ME} + PE_{MD} + PE_{UM} \quad (7)$$

where

PE<sub>MD</sub> Project emissions from methane destroyed

PE<sub>ME</sub> Project emissions from energy use to capture and use methane

PE<sub>UM</sub> Project emissions from uncombusted methane from flaring and end uses of LNG

Project emissions from energy use to capture and use methane (PE<sub>ME</sub>), is obtained by the equation:

$$PE_{ME} = CONS_{ELEC,PJ} \times EF_{elec} \quad (8)$$

where

CONS<sub>ELEC,PJ</sub> Additional electricity consumption for use or destruction of methane

EF<sub>elec</sub> CO<sub>2</sub> emission factor of the grid

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. 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.

Project emissions from methane destroyed (PE<sub>MD</sub>) can be obtained by the equation:

$$PE_{MD} = PE_{LNG} + PE_{Flare} + PE_{Oxi} \quad (9)$$

$$PE_{LNG} = MM_{LNG} \times CEF_{CH4} \quad (10)$$

$$PE_{Flare} = MM_{Flare} \times (CEF_{CH4} + r \times CEF_{NMHC}) \quad (11)$$

with:

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

$$PE_{Oxi} = MM_{OXI} \times CEF_{CH4} \quad (13)$$

where:

$PE_{MD}$	Project emissions from CMM destroyed (t CO <sub>2</sub> eq)
$CEF_{CH4}$	Carbon emission factor for combusted methane (2.75 t CO <sub>2</sub> eq/t CH <sub>4</sub> )
$CEF_{NMHC}$	Carbon emission factor for combusted non methane hydrocarbons (various) (t CO <sub>2</sub> eq/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 of LNG ( $PE_{UM}$ ) can be obtained through the equation:

$$PE_{UM} = GWP_{CH4} \times [MM_i \times (1-Effi)] \quad (14)$$

Where

$MM_i$	Methane destroyed in the device i
$Effi$	Efficiency of methane destruction/oxidation in the device i
$GWP_{CH4}$	Global warming potential of methane (21 tCO <sub>2</sub> e/tCH <sub>4</sub> )



**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:**

<b>Data / Parameter:</b>	$BE_y$
Data unit:	t CO <sub>2Eq</sub>
Description:	baseline emissions in year y (tCO <sub>2e</sub> )
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:	$BE_y = BE_{MDy} + BE_{MRy} + BE_{Use,y}$

<b>Data / Parameter:</b>	$BE_{MRy}$
Data unit:	t CO <sub>2Eq</sub>
Description:	Baseline emissions from release of methane into atmosphere in year y (tCO <sub>2e</sub> ) 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 data or description of measurement methods and procedures (to be) applied	The GWP for methane is determined after the IPCC
QA/QC procedures:	Monthly recorded
Any comment:	Calculated using formulae in section B3 $BE_{MR,y} = (CMM_{PJ,y}) \times GWP_{CH_4}$

<b>Data / Parameter:</b>	$BE_{MDy}$
Data unit:	t CO <sub>2Eq</sub>
Description:	Baseline emissions from destruction of methane in the baseline in year y (tCO <sub>2e</sub> )
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:	

<b>Data / Parameter:</b>	$PC_{NMHC}$
Data unit:	%
Description:	Concentration (in mass) of NMHC in extracted gas (%), to be measured on

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	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:	

<b>Data / Parameter:</b>	$CMM_{Pj,y}$
Data unit:	tCH <sub>4</sub>
Description:	CMM captured, sent to and destroyed by use <i>i</i> in the project activity in year <i>y</i>
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 the thermal oxidiser, flare and as LNG will be measured by measuring equipment consisting of flow meters, methane detectors, oxygen detectors, thermometers, pressure gauges, weighting instruments. 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:	$CMM_{PJ} = MM_{Fl} + MM_{LNG} + MM_{oxi}$

<b>Data / Parameter:</b>	$GWP_{CH_4}$
Data unit:	tCO <sub>2Eq</sub> /tCH <sub>4</sub>
Description:	Global warming potential of methane
Time of determination/ monitoring	Ex ante
Source of data:	IPCC
Value of data applied	21 tCO <sub>2e</sub> /tCH <sub>4</sub>
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	$CMM_{BLi,y}$
Data unit:	t CH <sub>4</sub>
Description:	CMM that would have been captured , sent to and destroyed by use <i>i</i> in the baseline scenario in year <i>y</i>
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. The existing systems use methane for heat generation which is to meet before other uses. The amounts of methane used in these systems cannot be used for the project activity and are so not reasonably significant for the project.
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	$MM_{Oxi}$
Data unit:	tCH <sub>4</sub>
Time of determination/monitoring	Monthly
Description:	Methane destroyed in the thermal oxidiser
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 oxygen destroyed in the thermal oxidiser. For safety reasons all oxygen has to be removed. The calculation obtained from the chemical equation for combustion.
QA/QC procedures:	The data are recorded at least each 30 minutes. Additional information see annex 3
Any comment:	$MM_{Oxi} = f(M_{O_2}) = 16/64 \times M_{O_2} = 0.25 \times M_{O_2}$

<b>Data / Parameter:</b>	$MM_{Flare,i,y}$
Data unit:	tCH <sub>4</sub>
Description:	Methane destroyed in the flare I in year y
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 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:	The amount of methane destroyed in the flare will be calculated under consideration of the evaluated flare efficiency as 99.5% of the estimated entire methane amount sent to the flare

<b>Data / Parameter:</b>	$MM_{LNG}$
Data unit:	tCH <sub>4</sub>
Description:	Methane sent to destruction as LNG
Time of determination/monitoring	Weighted on demand for every dispatch
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 an appropriate truck weighting measuring equipment. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements. The composition of the LNG is to analyse for each truck load. The



	resulting methane amount will be calculated according to the given fractional analysis of the product and using parameters provided by IPCC or other reliable sources.
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	$T_{FL}$
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 run time of the flare is monitored by continuous measurement of the exhaust gas temperature. See Annex 3

<b>Data / Parameter:</b>	$Eff_{Flare}$
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:	The amount of methane destroyed in the flare will be calculated under consideration of the evaluated flare efficiency as 99.5% of the estimated entire methane amount sent to the flare

<b>Data / Parameter:</b>	Effi
Data unit:	%
Description:	Efficiency of methane destruction/oxidation in device i
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:	



<b>Data / Parameter:</b>	CE <sub>F</sub> <sup>NMHC</sup>
Data unit:	t CO <sub>2eq</sub> / t <sub>NMHC</sub>
Time of determination/ monitoring	Once a year
Description:	Carbon emission factor for combusted non methane hydrocarbons (various)
Source of data:	Estimated
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 of the gas composition will be provided by an accredited laboratory. The emission factors will be estimated for the particular gas component from appropriate sources
Any comment:	To be obtained through periodical analysis of the fractional composition of gas captured.

<b>Data / Parameter:</b>	PC <sub>NMHC</sub>
Data unit:	%
Time of determination/ monitoring	Annually
Description:	NMHC concentration (in mass) in extracted gas
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:	Measured by an accredited laboratory
Any comment:	

<b>Data / Parameter:</b>	GWP <sub>CH<sub>4</sub></sub>
Data unit:	tCO <sub>2e</sub> / tCH <sub>4</sub>
Time of determination/ monitoring	<i>Ex ante</i>
Description:	Global warming potential of methane
Source of data:	
Value of data applied	21 tCO <sub>2e</sub> /tCH <sub>4</sub>
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	CE <sub>F</sub> <sup>CH<sub>4</sub></sup>
Data unit:	tCO <sub>2e</sub> /tCH <sub>4</sub>
Time of determination/ monitoring	<i>Ex ante</i>



Description:	Carbon emission factor for combusted methane
Source of data:	
Value of data applied	44/16 = 2.75 tCO <sub>2</sub> e/tCH <sub>4</sub>
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

**D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO<sub>2</sub> equivalent):**

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

$$BE_{MDy} = 0 \quad (2)$$

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

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

$$CMM_{PJ,y} = MM_{Fl} + MM_{LNG} + MM_{Oxi} \quad (4)$$

The total emissions reductions from displacement of fossil fuels are not taken under account due to avoid of double-counting

$$BE_{Use,y} = 0 \quad (15)$$



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

<b>Data / Parameter:</b>	
Data unit:	
Description:	
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	
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<sub>2</sub> equivalent):**

not applicable

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

In accordance to 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. the heat demand of the mine is met before the extern uses, because it is essential for the mine processes. The amount of captured methane was furthermore every month bigger as the summarised project and baseline demand till now
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 degasification activities are independent from the emission reducing project
4. The impact of the emission reducing project on coal prices is difficult to assess. The revenues from carbon trading are for the project operator, not for the mine, and necessary for an economical viability of the presented project. The emission reducing project as such does not influence coal production so it is unlikely that the emission reducing project will impact coal prices

Furthermore according to “Provisions for Joint Implementation small-scale project”, Version 03, leakage only has to be considered within the boundaries of non-Annex I Parties.

**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<sub>2</sub> 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<sub>2</sub> 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:

$$ER_y = BE_y - PE_y \quad (16)$$

where:

ER<sub>y</sub> Emissions reductions of the project activity during the year y (t CO<sub>2eq</sub>)

BE<sub>y</sub> Baseline emissions during the year y (t CO<sub>2eq</sub>)

PE<sub>y</sub> Project emissions during the year y (t CO<sub>2eq</sub>)

**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, manometers, thermometers, LNG amount 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:**

<b>Data</b>	<b>Uncertainty level of data (high/medium/low)</b>	<b>Explain QA/QC procedures planned for these data, or why such procedures are not necessary.</b>
<i>NMHC Concentration</i>	low	The determination will be provided by an appropriate measurement.
<i>LNG production</i>	low	The indication of the measurement instrument should be controlled one-time during the final inspection by the manufacturer. The indication of the measurement instrument should be controlled during the regular inspections while the operation time and a device which is obviously out of order should be substituted.
<i>Methane amount</i>	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 device or apparatus which is detected as obviously out of order should be substituted.

**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 automatic, but the operating personnel have 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 measuring devices fulfil the requirements for billing.

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, liquid methane production, exhaust gas temperature of the flare. The plant and all relevant process data are to be observed daily by the staff. The process data are to be collected and archived monthly.

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

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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.

<b>D.4. Name of person(s)/entity(ies) establishing the <u>monitoring plan</u>:</b>
--

Date of completion of the monitoring plan: 30 October 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 utilised in the liquefaction plant 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 <sub>2</sub> Eq]						
Year	2008	2009	2010	2011	2012	2013-2017
Methane destruction						
Flaring			0	522	2,018	13,316
Oxidising	0	0	0	140	541	3,812
combustion of liquid methane	0	0	0	1,605	6,200	43,689
additional power consumption	0	0	0	1,479	5,715	40,277
<b>sum</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3,746</b>	<b>14,474</b>	<b>101,095</b>

**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 [t CO <sub>2</sub> Eq]						
Year	2008	2009	2010	2011	2012	2013-2017
Methane destruction						
Flaring			0	522	2,018	13,316
Oxidising	0	0	0	140	541	3,812
combustion of liquid methane	0	0	0	1,605	6,200	43,689
additional power consumption	0	0	0	1,479	5,715	40,277
<b>sum</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3,746</b>	<b>14,474</b>	<b>101,095</b>

**E.4. Estimated baseline emissions:***Table E-4 – Estimated baseline emissions*

Estimated baseline emissions [t CO <sub>2</sub> Eq]						
Year	2008	2009	2010	2011	2012	2013-2017
Methane destruction						
Flaring	0	0	0	3,989	15,412	101,689
Oxidising	0	0	0	1,069	4,131	29,112
combustion of liquid methane	0	0	0	11,803	45,602	321,357
<b>sum</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>16,861</b>	<b>65,145</b>	<b>452,159</b>

**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	0	-	0	0
2011	3,746	-	16,861	13,115
2012	14,474	-	65,145	50,671
<b>Total t CO2 equiv</b>	<b>18,221</b>	<b>-</b>	<b>82,006</b>	<b>63,785</b>

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	20,264	-	91,203	70,939
2014	20,208	-	90,239	70,031
2015	20,208	-	90,239	70,031
2016	20,208	-	90,239	70,031
2017	20,208	-	90,239	70,031
<b>Total t CO2 equiv</b>	<b>101,095</b>	<b>-</b>	<b>452,159</b>	<b>351,064</b>

**Krupinski-lcmm**

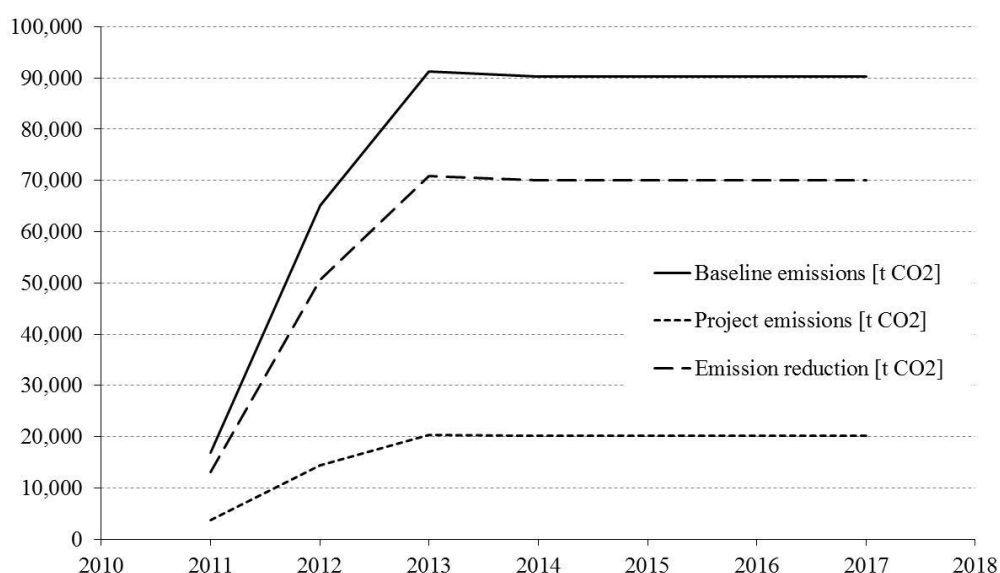


Figure E-1 - Baseline emissions, project emissions and emissions reduction; total project

**SECTION F. Environmental impacts****F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:**

The plant requires an approval by the Polish Environmental Authorities.

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. The biggest innovation of the project is that it uses CMM, which usually can be utilised only at the capture location, into a very valuable fuel usable outside the mine, even independently from any pipeline. The end users of the product can apply it as a substitute of natural gas or to move away from the use of environmentally unfriendly fuels as heavy heating oils. Not only the applied technology, but the concept along the entire supply chain step beyond the present state of the art.

Furthermore the operation of the plant creates additional jobs.

Beside the positive effect on the global climate protection, no transboundary 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. The plant has to fulfil the requirements of the Polish regulations. According to the Polish regulations an Environmental Impact Analysis was required. The final operational permit does not include any significant additional requirements. Notwithstanding the plant operator implemented very restrictive HSE regulation based on those of the Shell Group in order to ensure both the safety of the operation and of the environment. There is no special permission for the emissions from the plant. There was only mandatory to inform about the start up of the plant.

**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: Community Pszczyna, 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 Community Pszczyna 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 Letter of Endorsement was issued in August 2008.

Annex 1CONTACT INFORMATION ON PROJECT PARTICIPANTS**Proposer and project operator**

Organization:	LNG Silesia
Street/P.O.Box:	ul.Leśna
Building:	1
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Postal code:	43-170
Country:	Poland
Phone:	+48 32 324 46 52
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E-mail:	
URL:	
Represented by:	Artur Kostka
Title:	CEO
Salutation:	Mr.
Last Name:	Kostka
Middle Name:	
First Name:	Artur
Department:	
Phone(direct):	
Fax (direct):	
Mobile:	
Personal e-mail:	akostka@lngsilesia.pl

**Consultant and investor, buyer of the emission reduction certificates**

Organization:	Carbon-TF B.V.
Street/P.O.Box:	Kaldenkerkerweg 158
Building:	
City:	Tegelen (Venlo)
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Postal code:	5932 CZ
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Phone:	+31 (0) 77 351 7985
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URL:	<a href="http://www.carbon-tf.com">www.carbon-tf.com</a>
Represented by:	Clemens Backhaus
Title:	Managing Director
Salutation:	
Last Name:	Backhaus
Middle Name:	
First Name:	Clemens
Department:	
Phone(direct):	
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Mobile:	
Personal e-mail:	<a href="mailto:ba@carbon-tf.com">ba@carbon-tf.com</a>

## Contact person for the purpose of the project:

Organization:	Carbon-TF B.V.
Street/P.O.Box:	Kaldenkerkerweg 158
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URL:	<a href="http://www.carbon-tf.com">www.carbon-tf.com</a>
Contact person:	Alina Mroz
Title:	Director Business Development
Salutation:	
Last Name:	Mroz
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Personal e-mail:	<a href="mailto:mr@carbon-tf.com">mr@carbon-tf.com</a>

Annex 2**BASELINE INFORMATION****Justification of the methane amount taken for the baseline estimation**

The CMM delivery agreement from the mine operator was taken for the estimation of the size of the utilisation plant. The average efficiency of the utilisation plant in the first year was assumed as 40% in the second as 70%, which is realistic in the case of a new technology. The supporting documents regarding the assumption were provided to the AIE.

**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.

**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](http://www.kobize.pl/materialy/jicdm/JI-wskaznik_referencyjny_26sie2011_publik.pdf)

**Key elements of the baseline:**

<b>Data / Parameter:</b>	BE <sub>y</sub>
Data unit:	t CO <sub>2Eq</sub>
Description:	baseline emissions in year y (t <sub>CO<sub>2e</sub></sub> )
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:	$BE_y = BE_{MDy} + BE_{MRy} + BE_{Use,y}$

<b>Data / Parameter:</b>	BE <sub>MRy</sub>
Data unit:	t CO <sub>2Eq</sub>
Description:	Baseline emissions from release of methane into atmosphere in year y (t <sub>CO<sub>2e</sub></sub> ) 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 data or description of measurement methods and procedures (to be) applied	The GWP for methane is determined after the IPCC
QA/QC procedures:	Monthly recorded
Any comment:	Calculated using formulae in section B3 $BE_{MR,y} = (CMM_{PJ,y}) \times GWP_{CH4}$

<b>Data / Parameter:</b>	$BE_{MDy}$
Data unit:	t CO <sub>2Eq</sub>
Description:	Baseline emissions from destruction of methane in the baseline in year y (tCO <sub>2e</sub> )
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:	

<b>Data / Parameter:</b>	$PC_{NMHC}$
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:	

<b>Data / Parameter:</b>	$CMM_{Pjiv}$
Data unit:	tCH <sub>4</sub>
Description:	CMM captured, sent to and destroyed by use <i>i</i> in the project activity in year <i>y</i>
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	The amount of methane destroyed in the thermal oxidiser, flare and as LNG will be measured by measuring equipment consisting of flow meters,



measurement methods and procedures (to be) applied	methane detectors, oxygen detectors, thermometers, pressure gauges, weighting instruments. 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:	$CMM_{PJ} = MM_{FI} + MM_{LNG} + MM_{Oxi}$

<b>Data / Parameter:</b>	$GWP_{CH_4}$
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:	

<b>Data / Parameter:</b>	$CMM_{BL,y}$
Data unit:	t CH <sub>4</sub>
Description:	CMM that would have been captured , sent to and destroyed by use <i>i</i> in the baseline scenario in year <i>y</i>
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. The existing systems use methane for heat generation which is to meet before other uses. The amounts of methane used in these systems cannot be used for the project activity and are so not reasonably significant for the project.
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	$MM_{Oxi}$
Data unit:	tCH <sub>4</sub>
Time of determination/monitoring	monthly
Description:	Methane destroyed in the thermal oxidiser
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 oxygen destroyed in the thermal oxidiser. For safety reasons all oxygen has to be removed. The calculation formula obtained from the chemical equation for combustion.
QA/QC procedures:	The data are recorded at least each 30 minutes. Additional



	information see annex 3
Any comment:	$MM_{Oxi} = f(M_{O2}) = 16/64 \times M_{O2} = 0.25 \times M_{O2}$

<b>Data / Parameter:</b>	$MM_{Flare}$
Data unit:	tCH <sub>4</sub>
Description:	Methane destroyed in the flare
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 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:	The amount of methane destroyed in the flare will be calculated under consideration of the evaluated flare efficiency as 99.5% of the estimated entire methane amount sent to the flare

<b>Data / Parameter:</b>	$MM_{LNG}$
Data unit:	tCH <sub>4</sub>
Description:	Methane sent to destruction as LNG
Time of determination/ monitoring	Weighted on demand for every dispatch
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 an appropriate truck weighting measuring equipment. The equipment fulfils Polish requirements for billing within the gas and oil industry sector. Calibration according to the producer instructions, legal and operation requirements. The composition of the LNG is to analyse for each truck. The resulting methane amount will be calculated according to the given fractional analysis of the product and using parameters provided by IPCC or other reliable sources.
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	$T_{FL}$
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 run time of the flare is monitored by continuous measurement of the exhaust gas temperature. See Annex 3

<b>Data / Parameter:</b>	Eff <sub>Flare</sub>
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:	The amount of methane destroyed in the flare will be calculated under consideration of the evaluated flare efficiency as 99.5% of the estimated entire methane amount sent to the flare

<b>Data / Parameter:</b>	CE <sub>FNMHC</sub>
Data unit:	t CO <sub>2eq</sub> / t <sub>NMHC</sub>
Time of determination/ monitoring	Once a year
Description:	Carbon emission factor for combusted non methane hydrocarbons (various)
Source of data:	Estimated
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 of the gas composition will be provided by an accredited laboratory. The emission factors will be estimated for the particular gas component from appropriate sources
Any comment:	To be obtained through periodical analysis of the fractional composition of gas captured.

<b>Data / Parameter:</b>	PC <sub>NMHC</sub>
Data unit:	%
Time of determination/ monitoring	Annually
Description:	NMHC concentration (in mass) in extracted gas
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:	Measured by an accredited laboratory
Any comment:	

<b>Data / Parameter:</b>	GWP <sub>CH4</sub>
Data unit:	tCO <sub>2e</sub> / tCH <sub>4</sub>
Time of determination/ monitoring	<i>Ex ante</i>
Description:	Global warming potential of methane
Source of data:	
Value of data applied	21 tCO <sub>2e</sub> /tCH <sub>4</sub>
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	

<b>Data / Parameter:</b>	CEF <sub>CH4</sub>
Data unit:	tCO <sub>2e</sub> /tCH <sub>4</sub>
Time of determination/ monitoring	Ex ante
Description:	Carbon emission factor for combusted methane
Source of data:	
Value of data applied	44/16 = 2.75 tCO <sub>2e</sub> /tCH <sub>4</sub>
Justification of the choice of data or description of measurement methods and procedures (to be) applied	
QA/QC procedures:	
Any comment:	



### 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**

Combustion efficiency of 99.5%, according to the IPCC guidelines (see also ACM0008 Version 1 and Version 2), has been taken into account. 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.

### **Requirements**

The chosen flare is designed to fulfil 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. Additionally the emissions of the flare have to be verified every three years by a measurement.

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. Normally a periodical emissions measurement of the main components CO, NO<sub>x</sub> 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/m<sup>3</sup> 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. Characteristic for landfill gas flares is the continuous operation of the flaring process and the controlled combustion process. The required 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 draught 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.

### **Oxidiser**

The amount of oxygen sent to the plant will be calculated and based upon the measurement of the volumetric gas stream and the mole concentration of the relevant components (methane and oxygen at fixed 5% residual carbon dioxide and balancing amount of nitrogen). The oxygen must be removed below 100ppm from the feed gas, so a combustion efficiency of the oxidation at 99.5% is a conservative approach.